

Gaming Behavior among Dutch Males: Prevalence and Risk Factors for Addiction

Masterthesis at the University of Twente by Maria Haagsma

Title: Gaming behavior among Dutch males: prevalence and risk factors for addiction

Author: Maria Haagsma

Faculty of Behavioral Sciences, University of Twente, Enschede

Education: Master Psychology, Health & Risk

1st supervisor: Oscar Peters

2nd supervisor: Marcel Pieterse

Date: October 2008

Abstract

As the popularity of gaming has grown in the last decades, so has concern over game addiction. In this study, prevalence and risk factors for game addiction were examined by identifying which playing variables, demographic factors, social cognitive and psychological variables are associated with playing frequency and addiction. An online questionnaire was used to examine playing variables, demographic factors, social cognitive and psychological variables. The sample consisted of 176 male adolescents and young adults. A lot of time is spend on gaming, respondents spend on average half a workweek on playing games. Online games, especially MMORPG's, were played for much more hours than offline games. Despite the amounts of time that were spend on gaming, only a few respondents met the criteria for game addiction. Depression, self-efficacy and immersion motives were strong independent determinants of game addiction. Respondents who were more depressed, played games to escape reality and who found it difficult to control their own game behavior, experienced more addiction. Factors like psychological wellbeing determined if gaming becomes an addiction and not necessarily the amounts of time spend on gaming. These findings suggests that in general, most respondents experienced little negative consequences. For them gaming was a fun daily activity like any other. Nevertheless, gaming can be become a serious problem for a small group of players. This study identified some important factors that could form a risk for game addiction.

INTRODUCTION

Gaming has become one of the most popular activities in the last decades. It started in the latter half of the 1970s when home video games achieved widespread popularity with the release of a home version of “Pong”, a simple table tennis game. In the 1980s videogames became more popular, most of the 20 million sold computers were used for games. In 1985 the Nintendo console was released with the generally known game ‘Mario’. The gaming industry showed substantially growth in the early 1990s with the development of gaming console machines such as PlayStation and Super Nintendo and continued in this millennium with a new generation of machines with increasingly sophisticated processing power. An even more revolutionary development was the involvement of the Internet. New games were introduced that enable people to play together online.

Online game playing has grown rapidly; millions of people play online games every day. According to Yee (2006), enormous amounts of time are invested in online gaming. He concluded that the average gamer played over half a workweek and that a small but significant group was dependent on gaming. Griffiths, Davies and Chappell (2004a) found a mean playing time of 25 hours per week among their respondents. A second study of Griffiths, Davies and Chappell (2004b) showed that not all gamers spend that much time on gaming. They found that there was a wide range of playing frequency in online gamers, with respondents who played relatively small amounts of time, whereas others played for a whole workweek. This difference in play frequency was generally associated with age. Adolescents played for more hours per week than adults did.

Massively Multiplayer Online Role Playing Games (MMORPG’s) are the latest online computer gaming experience. This is a genre of computer role-playing games in which a large number of players interact with one another in a virtual world. To support all those players, these game worlds are very large. Most of them require payment of a monthly subscription to access the central servers. MMORPG’s are typically represented by sophisticated and detailed worlds, both visual and auditory. MMORPG’s are available 24 hours per day and contain a unique culture, social structure, economy and ecology which is evolving continuously. Players can experience these social environments through their self

made character. The world in a MMORPG is persistent and does not have clear beginnings or endings, it continues to exist and evolve while the player is away from the game. Because these worlds are endless, deciding to quit is up to the player. The main feature of these games is the system of goals and achievements. Early achievements are quick and gradually take more time and effort. Most forms of advancement require cooperation or dependency on other users. Therefore, social interaction is of great importance, as you have to collaborate with other players to proceed within the game (Ng & Wiemer-Hastings, 2005). In nearly all MMORPG's, the development of the player's character is a primary goal. Players earn points for their actions and use those points to reach character "levels", which makes them better at whatever they do. Examples of these games are Guild Wars, Lineage, Eve Online and World of Warcraft. The latter is the most popular (mmogchart, 2008) and has about 10 million active subscribers worldwide.

As the popularity of gaming has grown, so has concern over game addiction. Yee (2002) concluded in a study among MMORPG players that game addiction is an existing phenomenon. There seems to be a high correlation between game frequency and the probability to develop withdrawal symptom as fear, irritability and anger. Of the respondents, 18 percent said that gaming had negative effects on their health, work or relationships. Half of the respondents considered themselves as addicted. Salguero and Moran (2002) also put forward in their study among Spanish adolescents that game behavior among some adolescents may be similar to dependence. For this group of people the behavior is beyond their control, causes damage and is used to escape reality. Griffiths, Davies and Chappell (2003) found in their study among *Everquest* players between 14 and 29 years of age that one fourth of the respondents played over 40 hours per week and that this group is addicted, assuming that gaming in this amount must have an impact on other aspects of live. According to the American Psychiatric Association game addiction is not a mental disorder, but this diagnosis might be confirmed in 2012 (APA, 2007). Game addictions are of a purely psychological nature (Kurapati, 2001), though it is stated that it mirrors other behavioral addiction like gambling (Griffiths, 1991). Although different terms have been used, researchers generally agree that overuse of games can lead to a behavioral addiction. Most studies has adopted the diagnostic criteria for pathological gambling found in the DSM to measure game addiction (Fisher, 1994; Salguero & Moran, 2002). Lee, Yu and Lin (2007)

pointed out in their study among MMORPG players that game addiction should not be viewed as one-dimensional. There are multiple, intertwining factors like jobs, attitudes, daily routines and lifestyles, that influence game addiction. The diversity among gamers in terms of social contexts and motivations must be acknowledged. Furthermore, gamers' levels of attachment to a game changes over time. Many factors, like social context, interaction with other gamers and game design, have an influence on addictions to a game. The process of addiction does not consist of a linear passage from enjoyment to addiction, addiction is not always the final step in a gamers' relationship to a game.

Research on this rapidly growing phenomenon is of great importance. It has become clear that research findings presented in the last years are rather diverse. It is important to know more about the background of excessive game usage, in view of the fact that a small but significant group is dependant on gaming. Factors that can lead to game addiction should be investigated, as well as which consequences this excessive gaming has for the person.

The aim of this study was to examine prevalence and risk factors for game addiction by identifying which playing variables, demographic factors, social cognitive and psychological variables are associated with playing frequency and game addiction.

Risk factors

In this study, mainly a social psychological perspective was taken. A number of variables which can be a risk factor for game addiction emerged from the literature. These variables were subdivided in demographic variables, game behavior, social cognitive and psychological variables. They are discussed in the following paragraphs.

Demographic variables

Age seems to be correlated with playing frequency. Griffiths, Davies & Chappell (2004b) found that the younger the player, the longer they spent each week on gaming. Differences in education level also were associated with playing time. Rooij and Van den Eijnden (2007) pointed out that respondents who followed pre-vocational education spent more time on gaming than respondents who followed senior general secondary education or pre-university education.

Playing variables

Results from previous studies showed that respondents who played games online, spent much more time on gaming than offline players do (Van Rooij & van den Eijnden, 2007; Smyth, 2007). Especially MMORPG's players invested more time in gaming than players of others genres (Smyth, 2007; Griffiths, Davies & Chappell, 2004b; Ng & Wiemer-Hastings, 2005). MMORPG's require a different gaming experience than other types of games because the always evolving and changing character of the game.

