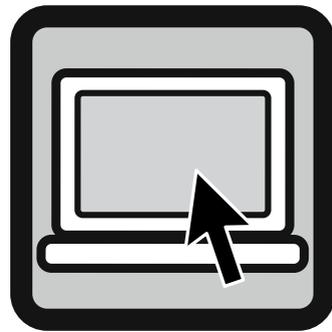




# Online video game addiction

Exploring a new phenomenon



Antonius J. van Rooij



## **Online video game addiction. Exploring a new phenomenon.**

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### **Recommended citation**

Van Rooij, A. J. (2011). Online Video Game Addiction. Exploring a new phenomenon [PhD Thesis]. Rotterdam, The Netherlands: Erasmus University Rotterdam

ISBN/EAN: 9789074234887

### **Keywords**

Video game addiction, internet addiction, online video games, MMORPG, gambling, compulsive online video game use, compulsive internet use, psychosocial well-being, online friendship quality, loneliness, depression, social anxiety, negative self-esteem, social responsibility

### **Studies in this thesis were supported by**

Netherlands Organization for Health Research & Development (ZonMw), Volksbond Foundation Rotterdam, Kennisnet Foundation, Addiction Care North Netherlands, De Hoop Foundation, Novadic Kentron Addiction Care, Tactus Addiction Care, Brijder Addiction Care, and the IVO Addiction Research Institute.

### **Language**

Laraine Visser-Isles (The Language Bureau)

### **Cover illustration**

[www.tagxedo.com](http://www.tagxedo.com)

### **Lay-out and print**

[www.basementgraphics.nl](http://www.basementgraphics.nl)

# Online video game addiction

Exploring a New Phenomenon

# Online videogame verslaving

Verkenning van een nieuw fenomeen

## Proefschrift

ter verkrijging van de graad van doctor  
aan de Erasmus Universiteit Rotterdam op gezag van

de rector magnificus  
Prof.dr. H.G. Schmidt

en volgens besluit van de het College voor Promoties

De openbare verdediging zal plaatsvinden op  
woensdag 11 mei 2011 om 11:30 uur

door

Antonius Johannes van Rooij  
geboren te Delft



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# introduction

chapter 1  
**Introduction**



# Chapter 1

## Introduction

### 1.1 The gaming generation

*“Anything invented before your fifteenth birthday is the order of nature. That’s how it should be. Anything invented between your 15<sup>th</sup> and 35<sup>th</sup> birthday is new and exciting, and you might get a career there. Anything invented after that day, however, is against nature and should be prohibited”.*

- Douglas Adams

Over a period of thirty years, video games have evolved from Pac Man to photorealistic, massively populated, three-dimensional environments. Adolescents become involved with online virtual communities (tribes, guilds, groups) and play games on a daily basis with people they have never seen in ‘real’ life. Large online games provide a virtual environment in which they have fun and can freely experiment with different identities, speak other languages, and form new social connections at the same time.

Nowadays, games have developed beyond simple concepts such as ‘eat-the-yellow-dots’ in Pac Man. Gaming now includes sophisticated persistent virtual worlds (World of Warcraft, Lord of the Rings Online, Guild Wars), competitive team-based online shooting games (Counterstrike, Team Fortress 2), and multi-user real-time strategy games (Starcraft 2, Warcraft 3). These changes are largely driven by the rapid developments in computing power and internet access, as well as by the declining costs of consumer electronics. As a result of increased availability, more people are playing games; however, some individuals seem to be playing more as well. A 2008 press release by the market research group NPD states that: *“...of the 174 million gamers who personally play games on PC/Mac or video game systems, three percent are Extreme Gamers”* (NPD, 2008). Extreme gamers play an average of 45 hours per week. A press release by the same firm two years later stated that this percentage had increased. In 2010 the NPD group reported that the group of extreme gamers had grown to four percent, emphasizing that *“...extreme gamers spend two full days per week playing video games”* (NPD, 2010).