Social cognitive variables

Self-efficacy is one of the most important influences upon behavior in Bandura's social cognitive theory of personality (1977; 1986). Bandura portrays the human individual as proactive, self-organizing and self-reflecting agents, instead of shaped by external events and circumstances. Among the mechanisms of personal agency, none is more central or pervasive than people's beliefs about their capabilities to exercise control over their own level of functioning and over events that affect their lives. Self-efficacy is defined as the perceived trust that someone has in his or her ability to perform a certain behavior. Expectations of self-efficacy determine whether behavior will be initiated, continued or changed. People who think they can easily quit a game, are likely to spend fewer hours on gaming and score lower on game addiction than people with low self-efficacy. Self-efficacy beliefs function as an important set of proximal determinants of human self-regulation (Bandura, 1991). Self-regulation is defined as the ability of an individual to manage his own behavior through observation and evaluation. According to Seay and Kraut (2007) it is important that any study addressing problematic use of gaming examines the role of an individual's self-regulatory abilities in managing gaming behavior. LaRose, Lin, and Eastin (2003) suggested in their study on internet use that internet addiction can be redefined as deficient self-regulation, a disability in controlling own behavior. The symptoms that others described as symptoms of internet addiction may be in fact indicators of deficient self-regulation of internet usage.

Although few studies on game addiction included social environment as an influence, it could play an important role in gaming behavior. The perception of significant others' actions provide information that people may use in deciding what to do themselves. This perception of attitudes and behaviors of significant others are called descriptive norms (Ajzen, 1991).

People who have friends that play games, are more likely to play games themselves. According to Sheeran and Ravis (2003) the descriptive norm construct should be an additional predictor in Ajzen's (1991) theory of planned behavior. They found in their study that observing the behavior of others may be of greater importance in decision making than social pressure from others, particularly in the case of health-risk behaviors. It is also likely that parents play an important role in the behavior of their children. Probably less hours are spent on gaming if parents set clear rules concerning the amount of time spent. In this way, parental supervision can prevent excessive game behavior.

In former studies multiple motivations emerge as explanation for continuous game use. According to Yee (2002) there are certain appealing factors in the game that lead to continuous gaming; reward, the building of a social network and immersion. Kurapati (2001) found that gaming is an outlet for emotional and psychological problems. It also releases stress that is caused by daily activities. Jansz and Tanis (2007) found in their study of online shooters that many players are motivated by the competition and challenge that games offer. Several studies put forward that the social aspects in online games were particularly attractive (Davies & Chappell, 2004a; 2004b; Wallace, 1999; Yee, 2002; 2006; Van Rooij & van den Eijnden, 2007; Smyth, 2007). For some gamers, the social experience in the game appears to be better and more satisfying than what happens in the real world. These people are more introvert and have another view on social life. They find it more pleasant to maintain contact in online games than in real life (Ng & Wiemer-Hastings, 2005). Starting a relation in an online gaming is easy, this is possibly very difficult for some people in real life (Yee, 2002). Yee (2007) created an empirical model of player motives by means of a factor analytical approach. Ten motives were revealed that grouped into three overarching components; Achievement, Social and Immersion. The Achievement component includes challenge and competition motives. The Social component includes motives like socializing and teamwork and the Immersion component included motives that are related to discovery and escape.

Psychological variables

Social fear seems to be associated with playing frequency. Hence, Lo, Wang and Fang (2005) concluded that as the amount of playing frequency increased the amount of social fear also increased, due to the less fulfilling interpersonal relationships. Van Rooij and Van den

Eijnden (2007) found the same relation but than otherwise; social fear led to increased gaming. Also loneliness led to a higher playing frequency. They suggest that young people who experience more social fear and loneliness uses games as an escape. Furthermore, they found that compulsive gamers scored higher on loneliness, depression and lower on self esteem. Yee (2002) and Ko et al. (2005) also suggest that self esteem is correlated with game addiction. Individuals who are low on self esteem can overcome this issue in the virtual world. In the game world they may be able to feel strong in ways that they are unable to do in real life. It is probably the low self esteem that leads to addiction instead otherwise.

Research questions

The variables that were discussed in the previous paragraphs play an important role in the amount of time people invest in playing games and in game addiction. The variables were subdivided in the following categories: demographic variables (age and education); game behavior (playing frequency, type of game); social cognitive variables (self efficacy, descriptive norm, parental supervision, motives, feelings) and psychological variables (social fear, loneliness, depression, self-esteem).

Before identifying which factors are related to playing frequency and addiction, it was important to examine how game behavior looked like. Various aspects of game behavior were examined. The first research question was:

- 1. What does game behavior look like?*

The prevalence of game addiction was also assessed:

- 2. What is the prevalence of game addiction?*

Demographic, social cognitive and psychological variables were examined and how these variables are associated with game behavior and addiction:

- 3. Which playing variables, demographic factors, social cognitive and psychological variables are associated with playing frequency and game addiction?*

METHOD

Procedure and respondents

An online questionnaire was placed at forums on ten Dutch gaming sites. The following websites were selected by searching Google for keywords (game, gaming, and forum), the first ten hits were chosen: forum.gamer.nl, www.gamez.nl, www.wow-nl.com, www.gamersnet.nl, gamerzpalace.koh3.com, www.jouwgames.nl, onlinegamesforum.nl, www.gamelineer.nl, www.gamingonly.nl, forum.xboxworld.nl. Forum visitors were asked to voluntarily fill in the questionnaire. The respondents used the hyperlink to visit the address where the questionnaire was located. Respondents were informed about the duration of the questionnaire and what was investigated. All respondents were guaranteed anonymity and confidentiality.

The 182 respondents who filled out the questionnaire were primarily male (176 male, 6 female). The percentage of women was too small (3.3%) so they were excluded from this study; comparisons done with such a small group are not reliable. A total of 176 male respondents who were adolescents and young adults took part in this study. Demographics of the respondents are displayed in Table 1. The sample ranged between 12 and 38 years, with the mean age of 19 (SD = 5 years). Two-third of respondents (63.7%) were under 20 years of age (8% was aged 10-14 years, 55.7% was aged 15-19 years). The remainders were aged 20-24 years (21%), 25-29 years (11.4%), and 30 years or older (4%). Three-quarter of the respondents were student (77.8%), 19.9% had a job. Of the students, 50% was following secondary education and 16.7% intermediate vocational education. One third was following higher education (20.3% higher vocational education, 10.9% university). The remaining students were in elementary school (1.4%) or followed special education (0.7%). Of the respondents who had a job, eight had finished secondary education (22.9%), twelve intermediate vocational education (34.3%) and thirteen higher education (37.2%).

Measures

The online questionnaire survey (see appendix 1) contained 30 questions. The first questions addressed demographic variables, such as age and education level. Secondly, playing variables during the last six months was measured (i.e. amount of time spent playing

games, level of addiction, the games that were played, the time of day, playing with friends). Third, social cognitive variables (i.e. self-efficacy, motivations, parent supervision, descriptive norm) were measured. Finally, psychological characteristics were measured. These included self esteem, social fear, depression and loneliness. Five-point Likert scales were used, unless noted else wise. In the next paragraph, the conceptualization of each construct will be discussed.

Table 1

Demographics of Respondents

Age	N (176)	%	M (hours/wk)
10-14	14	8.0	22.5
15-19	98	55.7	20.5
20-24	37	21.0	15.0
25-29	20	11.4	19.4
30 >	7	4.0	15.1
Total	176	100.0	19.1

Occupation	N (176)	%	M (hours/wk)
Study	137	77.8	19.5
Work	35	19.9	16.5
Study and work	1	0.6	18.0
Different	3	1.7	36.0

Education level (current)	N (138)	%	M (hours/wk)
Elementary school	2	1.4	29.5
Special education	1	0.7	2.0
Pre-vocational education	14	10.1	35.6
Senior general secondary education	27	19.6	20.7
Pre-university education	28	20.3	16.0
Senior vocational education	23	16.7	17.0
Vocational colleges	28	20.3	16.7
University	15	10.9	17.2

Education level (finished)	N (176)	%	M (hours/wk)
Elementary school	67	38.1	21.9
Special education	1	0.6	21.0
Pre-vocational education	27	15.3	20.6
Senior general secondary education	21	11.9	12.4
Pre-university education	21	11.9	17.4
Senior vocational education	21	11.9	17.7
Vocational colleges	10	5.7	16.9
University	5	2.8	9.8
No education finished	3	1.7	36.3

Demographic variables

Demographics that were asked were age, occupation and education. Students were asked for current education as well as completed education, respondents that had a job or other occupation were only asked for completed education.

Playing variables

Game behavior during the last six months was measured using multiple items. First, respondents were asked how many hours they played each day and how many days they played each week. The amount of hours played per week was calculated by multiplying these numbers. A Dutch translation of the game addiction scale, developed by Lemmens (2008), was inserted in the questionnaire to measure game addiction as a dependant variable. This scale was based on pathological gambling criteria found in the DSM. Table 2 provides information about reliability, number of items and descriptive statistics. Self reported game addiction was measured by the following items: 'I think I spend too much time on gaming', 'I think my game behavior is problematic' and 'I think I'm going to seek help' [scale ranged from (1) 'certainly not' to (5) 'certainly']. Furthermore, questions were asked regarding the time of day when played and the amount of hours played continuously. This was not found in the literature but it is expected that these are associated with game addiction. Gamers were asked which games they played and if they played online or offline (or both). Afterwards these games were categorized by the following genres: MMORPG's (e.g. World of Warcraft), adventure (e.g. Final Fantasy), shooters (e.g. Call of Duty), strategy (e.g. Company of Heroes), action (e.g. Ninja Gaiden), sports (e.g. Fifa), racing (e.g. Grand Theft Auto) and other (music games, Nintendo Wii, small puzzle games). How much money the respondents spend on buying games each month was also asked. Then the respondents were asked whether they played alone or with friends. There also were two questions about the home situation, the first one was whether the respondents were living with their parents/caretakers or not. If respondents answered this question with 'yes', they were asked where within their home they could play games.

Psychological variables

Social fear was measured using an existing scale from the report of national monitor research 'Internet en Jongeren', which was accomplished by IVO (van Rooij & van den Eijnden, 2007). Self esteem was measured using a Dutch translation (van Rooij & van den Eijnden, 2007) of the Rosenberg's Self-Esteem Scale (4-points scale) (Rosenberg, 1989). Depression was measured using the Depressive Mood List 'DML' (5-points scale) (Kandel & Davies, 1982, 1986), which was translated into Dutch by Engels, Finkenauer, Meeus, & Dekovic (2001). Loneliness was measured using a Dutch translation (van Rooij & van den Eijnden, 2007) of a 5-point version of the improved UCLA Loneliness Scale (Russel, Peplau & Cultrona, 1980). The items of each scale are presented in Table 2.

Table 2

Reliability Analysis for Game Addiction Scale, Self-efficacy and Psychological Constructs (N = 176)

Construct	Number items	Cronbach's alpha (α)	M	SD
Addiction	7	.83	2.0	0.74
Self-efficacy	5	.77	3.5	0.97
Social fear	10	.91	2.1	0.78
Depression	6	.84	2.2	0.77
Loneliness	10	.84	1.8	0.59
Self esteem	10	.88	3.2	0.60

Social cognitive variables

Self-efficacy was measured using a 5-point Likert scale, the scale ranged from (1) 'easy' to (5) 'difficult'. Descriptive norm was measured by asking how many of the respondents' friends also played games. Parents' supervision was measured using the following items: 'I'm allowed to play games as often as I want'; 'I'm allowed to game for as long as I want' and 'I'm allowed to play games when I want'. The scale ranged from (1) 'fully disagree' to (5) 'fully agree'. The internal consistency of these three items was high ($\alpha = .80$). The respondents were also asked if their parents were aware of the amount of time they spend on gaming. At the end there was a question addressing school performance, Rooij and Van den Eijnden (2007) found in their study among Dutch adolescents a negative correlation between school performance and game addiction. To measure the emotions respondents experienced during gaming, a list of emotions was made based on the literature (Jansz, 2005; Holbrook, Chestnut, Oliva & Greenleaf, 1984). The respondents were asked to indicate to what extend

the prescribed emotions corresponded to themselves, the scale ranged from (1) ‘never’ to (5) ‘always’. Motives for gaming were measured by asking the respondents to what extent the motives corresponded to themselves, the scale ranged from (1) ‘fully disagree’ to (5) ‘fully agree’. The list of motives was based on the model of Yee (2007) and subdivided in the following categories; ‘Achievement’, ‘Social’ and ‘Immersion’. The items and the descriptive statistics for each component are shown in Table 3. Almost all components had a Cronbach’s alpha of over .70. The component ‘Immersion’ had an alpha of .66. Although this was under .70, the component was taken into further analysis.

Table 3.

Descriptive Statistics and Items per Component of Motives for Play

Component	Mean scores	SD
Achievement ($\alpha = .73$)	3.4	0.73
“I play games because I...”		
1. feel good when reaching the next level	3.4	1.12
2. like getting better in playing the game	4.0	0.80
3. want to reach the next level as fast as possible	2.7	1.12
4. like competing with other players	3.9	1.01
5. like eliminating other players	3.4	1.19
Social ($\alpha = .83$)	3.1	0.93
“I play games because I...”		
1. can help other players	3.4	1.16
2. make new friends	2.7	1.23
3. meet with online friends	3.2	1.27
4. like working together in a group	3.7	1.14
5. feel like belonging to a group	2.4	1.19
Immersion ($\alpha = .66$)	3.4	0.64
“I play games because I...”		
1. like discovering new things that are unknown	3.2	1.25
2. like discovering the game world	3.9	0.92
3. can relax from daily occupations	4.2	0.71
4. ‘m immersed in the fantasy world of the game	3.5	1.18
5. ‘m bored	3.3	1.17
6. experience no limits like in real life	2.8	1.28
7. can forget daily problems	3.3	1.22

Data analyses

First, reliability analyses were done to assess the reliability (Chronbach’s alpha) of the questionnaire. Then the descriptive statistics were calculated. Two dependant variables were examined; playing frequency and game addiction. Variance analyses were done to determine differences in playing frequency and game addiction for various dichotomous variables (e.g.

age categories, education categories, game genres). Correlation analyses were also done to determine associations between various five-point Likert scale variables (e.g. playing online with friends and self-efficacy) and playing frequency and game addiction. Finally, a multivariate regression analysis was done to examine which variables are independent determinants for game addiction.