The video game industry has developed from a spare-time hobby for a male subculture of computer fans into a fully-blown global entertainment industry for the general public. The growth continues as the game industry actively opens up new markets. New games target young children, girls, mothers, and the elderly as potential new game consumers. A case in point is the worldwide success of the Nintendo Wii (2006), a motion controllable console system aimed at more casual gaming audiences (Nuttal, 2006).

Thus, adolescents at the beginning of the 21st century are growing up as a gaming generation, Generation Game if you will. They are no longer aware that a world without the internet and video games ever existed. Because an entire generation is growing up on a diet of video games, it is highly relevant to establish and understand what the potential negative effects of gaming might be. First, however, we will look at some background information on video games in order to avoid some common pitfalls of oversimplification.

## 1.2 About video games

Video games are invariably played on a video game system or 'platform'. Traditionally, systems for home use are divided into personal computer (PC) and video game consoles. A video game console is a small box that accepts games in the form of standardized cartridges, DVDs, Blu-ray discs, or direct internet downloads. Consoles are generally designed to be connected to a television, with the exception of such handheld systems as the Game Boy, Nintendo DS, or Playstation Portable. Gaming on both PCs and consoles has been steadily developing since the commercial introduction of the first video game consoles, such as the Magnavox Odyssey, in the early 1970s.

Following the widespread introduction of the internet in the 1990s, a variety of PC games began to utilize the internet for multiplayer gaming. As a result of these developments, a variety of existing game genres made a transition to incorporate the new online multiplayer options. Examples include first-person shooters such as Counterstrike (1999) or real-time strategy games such as Starcraft (1998). Equally interesting, however, are the various newly-emerging game genres which were entirely based upon online and internet enabled playing, such as Unreal Tournament (2000). Notable examples are the development of persistent virtual worlds such as Everquest (1999), World of Warcraft (2004), and numerous small internet browser-based games.

Catching up, these advances in internet-enabled play also spread to the current generation of console games: each of the three major console systems (Xbox 360, PS3, and Wii) and the two handheld systems (PSP and DS) incorporate online functionality through wireless internet access. This enables multiplayer gaming, downloading of new game content, or even the downloading of entire games.

In fact, even mobile telephones and personal organizers have now become sophisticated enough to run more than simple, offline games. Apple's iOS devices, such as the iPhone 3G in 2008, and Google Android based phones (with their large touch screens, excellent sound, and integrated download) are certainly potential video-game markets for additional programs, or 'Apps'. These advances have opened a new

market for handheld gaming, which is rapidly being developed and will undoubtedly continue to expand in the future.

Table 1.1 provides an overview of the three main modes of game playing that fits well with the current situation on the video game market (Van Rooij, Schoenmakers, Meerkerk, & Van de Mheen, 2008, 2009).

**Table 1.1 Summary of popular modes of video game playing.**

	Explanation
Single Player	The most basic type of gaming is single-player gameplay on a local system. A notable classic example would be Pac Man, and a more recent one is the role-playing game called Dragon Age Origins (2009).
Casual browser games	Casual browser games allow the gamer to play simple single-player games on a remote server. While they are traditionally played alone, multiplayer casual browser games have recently become very popular through social networking websites. Farmville on Facebook is a good example of this phenomenon.
Multiplayer Online Gaming	Multiplayer online games can be played with other gamers. As a result, networks of relationships with other gamers become very important. Some games, such as First Person Shooters (FPS), are played in temporary environments, whereas Massive Multiplayer Online Role Playing Games (MMORPGs) utilize a persistent world that continues even if the gamer is absent.