RESULTS

Game behavior and addiction

Play frequency.

The mean playing time per week in this sample was 19.1 hours ($SD = 15.3$ h). Yee (2006) found similar results. Respondents reported a wide range of hours played per week. These were 1-5 hours (10.8%), 6-10 hours (25%), 11-15 hours (22.2%), 16-20 hours (3.4%), 21-25 hours (13.1%), 26-30 hours (7.4%), 31-40 hours (8.5%), 41-50 hours (5.7%) and over 50 hours (4%). Four respondents claimed to play 70 hours per week and one person 84 hours. Furthermore, three-quarter of the respondents played three or more days each week, 42.6% played every day. When asked how many hours respondents played on average per day, 59.1% of respondents said they played 2 or 3 hours each day. Only a few respondents reported to play for over 8 hours.

There was no relation between age and playing frequency. Furthermore, students played about the same amount of hours per week as people who had a job. There were significant differences in gaming duration regarding the level of current education ($F(6,136) = 3.6, p < .01$, special education was excluded from this analysis because it just had one participant). Sheffe post hoc test was done to find the exact relation between education level and playing frequency. Respondents that followed pre-vocational education played significant more hours per week than senior vocational education, pre-university education and vocational colleges.

Respondents were asked which time of day they played mostly in the past six months. Most of them (81.9%) said to play often or always in the evening. 43.2% played often or always in the afternoon, 19.3% said to play often or always at night. When asked how many hours they mostly played uninterrupted, 61.9% of the gamers report to play for 1 till 2 hours without a break. 28.4% play 3 till 4 hours continuous, and a percentage of 6.3% play for longer than 5 hours.

Addiction.

When asked if respondents thought they spend too much time on gaming, 24.4% agreed. Only 3.9% considered their gaming behavior as problematic and 2.2% was thinking about getting help. Respondents are considered to be addicted to gaming when they scored

‘sometimes’ or higher on all seven items of the game addiction scale (Lemmens, 2008). In this study, four (2.3%) respondents met these criteria. An association was found between self perception of problematic gaming and the score on the game addiction scale. Respondents who thought they spend too much time on gaming ($r = .52, p < .01$), thought their gaming behavior was problematic ($r = .65, p < .01$), and were thinking about seeking help ($r = .37, p < .01$) scored higher on game addiction.

Game genre.

Respondents were asked which game they played and if they played this game online or offline. Number of players, playing frequencies and scores on game addiction scale for each genre are shown in Table 4. The genre that most respondents played was shooters (33%). After this, racing games (25%) and MMORPG’s (16.5%) were most played.

Table 4
Playing Frequency and Score on the Game Addiction Scale for each Game Genre

Genre	Number of players (N)		Playing frequency (M hours/wk)	Addiction (M)
MMORPG	29	16.5%	30.9	2.3
Adventure	5	2.8%	24.2	2.0
Shooters	58	33.0%	20.6	2.0
Strategy	7	4.0%	18.0	1.7
Action	11	6.2%	11.3	1.5
Sports	5	2.8%	14.8	1.7
Racing	44	25.0%	15.0	1.8
Other	14	8.0%	11.0	1.7
Unknown	3	1.6%		
Total	176	100.0%	19.1	1.9

The genres adventure, strategy and sports only had a few respondents so the game genres were subdivided in three categories. Number of players, playing frequencies and scores on the game addiction scale for each game category are shown in Table 5. Variance analysis was done to determine if there were significant differences in playing frequency and game addiction for the several game categories. There were significant differences in the average amount of playing time ($F(2,158) = 8.6, p < .01$). Scheffe post hoc test showed that players of MMORPG’s, adventure and strategy games spend significant more time per week on gaming than players of any other category. There also were significant differences in the scores on addiction for the several game categories ($F(2,158) = 3.2, p < .05$). Respondents

who played MMORPG's, adventure and strategy games scored significant higher on game addiction than players of racing- and sports games.

Table 5

Playing Frequency and Score on the Game Addiction Scale for each Game Category

Category	Number of players (N)		Playing frequency* (M hours/wk)	Addiction** (M)
MMORPG & Adventure & Strategy	41	25.8%	27.9	2.2
Shooters & Action	69	43.4%	19.1	1.9
Racing & Sports	49	30.8%	15.0	1.8
Total	159	100.0%	20.0	1.9

* Scheffe post hoc test; MMORPG's, Adventure & Strategy games were significantly more played than any other category.

** Scheffe post hoc test; respondents who played MMORPG's, adventure and strategy games scored significant higher on game addiction than players of racing- and sports games.

Number of players, playing frequencies and scores on the game addiction scale for online and offline play are shown in Table 6. Half of the respondents (42.8%) only played online, 22.5% played offline and 17.6% played online as well as offline. Respondents who played online had a significantly higher playing frequency ($F(2,143) = 11.8, p < .01$) and played longer continuously than respondents who played offline ($F(2,143) = 5.2, p < .01$). They also scored lower on self efficacy ($F(2,143) = 5.7, p < .01$) than offline players. Furthermore, respondents who played online scored significantly higher on the game addiction scale than offline players and respondents who played online as well offline ($F(2,143) = 7.9, p < .01$).

Table 6

Playing Frequency and Score on the Game Addiction Scale for Online/Offline Play

Online / offline	Number of players (N)		Playing frequency* (M hours/wk)	Addiction** (M)
Online	74	42.0%	24.8	2.2
Both	31	17.6%	19.5	1.7
Offline	39	22.2%	10.9	1.7
Unknown	32	18.2%		
Total	176	100.0%	19.1	1.9

* Scheffe post hoc test; online players played significant more hours per week than offline players.

** Scheffe post hoc test; online players scored significant higher on game addiction than online/offline players and offline players.

When respondents were asked if they played alone, 70.5% said they did. A third (27.8%) sometimes played with their friends on the same computer, 8% often. A quarter (22.2%) said they often played with their friends in the same room. 67% of respondents played online with friends. Younger respondents played significantly more online with friends ($r = -.31, p < .01$) and more with their friends in the same room ($r = -.21, p < 0.1$) than older respondents did. MMORPG's and shooters were more played online with friends than other genres ($F(7,172) = 5.3, p < .01$).

If respondents played more online with friends they played for more hours per week ($r = .44, p < .01$) and longer without a break ($r = .15, p < .05$). This was especially the case for respondents that always played online with friends. Their mean playing time was substantially higher ($M = 39$ hours/wk). Furthermore, they scored lower on self-efficacy ($r = -.20, p < .05$) and higher on game addiction ($r = .25, p < .01$). If respondents played more alone, they had a lower play frequency ($r = -.16, p < .05$) Furthermore, they had an higher score on social fear ($r = .18, p < .05$) and loneliness ($r = .16, p < .05$). Half of the respondents (53.4%) started gaming when they were 5-9 years of age. 36.4 % were 10-14 years of age when they first played a computer game.

Psychological variables

A positive correlation was found between game addiction and playing frequency. If respondents had a higher score on the game addiction scale they spend more time on gaming ($r = .39, p < .01$) and played for more hours continuously ($r = .41, p < .01$). There was no significant association between the various psychological variables and playing frequency. This association was found with game addiction. Correlations between psychological variables, playing frequency and game addiction are shown in Table 7. Respondents, who scored higher on game addiction, also had a higher score on depression, social fear, and loneliness. Especially the association between game addiction and depression was very strong. Furthermore, they had a lower score on self esteem.

Table 7

Correlations between Psychological Variables, Playing Frequency and Score on the Game Addiction Scale

Psychological variables	Playing frequency	Game addiction
Social fear	.06	.33**
Depression	.08	.48**
Loneliness	.08	.21*
Self esteem	-.03	-.29**

Social cognitive variables

Parents' supervision.

Out of the 146 respondents (83%) who were living with their parents or caretakers at home when this survey was taken, 83.6% usually played at their own room. Most of the respondents who lived at home with their parents claimed that they can game as often (80.8%), as long (66.5%), and when (82.9%) they want. 73.3% said that their parents are well aware of their playing behavior. There was no association between parents' supervision and playing frequency. Respondents didn't play for more hours if their parents allow them to decide upon their own game behavior. There was a significant correlation between parents' supervision and game addiction. The more respondents said that they can game as often, as long and when they want the lower their score on the game addiction scale. Respondents with more parental supervision scored higher on game addiction ($r = .29, p < .01$). Furthermore, they reported higher self perceptions of problematic gaming. If parental supervision was higher, the more respondents thought they spend too much time on gaming ($r = .16, p < .05$) and their gaming behavior was problematic ($r = .16, p < .05$).

When asked about their study results, 64.2% said they had good till very good results, 25.6% had sufficient results. There was no relation between playing frequency and study results. There was a negative correlation between game addiction and study results ($r = -.32, p < .01$). Respondents that had lower study results scored higher on game addiction.

Descriptive norm.

Half of the respondents (49.4%) said their friends also played games. 7.4% said all of their friends played games. Respondents that were younger scored higher on descriptive norm than

older respondents. In particular, respondents that were over 30 years of age had a lower score. There was no relation between descriptive norm, playing frequency and addiction.

Self-efficacy.

Self-efficacy was associated with playing frequency ($r = -.38, p < .01$). If the score on self-efficacy was lower, more hours were spend on gaming. This correlation also exists between self-efficacy and game addiction ($r = -.47, p < .01$), respondents with less self-efficacy scored higher on the game addiction scale.

Emotions.

Respondents were asked to what extend they experienced certain emotion during gaming. The emotions that were mostly experienced were relaxation and pleasure. In less degree, reward, achievement, tension and immersion were experienced. Feelings of fear were almost never experienced. Table 8 shows the mean scores on each emotion and the correlation with game addiction. There was a significant relation between certain emotion and game addiction.

Table 8
Descriptive Statistics and Correlation with Score on the Game Addiction Scale for each Emotion

Emotion	Game addiction	Mean score	SD
Relaxation	.05	4.1	0.60
Pleasure	.09	4.2	0.50
Reward	.12	3.6	0.89
Fear	.04	1.4	0.63
Achievement	.26**	3.6	0.92
Tension	.26**	3.4	0.87
Immersion	.29**	3.7	0.88
Usefulness	.24**	2.6	1.07
Frustration	.26**	2.7	0.90
Pride	.23**	3.1	1.05
Control	.11	3.1	1.13
Anger	.17*	1.9	0.82

** Correlation is significant at the 0.01 level

* Correlation is significant at the 0.05 level

Motives for gaming.

The mean scores of the motives and the correlations with play frequency and addiction are shown in Table 9. In general, respondents played games to relax from daily occupations. The mean score on this motive was relative high. Also, they played because they liked getting better in playing the game and discovering the game world.

All main components and most of the motives that are subdivided in these components had a significant correlation with playing frequency and the score on game addiction. The correlation between the social component and playing frequency was relatively high, the relation with game addiction was less strong. Especially the motive ‘meeting with online friends’ had a strong correlation with playing frequency. Immersion was especially associated with gaming addiction. Achievement correlated high with playing frequency as well as game addiction. There were significant differences regarding to motives for play between online and offline players. Online players scored significant higher on the Achievement component ($F(2,143) = 12.7, p < .01$) and the Social component ($F(2,143) = 21.1, p < .01$) than offline players.

Table 9

Correlations between Motives, Playing Frequency and Score on the Game Addiction Scale

Motives "I play games because I..."	Playing frequency	Game addiction
Achievement		
feel good when reaching the next level	.38**	.49**
like getting better in playing the game	.21*	.38**
want to reach the next level as fast as possible	.36**	.33**
like competing with other players	.29**	.40**
like eliminating other players	.34**	.31**
	.16*	.30**
Social		
can help other players	.42**	.28**
make new friends	.24**	.14
meet with online friends	.33**	.16*
like working together in a group	.42**	.27**
get the feeling of belonging to a group	.30**	.22**
	.32**	.28**
Immersion		
like discovering new things that are unknown	.26*	.43**
like discovering the game world	.22**	.32**
can relax from daily occupations	.16*	.23**
'm immersed in the fantasy world of the game	.03	.11
'm bored	.08	.23**
experience no limits like in real life	.01	.24**
can forget daily problems	.20**	.32**
	.16*	.34**

**Correlation is significant at the 0.01 level

* Correlation is significant at the 0.05 level

Regression analysis

To determine what extent the variables explained game addiction, a linear regression analysis was done with game addiction as dependant variable. The variables that correlated significantly with game addiction in bivariate analyses were included in the analysis. Not all respondents were included in this analysis because not everybody reported which game they played and if they played online or offline (or both). The results are shown in Table 10. In the first model the psychological variables were included. Depression appears to be significant. In the second model the playing variables were included, the variables ‘game category’ and ‘online/offline playing’ were transformed in dummy variables. Playing frequency and online playing with friends were significant. When the social cognitive variables were included in the third model, self-efficacy and the immersion motive were significant. Playing frequency and online playing with friends were mediated by the social cognitive variables and were no longer significant. Depression, self-efficacy and the immersion motive were strong independent determinants for game addiction.

Table 10

Regression Analysis with Dependant Variable Score on the Game Addiction Scale (N=131)

Variable	Model 1	Model 2	Model 3
	B	B	B
Social fear	.116	.108	.051
Depression	.472**	.443**	.332**
Loneliness	-.080	-.014	.002
Self esteem	-.039	.025	.093
Play frequency		.202*	.126
Online		.164	.089
Offline		.051	-.007
MMORPG		-.014	.011
Online with friends		.181*	.135
Parents supervision			.093
Self-efficacy			-.206**
Achievement			.124
Social			-.120
Immersion			.246**
R2	.276	.419	.557
F(df)	12.11(4)	9.78(9)	10.52(14)
P	.000	.000	.000
R2-change	.276	.143	.138
F-change (df)	12.11(4)	6.00(5)	7.31(5)
P change	.000	.000	.000

** Significant at the .01 level

* Significant at the .05 level

Discussion

The aim of this study was to examine prevalence and risk factors for game addiction by identifying which playing variables, demographic factors, social cognitive and psychological variables are associated with playing frequency and game addiction.