Given the rapid proliferation of ways to play games and the different nature of gameplay per mode, it has become important to consider the mode of playing when studying games. Besides the mode of playing, it is important to take into account that there are various game genres (M. S Lee et al., 2007; M. J. P. Wolf, 2005). Game reviews often note that we are dealing with an 'online first person shooter' or a 'massive online role playing game'. In fact, some platforms are better suited for specific game types. Traditionally, console systems are well known for platform jumping games such as Super Mario, fighting games such as Streetfighter, and other direct action games. Typical PC games, such as Real Time Strategy (RTS) games, tend to be more drawn out and complex. Over the last decade, the playing field has leveled somewhat. However, the new genre of Massive Multiplayer Online Role-Playing Game (MMORPG) has established a firm foothold in the PC gaming market while no successful console-based MMORPG has yet appeared. The best known MMORPG is the market-dominating game World of Warcraft, which was introduced in 2004 and is played by over ten million paying customers worldwide - according to its developer Activision-Blizzard (Blizzard Entertainment, 2008a). The game is under continuous development, which has resulted in various expansions, such as the Burning Crusade, Wrath of the Lich King, and the upcoming expansion Cataclysm.

### 1.3 What is video game addiction?

Previous research by IVO, specifically the Monitor Study Internet and Youth, confirms that video gaming is a popular activity in the Netherlands. Over 70% of children aged between 10 and 15 years play games occasionally, while 40% of adolescents play an online multiplayer game (Van Rooij & Van den Eijnden, 2007). Especially online gaming tends to be very time consuming and often replaces other activities such as watching television, sports, or real-life socializing (Bainbridge, 2007). Scientists and health care workers have increasingly observed that some gamers escalate their gaming hobby to the point of problematic use (Griffiths & Hunt, 1998; Lemmens, 2006; Van den Eijnden, Van Rooij, & Meerkerk, 2007; Van Rooij & Van den Eijnden, 2007). Research reports confirm that, for some individuals, gaming can be severely disruptive to school, work, and 'real-life' social contacts (Chappell, Eatough, Davies, & Griffiths, 2006; Grüsser, Thalemann, & Griffiths, 2007; Wan & Chiou, 2006).

In daily health care practice, this type of behavior is generally labeled as 'video game addiction' and is taken seriously by medical professionals in addiction care. In fact, most Dutch addiction clinics are regularly confronted with adolescent males who claim to suffer from 'video game addiction' (Meerkerk, Van Rooij, Amadmoestar, & Schoenmakers, 2009). Prompted by a troubling 2007 episode of the Dutch documentary show *Zembla*, 'game addiction' has also been a topic of debate among politicians and policy-makers. The Dutch Minister for Health, Welfare and Sports was requested to provide the government's position on the issue. In his response he confirmed the severity of the issue, and stated that: *"...some games are structured to tie persons to the game and promote frequent and long sessions of gaming. This is a disturbing signal."* [translated] (Minister Klink, 2008).

While the general public has a fairly good idea of what is meant by 'game addiction', it is considerably more difficult to arrive at a scientific definition of this phenomenon. There is no official diagnosis for 'game addiction'. Fortunately, Robert West provided us with the following generalized definition of addiction: *"Nowadays the term 'addiction' is applied to a syndrome at the centre of which is impaired control over a behaviour, and this loss of control is leading to significant harm. The fact that there is harm is important because otherwise addiction would be of limited interest."* (West & Hardy, 2006, p. 10). Translated to video gaming, this means that 'video game addiction' can be broadly defined as **a loss of control over gaming, leading to significant harm**. Unless otherwise specified, the current thesis adopts this broad definition when referring to game addiction.

Scientists are still strongly divided about the necessity to label problematic gaming as an addiction. In fact, while some authors argue in favor of creating an official diagnosis for video game addiction (AMA, 2006; Block, 2008; Council on Science and Public Health, 2007), others argue that the concept of video game addiction is hardly based on scientific facts, but rather on media hysteria (Wood, 2008a, 2008b). Some worry that game addiction might in fact be a different name for 'high engagement' (Charlton & Danforth, 2007) or that it is merely the expression of an underlying, primary psychological problem (Shaffer, Hall, & Bilt, 2000; Wood, 2008b). Moreover, it seems that the empirical evidence at hand is insufficient to reach definitive conclusions regarding 'game addiction' (Council on Science and Public Health, 2007).