The respondents spent a lot of time on gaming, especially on online games such as MMORPG's. Despite the amounts of time spent on gaming, most respondents did not experience game addiction. Although for most respondents gaming goes without negative consequences, there was a small group who did experience their game behavior as problematic. There were other factors such as self-efficacy, motives of play and psychological wellbeing, that altogether might lead to the development of a game addiction. Respondents who experienced a higher level of addiction, were more depressed, played games to escape reality and found it difficult to control their own game behavior. This suggests that factors like psychological wellbeing determined if gaming becomes an addiction and not necessarily the amounts of time spent on gaming.

Game behavior

The first research question was: 'What does game behavior look like?'. The results of this study show that frequency of play clearly covers a behavioral continuum as the amounts of time spent on gaming differed strongly for certain respondents. Some played for a few hours and others seems to do nothing else than gaming. For most respondents gaming is a daily activity like any other; in general respondents played almost every day for about two or three hours per day. A small group devoted a whole workweek on gaming. Previous research (Griffiths, Davies & Chappell, 2003) suggests that anyone who commits that much time runs the risk of sacrificing other duties and perhaps may be at risk to game addiction. Online games, and especially shooters, racing games and MMORPG's were very popular genres. Many respondents played online with their friends. In conclusion, much time was spent on gaming, especially online games were very popular. However, the respondents in this study were male adolescents and young adults. So, the results found in this study may not be generalized to the whole gamers population.

Prevalence of addiction

The second research question was: ‘What is the prevalence of game addiction?’. In this study there were only a small number of respondents who met the criteria for game addiction. It can be questioned if game addiction is measured properly by adapting pathological gambling criteria found in the DSM. Although many researchers have used these criteria to define and measure game addiction, little research is done on the validity of this method. Game addiction is not considered as a mental disorder by the APA (2007) at this time, so first consensus must be reached on whether game addiction can be diagnosed at all. Earlier studies suggest that game addiction should be considered as a continuous variable instead of an all-or-nothing phenomenon that distinguishes addicts from non addicts. Furthermore, levels of addiction can change over time (LaRose, Lin, & Eastin, 2003; Lee, Yu & Lin, 2007). It is likely that people immerse themselves within games during stressful periods. Perhaps game addiction can not be measured using a scale which contains fixed criteria defining whether a person is addicted or not.

In conclusion, a small group of respondents was addicted to games. Possibly, more people experienced serious problems due to their game behavior but this was not revealed because of an inadequate scale.

Risk factors

The third research question was: ‘Which playing variables, demographic factors, social cognitive and psychological variables are associated with playing frequency and game addiction?’. These results are discussed in the following paragraphs.

Playing variables

Playing frequency. Certain playing variables were associated with playing frequency and game addiction. As expected, playing frequency had a strong correlation with game addiction. Remarkable is that playing frequency was not an independent determinant for game addiction. In the multivariate analysis it was mediated by the social cognitive variables. This suggests that regardless of the amount of time spent on gaming, other variables are important in the experience of game addiction.

Game genre. Respondents who played online games spent much more time on gaming than offline players, these results confirm findings from earlier studies (Rooij & Van den Eijnden, 2007; Smyth, 2007). Especially respondents who played games like MMORPG's, adventure and strategy games spent significantly more hours per week on gaming than players of any other genre. This is consistent with earlier research (Smyth, 2007; Griffiths, Davies & Chappell, 2004b; Ng & Wiemer-Hastings, 2005). After controlling for other risk factors, the playing of MMORPG's appeared not to be an independent determinant of game addiction. Previous research suggested that MMORPG's pose some risks for individuals who play excessively (Kurapati, 2004; Cole & Griffiths, 2007). Some studies reported more positive outcomes. Ng and Wiemer-Hastings (2005) conducted a study in which MMORPG players were compared with offline game players. They concluded that despite the amounts of time respondents spend on gaming they are not addicted. It is just an alternative to other forms of social entertainment. Cole and Griffiths (2007) proposed that online gaming facilitates social activity; almost half of their sample had met with online friends in real-life situations. Furthermore, 81 percent played online games with their real-life friends and family. This study shows that despite the fact that MMORPG players scored higher on game addiction, it can be questioned if there is a causal relation. It is possible that most MMORPG players played for fun but that a subgroup is at risk of becoming addicted because they experienced less psychological wellbeing and used these games as an escape from reality. MMORPG's may have a number of benefits such as the development of social skills (Ducheneaut & Moore, 2005; Cole & Griffiths, 2007), problem solving skills, critical thinking and creativity (Smyth, 2007). For these people, play can be enjoyable and they may benefit from the development of additional relationships and social interactions (Cole & Griffiths, 2007; Ng & Wiemer-Hastings, 2005).

Playing online with friends. Respondents who played online with their friends played for more hours continuously and scored lower on self-efficacy. They also scored higher on game addiction. In this study, descriptive norms were not related to playing frequency and game addiction. Playing with online friends did; so social environment played an important role in game behavior. In the multivariate analysis it indicated a risk factor for addiction although this was mediated by the social cognitive variables. These findings show that it is more

difficult to stop playing during an online game than an offline game, most likely due to the highly social interactive character of these games. For most respondents playing online with their friends was a fun activity and even had beneficial consequences. But for a small number of respondents who played games to forget their problems the social interactions could have reinforced their escaping behavior. If respondents experienced lower psychological wellbeing, this type of games could have provide a good alternative for reality. A reason why the game world can be a good alternative for reality is that the social relationships in the game are more satisfying and easier to maintain than in real life. These findings support earlier research (Ng & Wiemer-Hastings, 2005; Yee, 2007). Especially if respondents have little social interactions in reality this can be a satisfying alternative. For this reason it can become more and more difficult to regulate own game behavior.

Demographic factors.

In this study no differences were found in playing frequency regarding to age. This is in contrast to earlier findings; results from a study among *Everquest* players (Griffiths, Davies & Chappell, 2004b) showed that younger respondents spent more time on gaming than older respondents. They suggest that people who are younger have more leisure time and have less responsibilities than adults. In this study there was no relation found between age and playing frequency. Differences in playing time regarding to age are possibly related to game genre.

Psychological variables.

Lower psychological wellbeing was associated with higher levels of game addiction; respondents who felt more depressed, social feared and lonely experienced more addiction. Furthermore, respondents that had lower self esteem scored higher on game addiction. Yee (2002) and Ko et al. (2005) also concluded that self esteem is correlated with game addiction. In the multivariate analysis depression appeared to be an independent risk factor for addiction. It is possible that respondents who felt depressed used games as an escape from reality. If there is less satisfaction in real life it is likely that the game world offers an effective way to forget problems and is experienced as more satisfying than the real world. It becomes more and more difficult to keep game behavior under control. Bandura (1991) also stated that depressed people are less capable of controlling their own behavior. It is possible

that depression leads to lower self-efficacy and escaping behavior and finally to game addiction.

Social cognitive variables.

Parents' supervision. Respondents were also asked about parents' supervision. Respondents with more parental supervision scored higher on game addiction. This is remarkable, it seems more likely that people who have more parental supervision play for less hours per week and score lower on game addiction. In the multivariate analysis, it was not an independent determinant of game addiction. Furthermore, this parental supervision only applied to respondents who were living at home. Respondents with more parental supervision also had higher self perceptions of problematic gaming. It is possible that people with little parental supervision experience less addiction because they lack some sort of standard. If their parents intervene more with their gaming behavior, they probably experience their own behavior as more excessive.