The current thesis aims to contribute to the expansion of this empirical foundation by studying the phenomenon of video game addiction in the Dutch adolescent population. The focus is placed on adolescents as they are very involved with new types of video games, and most registered cases in addiction care in the Netherlands seem to involve young males (Meerkerk et al., 2009). The main source of data for addressing this issue is the ongoing Monitor Study Internet and Youth, a yearly repeated cross-sectional study that incorporates a longitudinal convenience subsample.

The Monitor Study Internet and Youth was initiated in 2006 (Meerkerk, Van den Eijnden, & Van Rooij, 2006; Van den Eijnden, Spijkerman, Vermulst, Van Rooij, & Engels, 2010; Van den Eijnden, Vermulst, Van Rooij, & Meerkerk, 2006), and repeated in 2007 (Van Rooij, Schoenmakers, Van de Eijnden, & Van de Mheen, 2010; Van Rooij & Van den Eijnden, 2007), 2008 (Van Rooij, Meerkerk, Schoenmakers, Van den Eijnden, & Van de Mheen, 2008; Van Rooij et al., 2008; Van Rooij, Schoenmakers, Vermulst, Van Den Eijnden, & Van De Mheen, 2011), 2009 (Van Rooij, Schoenmakers, Van den Eijnden, Vermulst, & Van de Mheen, n.d.), and in 2010. It is unique in being a repeated large-sample study focusing on problematic internet and game use and has the additional benefit of including longitudinal sub-cohorts.

This thesis aims to contribute to the development of knowledge on game addiction, which leads to the following main research goal.

**Main research goal:**

- To explore the phenomenon of video game addiction

Given the depth of the methodological confusion and rapid changes in the video game market, the current thesis does not aim to provide the final word on the issue of game addiction. Instead, it takes a pragmatic approach to the topic. It focuses first and foremost on providing some answers that have practical relevance for policymakers, health care practitioners, and the video game industry. More specifically, this means addressing basic questions of definition, scope, measurement, consequences, treatment, and ultimately responsibility with regards to game addiction.

## **Internet-game addiction?**

Although video games have been around for decades, accounts of video game addiction have recently become much more prevalent, coinciding with the introduction of multiplayer online functionality into mainstream gaming. While a scientific case study about game addiction, published in the early 1990s dealt with the offline game Pac Man (Keepers, 1990), it seems that specifically online games are most often associated with problems. A recent report, instigated by the American Medical Association, specifically refers to these types of games: *“Although video game overuse can be associated with any type of video game, it is most commonly seen among MMORPG players”* (Council on Science and Public Health, 2007, p. 2). In this debate, both Western and Korean research confirms the importance of online games: *“Role playing game users showed significantly higher internet addiction scores than web board and sports game*

users.” (M. S Lee et al., 2007) and “it is clear that the accounts presented by players and ex-players appear to be ‘addicted’ to *EverQuest* (a popular MMORPG) in the same way that other people become addicted to alcohol or gambling.” (Chappell et al., 2006).

Most of the work that has been published on addiction-like computer usage focuses on internet addiction, which includes a variety of internet behaviors (Griffiths, 2000; Huisman, Van den Eijnden, & Garretsen, 2001; C. H. Ko, J. Y. Yen, C. S. Chen, Yeh, & C. F. Yen, 2009; Tao et al., 2010; K. S. Young, 1998). Internet addiction is often modeled using the components framework which, in turn, is derived from the DSM-IV criteria for pathological gambling. Griffiths defined the following components of behavioral addiction: tolerance, withdrawal symptoms, relapse, salience, conflict, and mood modification (Griffiths, 2005a). Our research group applied these criteria for internet addiction to create a 14-item Compulsive Internet Use Scale or CIUS (Meerkerk, Van den Eijnden, Vermulst, & Garretsen, 2009). After statistical validation and qualitative research, the CIUS retained the following components: loss of control, conflict, preoccupation/salience, coping/mood modification, and withdrawal symptoms.