Liau, Khoo, and Ang (2005) found in their study on internet behavior among adolescents that parental supervision techniques do not seem to be effective in lowering risky internet behavior. They suggest that instead of trying to monitor what their children do, parents should encourage open communication regarding their internet use and use participative decision making to set specific rules about the limits of their internet behavior. This also may be the case for gaming behavior.

Respondents who are more supervised in game behavior by their parents could also be more attracted to this behavior just for the very reason that their parents restrict them. If parents are worried about the negative effects of gaming it is likely that they restrict their children more than parents who have in mind that videogames enrich their children. This 'forbidden fruits' effect is suggested by Nikken and Jansz (2006), they put forward that children who are more supervised might want to play more 'inappropriate' games, because their parents, in all their good intentions, call a lot of attention to those games.

It could also be the case that respondents are more supervised by their parents, when they are showing problematic game behavior. So parents' supervision could be the result of excessive game behavior instead of otherwise. Future research on game behavior and addiction should include parents' supervision.

Self-efficacy. As expected, self-efficacy was strongly associated with playing frequency; respondents who find it hard to control their game behavior played for more hours per week. They also scored higher on the game addiction scale. In the multivariate analysis, self-efficacy was a strong independent determinant for game addiction. So it seems that these self-regulatory processes are essential for playing games to remain an enjoyable pass-time rather than an addictive behavior. This supports earlier findings done by Seay and Kraut (2007), they suggest that active self-regulation is a player's best defense for addiction. LaRose, Lin, and Eastin (2003) concluded in their study that addiction can be redefined as deficient self-regulation. From their view addiction is a continuous variable that indicates in what amount people can regulate their own game behavior. Lee, Yu and Lin (2007) found in their study that gamers were aware of their addictions and seek help on game forums from other gamers when they fear that their gaming behavior is out of control. They rather ask their online peers for advice than following a recovery program. It is important that interventions available for people who experience their gaming behavior as problematic, are easy accessible and provide advice about how to get their own behavior under control.

Motives. Motives of play were also examined in this study. In general, respondents played for relaxation. This was not associated either with playing frequency nor game addiction. This suggests that for most respondents gaming is a way to relax from daily occupations like any other activity such as watching a movie or reading a book. Respondents also played because they liked the achievement and discovery aspect in the game.

Respondents who played for social reasons spent more hours per week on gaming. Especially respondents who reported they played games because they met with their online friends spent more time on gaming. This suggests that social interactions in the game lead to prolonged gaming. These social interactions are of great importance, because many online games require cooperation or dependency on other users for advancement.

Immersion motives were highly associated with game addiction. Respondents who played games to forget problems in real life experienced their game behavior as more problematic. They played for negative reasons rather than for fun and probably perceived the game world as more satisfying than their real lives. In the multivariate analyses higher immersion motives were an independent explaining variable for addiction. This indicate that motives play an

important role in when game behavior can be defined as problematic. Respondents who used games as an escape from reality experienced negative feelings and found their game behavior more problematic.

Achievement motives had a strong correlation with playing frequency as well as game addiction. Especially if respondents played because they wanted to reach the next level and experienced positive feelings when they succeed, game addiction scores were higher. In most games achievement is the main feature and many games are designed in a way that achievements are quick in the beginning and gradually take more time and effort. It is possible that for some people these feelings become so important that stop gaming becomes more difficult every time they play.

After controlling for other risk factors, only immersion motives were independent determinants for addiction. It is possible that most respondents played for multiple reasons, including social and achievement motives, but that for a small group of people who experienced feelings of depression the immersion motives become of most importance. And that depression together with escaping behavior could lead to addiction.

Respondents who played online games scored higher on achievement motives and social motives. This could be explained by the fact that social aspects and the need for achievement are more present in online games than in offline games because they are played with multiple players. In earlier research, Griffiths, Davies and Chappell (2004b) found that the biggest appeal for those that play online games is that they are social. This is probably why online gamers spend more time on gaming; they are drawn into the game by these social aspects. Ng and Wiemer-Hastings (2005) concluded that people who spend that much time on online gaming that they are showing patterns of addiction have a different perspective on social life; they choose to spend their time in-game rather than socializing in the real world. But for most users, online games are an alternative to other forms of social entertainment.

Conclusion.

Despite the amounts of time spent on gaming, there was only a small number of respondents that experienced game addiction. Nevertheless, this study showed that certain factors could form a risk to game addiction. It is not so much the amounts of hours spent on gaming that led to game addiction. There are other factors such as self-efficacy, motives of

play and psychological wellbeing that played a role in the experience of game addiction. Respondents who were more depressed, had less control over their own game behavior and played games to escape reality, scored higher on game addiction. The experience of less psychological wellbeing could have led to immersion motives and subsequently to problematic game behavior. It becomes more and more difficult to keep game behavior in control. It is also reasonable to assume that respondents who show excessive game behavior have less interaction with other individuals in person and, consequently experience an increased sense of depressive moods. These aspects probably affect each other in multiple ways. Further study is needed to investigate the direct relationship between psychological wellbeing, motives for play and game addiction.

Many respondents played online games with their friends. Especially MMORPG's are played a lot. Although most of them seemed to play without negative consequences, there is probably a small subgroup of players who are in risk for addiction. It is possible that for most respondents the social interactions in the game are beneficial. But for a small group these interactions could have reinforced their escaping behavior because they find more satisfying social interactions in the game than in reality.

According to these results, a group of gamers who are at risk for addiction could be described; they have less psychological wellbeing and lack the ability to quit gaming. Furthermore, they use games as an escape and in online games they find a good alternative for reality.

These findings suggests that in general, gaming goes without negative consequences and is a fun daily activity like any other. It can even bring positive consequences like social interactions and additional relationships. Nevertheless, game playing can be become a problem for a small group of players. This study identified some important determinants of addiction In further research on this phenomenon these risk factors must be taken into account.

Limitations and implications for future research.

This study revealed some interesting results that give rise to further research. Nonetheless, there are a number of limitations to the present study.

First, all respondents were obtained on several game forums. Therefore there is an issue about representativeness. Nevertheless, the aim of this study was to determine risk factors for addiction. This population is possibly a high risk group for addiction, given the fact they are active on game forums. Therefore, this group is probably easy to reach for online intervention. The sample was of relatively small size and consisted mainly of adolescents. Furthermore, there were only a few female respondents so comparisons between men and women could not be done. It is possible that women have other motives for playing games than men. Yee (2007) found that male respondents scored higher on achievement motives and female respondents scored higher on social motives. On the other hand, the fact that 95% of the respondents who filled in the questionnaire were men, can indicate that fanatic game play is mainly a thing that men do. So it is possible that women are not the target group for public health interventions. Most of the respondents were following an education and were living with their parents or caretakers at home. It is possible that adults show other gaming patterns than adolescents. Griffiths, Davies, and Chappell (2004b) suggested that adolescents are more vulnerable for game addiction than adults.

The purpose of this study was to examine social cognitive and psychological variables. There are probably more variables that influence game behavior, such as cultural differences. It is possible that people with different cultural values show different game behavior. Future research should include gamers from other countries as well a conduct cross-cultural analyses.