Internet addiction incorporates a variety of internet behaviors, one of which is online gaming. This has prompted some to examine online gaming from the perspective of internet addiction (Ng & Wiemer-Hastings, 2005). Given the suspected association between online games and game addiction, theoretically it makes sense to explore the option of creating a subcategory of internet addiction, namely internet game addiction or online game addiction. Davis refers to this type of categorization as Specific Pathological Internet Use (2001). This also makes practical sense, as actual practical problematic behavior tends to be application based: people develop problems with certain specific applications such as online erotica, gaming, or instant messenger use (Meerkerk, Van den Eijnden, & Garretsen, 2006; Mehroof & Griffiths, 2010; Van den Eijnden, Meerkerk, Vermulst, Spijkerman, & Engels, 2008; Wan & Chiou, 2006). Unfortunately, the relationship between internet addiction and online gaming (and various other internet applications) is not well studied, which leads to the first question.

#### **Research question:**

1. What is the relationship between online gaming, other internet applications, and internet addiction?

A second major problem in the study of game addiction is the issue of size. While it is highly relevant information for policymakers and clinicians, nobody knows how large the hypothesized group of addicted gamers actually is. In the absence of consensus on the measurement of game addiction, various researchers have provided a variety of estimates, ranging from several percent (Gentile, 2009; Grüsser et al., 2007) to ‘clinically insignificant’ numbers (West & Hardy, 2006). Moreover, many authors discuss generalized game addiction without taking into account the specific role that online games seem to play.

The hypothesized relationship between internet addiction and online game addiction suggests the following hypothesis. If online game addiction can be seen as a subtype of internet addiction, there should be a group of heavy online gamers which scores high on measures of internet addiction. The second research question aims to establish the size of this hypothesized group.

**Research question:**

2. What is the size of the hypothesized group of internet-addicted online gamers?

## Standardization of methodology and measurement

*"The central issue is the absence of research literature on this,"* states Dr. Charles O'Brien, director of the University of Pennsylvania's Center for Studies in Addiction and the current chair of the DSM-V committee to revise the manual. He adds that, with the backdrop of the health-care debate, now is a precarious time to introduce new disorders that will require more money to treat. *"At this point I think it's appropriate that it's not considered an official disease,"* says O'Brien. *"We are probably going to mention it in the appendix."* - Time.com (Sharples, 2009)

In the most widely-used psychiatric manuals the term 'addiction' is not used. The DSM-IV, the best known standardized manual for psychiatry, refers strictly to 'dependence' or 'abuse' in case of substances and 'impulse control disorder' (ICD) in the case of gambling (American Psychiatric Association, 2000). Interestingly, recent findings show strong similarities between pathological gambling (PG) and substance use dependency (SUD). Similarities are found in areas of personality (high scores of impulsiveness and sensation seeking), biochemistry (several similar neurotransmitter systems), and neurocircuitry (the mesolimbic reward system), co-morbidity (high rates of co-occurrence of SUDs and PG), and of course the fact that many people recover on their own after periods of intense problems during late adolescence and early adulthood (Brewer & Potenza, 2008; Potenza, 2006; Reuter et al., 2005). The strong similarities between PG and SUD have led scientists to argue in favor of grouping behavioral addiction and the various forms of substance dependency in the upcoming DSM-V (Brewer & Potenza, 2008; Potenza, 2006). While this remains an undecided academic debate, it shows that there are distinct similarities between classical substance abuse or dependency, and pathological gambling.

As pathological gambling is the only formally established behavioral addiction to date, it makes sense to take the criteria for pathological gambling as a starting point in the exploration of game addiction. This approach proved fruitful in modeling internet addiction with the help of Griffiths' components model (Griffiths, 2005a), which led to the creation of the 14-item Compulsive Internet Use Scale or CIUS (Meerkerk et al., 2009). As game addiction is hypothesized to mainly involve internet-enabled, online gaming, a similar approach can be explored for game addiction. Thus, the third research question attempts to provide the foundation for standardized measurement of game addiction.

**Research question:**

3. How can we standardize measurement of video game addiction?

## Harm and treatment

The operational definition of video game addiction for this thesis can be defined as 'a loss of control over gaming leading to significant harm'. Some scientists, opposing a new diagnosis, worry that video game addiction might merely be the expression of an underlying, primary psychological problem (Shaffer et al., 2000; Wood, 2008b). In spite of being contradictory, both perspectives imply a relationship between negative psychosocial state and video game addiction. However, this relationship is likely to be complicated as multiple, sometimes conflicting, hypotheses have been proposed to explain video game addiction. The behavior might be a flight from reality stemming from or leading to negative psychological wellbeing (Caplan, 2007, 2003; Ha et al., 2007; H. K. Kim & K. E. Davis, 2009), but on the other hand it may just as well be that gaming has considerable psychosocial benefits for some gamers (Longman, O'Connor, & Obst, 2009; Lim & Roselyn Lee, 2009; C. C. Wang & C. H. Wang, 2008). Moreover, online video gaming has the distinct characteristic of social interaction, which is highly likely to influence the relationship as well. For example: having good, high-quality online friendships is likely to have some effect on feelings of loneliness. Exploring this relationship, while taking online and offline friendships into account, leads to the fourth research question.

**Research question:**

4. What is the relationship between video game addiction and psychosocial wellbeing, and what role does the quality of online and real-life friendships play in this relationship?

Given the implication that we might be dealing with a new psychiatric disorder, there is a surprising lack of well-documented clinical interventions on internet addiction. Fortunately, a major Dutch addiction care clinic launched a pilot treatment program in 2009. This program explores the possibility of using an existing Cognitive Behavioral Therapy (CBT) and Motivational Interviewing (MI) based oriented treatment protocol ('Lifestyle Training') to treat self-proclaimed internet addicts. Although the treatment program focuses on adults and internet addiction in general, the program provides a valuable opportunity to obtain information on the characteristics of proper treatment for internet addiction. Moreover, the program accepted patients for treatment regardless of the specific internet application they were have problems with. As such, studying the program provides valuable information on the differences and similarities in the treatment of various types of internet and video game addiction. Thus, the fifth research question focuses on the evaluation of a treatment program.

**Research question:**

5. To what extent can conventional therapeutic approaches, such as a combination of CBT and MI, be applied to the issue of video game and internet addiction?

## Reflecting on responsibilities

Exploring Vana'diel is a thrilling experience. During your time here, you will be able to talk, join, and adventure with many other individuals in an experience that is unique to online games. That being said, we have no desire to see your real life suffer as a consequence. Don't forget your family, your friends, your school, or your work. - Developer Square Enix: A Word To Our Players (2008, Final Fantasy XI)

Almost all highly-rewarding activities, be it eating, psychoactive substances, sex, working, gambling, or video gaming, have examples of people who overindulge in them (Orford, 2001). The existence of a psychiatric diagnosis for pathological gambling (American Psychiatric Association, 2000) provides us with a very basic piece of information to study video game addiction, i.e. behavioral escalation can become extreme enough to warrant a psychiatric diagnosis. However, video games are a culturally-loaded and ever-changing activity, perhaps even more so than gambling. As the previous quote shows, the thriving video game industry is apparently warning us against overuse of their products. How does this relate to more heavily regulated industries involved in alcohol, smoking and gambling? The sixth, and final question, explores the responsibility of the video game industry.