It can be questioned if the game addiction scale used in this study is an appropriate scale. The first item ('How often during the last six months have you felt addicted to a game?') requires respondents to comprehend the construct of addiction. It is most likely that there are considerable differences among respondents regarding what it exactly means being addicted to gaming. Some people who play just for fun don't consider themselves addicted and probably have few negative consequences on their life. Even if they played for a whole workweek. But for others, who have lower social wellbeing and use games as an escape from reality, their gaming behavior can be experienced as an addiction.

Game genres in this study were subdivided for further analyses because a few genres had to little respondents. MMORPG's, adventure and strategy games were put in one category because they had most in common. Though, adventure games are different because they are

mostly played offline. So, the significant results that were found for this category; they are played for more hours per week and scored higher on addiction, must be taken with caution.

This type of study did not allow to address causality. The variables that appear to be explaining variables for game addiction could also be the result of problematic game behavior. For example, depression was positively associated with game addiction and was also strong independent explaining variable for game addiction; these results suggest that respondents who are more depressed experience their game behavior as some sort of escape from reality and as problematic. It alternatively could be the case that respondents who consider themselves as addicted to games develop feelings of depression. Therefore, longitudinal research is needed to determine the exact direction of associations between several variables. Nevertheless, the results from this study can provide guidance for future longitudinal studies or experiments for identifying causal relationships among the several variables.

References

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50, 179-211.

APA (American Psychiatric Association) (2007). Statement of the American Psychiatric Association on "Video Game Addiction". Retrieved February 2008, from http://www.psych.org/MainMenu/Newsroom/NewsReleases/2007NewsReleases/07-47video_gameaddiction_2_.aspx

Bandura, A. (1977). Deficient self regulation: Toward a unifying theory of behavioral change. *Psychological Review*, 84(2), 191-215.

Bandura A. (1986). Social foundations of thought & action: A social cognitive theory. Englewood Cliffs, NJ: Prentice Hall.

Bandura, A. (1991). Social cognitive theory of self-regulation. *Organizational Behavior and Human Decision Processes*, 50, 248-281.

Cole, H., & Griffiths, M. D. (2007). Social interactions in massively multiplayer online role-playing gamers. *Cyber Psychology & Behavior*, 10(4), 575-583.

Ducheneaut, N., & Moore, R.J. (2005). More than just 'XP': learning social skills in massively multiplayer online games. *Interactive Technology & Smart Education*, 2, 89-100

Engels, R., Finkenauer, C., Meeus, W., & Dekovic, M. (2001). Parental attachment and adolescents' emotional adjustment: the associations with social skills and relational competence. *Journal of Counseling Psychology*, 48(4), 428-439.

Fisher, S. (1994). Identifying video game addiction in children and adolescents. *Addictive Behaviors*, 19 (5), 545-553

Griffiths, M. D. (1991). Amusement machine playing in childhood and adolescence: A comparative analysis of video games and fruit machines. *Journal of Adolescence*, 14, 53-73.

Griffiths, M. D., Davies, M. N. O., & Chappell, D. (2003). Breaking the stereotype: the case of online gaming. *Cyber Psychology & Behavior*, 6(1), 81-91.

Griffiths, M. D., Davies, M. N. O., & Chappell, D. (2004a). Demographic factors and playing variables in online computer gaming. *Cyber Psychology & Behavior*, 7(4), 479-487.

Griffiths, M. D., Davies, M. N. O., & Chappell, D. (2004b). Online computer gaming: a comparison of adolescent and adult gamers. *Journal of Adolescence*, 27(1), 87-96.

Holbrook, M.B., Chestnut, R.W., Oliva, T.A., & Greenleaf, E.A. (1984). Play as a consumption experience: the roles of emotions, performance, and personality in the enjoyment of games. *The Journal of Consumer Research*, 11(2), 728-739.

Jansz, J (2005). The emotional appeal of violent video games for adolescent males. *Communication Theory*, 15(3), 219-241.

Jansz, J., & Tanis, M. (2007). Appeal of Playing Online First Person Shooter Games. *CyberPsychology & Behavior*, 10(1), 133-136.

Kandel, D., & Davies, M. (1982). Epidemiology of depressive mood in adolescents: an empirical study. *Archives of General Psychiatry*, 39(10), 1205-1212.

Kandel, D., & Davies, M. (1986). Adult Sequelae of adolescent depressive symptoms. *Archives of General Psychiatry*, 43(3), 255-262.

Kurapati, S. N. (2004). Addiction to massively multi-player on-line games: an ethical analysis. Unpublished manuscript, University of California Santa Cruz.

LaRose, R., Lin, C. A., & Eastin, M. S. (2003). Unregulated internet usage: addiction, habit, or deficient self-regulation? *Media Psychology*, 5(3), 225-253.

Lee, I., Yu, C. Y., & Lin, H. (2007). Leaving a never-ending game: quitting MMORPGs and online gaming addiction. Paper presented at the DiGRA 2007 Conference.

Lemmens, J. S., Valkenburg, P. M., & Peter, J. (2007). Development and Validation of a Game Addiction Scale. University of Amsterdam.

Liau, A. K., Khoo, A., & Ang, P. H. (2005). Factors of influencing adolescents engagement in risky internet behavior. *Cyber Psychology & Behavior*, 8 (6), 513-520.

Lo, S. K., Wang, C. C., & Fang, W. (2005). Physical interpersonal relationships and social anxiety among online game players. *Cyber Psychology & Behavior*, 8 (1), 15-20.

Ng, B. D., & Wiemer-Hastings, P. (2005). Addiction to the internet and online gaming. *Cyber Psychology & Behavior*, 8(2), 110-113.

Nikken, P., & Jansz, J. (2006). Parental mediation of children's videogame playing: a comparison of the reports by parents and children. *Learning, Media and Technology*, 31(2), 181-202.

Rosenberg, M. (1989). *Society and the adolescent self-image* (revised edition ed.). Middletown: Wesleyan University Press.

Russell, D., Peplau, L., & Cutrona, C. (1980). The revised UCLA Loneliness Scale: Concurrent and discriminant validity evidence. *Journal of Personality and Social Psychology*, 39(3), 472-480.

van Rooij, T., & van den Eijnden, R. (2007). Monitor internet en jongeren 2006 en 2007. Amsterdam: IVO.

Salguero, R. A. T., & Morán, R. M. B. (2002). Measuring problem video game playing in adolescents. *Addiction*, 97(12), 1601-1606.

Sheeran, P., & Ravis, A. (2003). Descriptive norms as an additional predictor in the theory of planned behavior: A meta-analysis. *Current Psychology*, 22 (3), 218-233.

Smyth, J. M. (2007). Beyond self-selection in video game play: an experimental examination of the consequences of massively multiplayer online role-playing game play. *Cyber Psychology & Behavior*, 10(5), 717-721.

Woodcock, B. S. (2008). An Analysis of MMOG Subscription Growth–Version 23.0. April 9th 2008 (Publication.: <http://www.mmogchart.com/charts/>)

Yee, N. (2002). Ariadne - understanding MMORPG Addiction. Unpublished manuscript.

Yee, N. (Ed.). (2006). The Psychology of MMORPG's: motivations, emotional investment, relationships and problematic usage. In R. Schroeder & A. Axelsson (Eds.), *Avatars at work and play: collaboration and interaction in shared virtual environments*. 187-207. London: Springer-Verlag.

Yee, N. (2007). Motivations of play in online games. *Cyber Psychology & Behavior*, 9, 772-775.