**Research question:**

6. What responsibility does the video game industry have with regard to video game addiction?

## 1.4 Thesis overview

Following this introductory chapter, chapters 2 through 6 present five empirical studies which address the majority of the main research questions. Part 1 comprises these chapters. The **second** chapter of this thesis deals with the various applications that adolescents utilize on the internet. The relationship between various internet applications and internet addiction (compulsive internet use) is explored cross-sectionally and longitudinally, with the aim to establish the relative contribution to internet addiction made by the various applications. The **third** chapter aims to give an estimate of the size of the group of addicted gamers. It utilizes an indirect approach to sidestep the problem of unclear definitions in the field of non-substance addiction research. Its goal is the identification of a hypothesized group of internet addicted gamers. The **fourth** chapter proposes a new scale, specifically developed to standardize measurement of game addiction. Besides testing psychometric properties of this scale, the 'Video game Addiction Test' or VAT, the effectiveness of the scale is tested against various discriminant and convergent outcome measures to establish validity. The **fifth** chapter explores the relationship between video game addiction and negative psychosocial symptoms, focusing specifically on the role of both online and offline friendships. The **sixth** chapter describes the treatment of internet and game addiction with a modified version of Cognitive Behavioral Therapy from the perspective of treating therapists.

Part 2 consists of chapters 7 and 8, which analyze the findings and issues described in the empirical studies. The **seventh** chapter explores the social responsibility of the video game industry, which is in a unique position as it is both the sole possessor of all relevant data on playing frequency and a major contributor to game design and content. Finally, the general discussion in the **eight** chapter combines results, presents limitations and overall conclusions, and provides directions for future research.

Table 1.2 summarizes the research questions per chapter.

**Table 1.2 Research questions and chapters.**

Research question	Chapter
1. What is the relationship between online gaming, other internet applications, and internet addiction?	2
2. What is the size of the hypothesized group of internet-addicted online gamers?	3
3. How can we standardize measurement of video game addiction?	4
4. What is the relationship between video game addiction and psychosocial wellbeing, and what role does the quality of online and real-life friendships play in this relationship?	5
5. To what extent can conventional therapeutic approaches, such as a combination of CBT and MI, be applied to the issue of video game and internet addiction?	6
6. What responsibility does the video game industry have with regard to video game addiction?	7



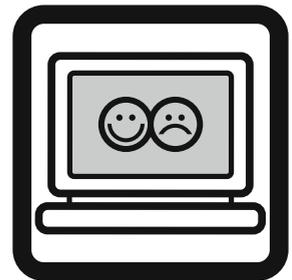
# PART I

## **Empirical studies**



## chapter 2

# Internet addiction: the role of online gaming and other applications



# Chapter 2

## Internet addiction: the role of online gaming and other applications

**Published as:**

Van Rooij, A. J., Schoenmakers, T. M., Van de Eijnden, R. J. J. M., & Van de Mheen, D. (2010). Compulsive Internet Use: The Role of Online Gaming and Other Internet Applications. *The Journal of Adolescent Health, 47*(1), 51-57. doi:10.1016/j.jadohealth.2009.12.021

## Abstract

### **Purpose**

Increasing research on internet addiction makes it necessary to distinguish between the medium of internet and its specific applications. This study explores the relationship between time spent on various internet applications (including online gaming) and Compulsive Internet Use in a large sample of adolescents.

### **Methods**

The 2007 (N = 4920) and 2008 (N = 4753) samples of a longitudinal survey study among adolescents were utilized, as well as the 2007-2008 cohort subsample (N = 1421). Compulsive Internet Use was predicted from the time spent on the various internet applications in two cross-sectional multiple linear regression models and one longitudinal regression model in which changes in behavior (i.e. time spend on various applications) were related to changes in Compulsive Internet Use.

### **Results**

In both samples, downloading, social networking, MSN use, Habbo Hotel, chatting, blogging, online games, and casual games were shown to be associated with Compulsive Internet Use. Off these, online gaming was shown to have the strongest association with Compulsive Internet Use. Moreover, changes in online gaming were most strongly associated with changes in Compulsive Internet Use over time for the longitudinal cohort.

### **Conclusions**

A clear relationship was shown between online gaming and Compulsive Internet Use. It is further argued that a subgroup of compulsive internet users should be classified as compulsive online gamers.

## 2.1 Introduction

Supported by accumulating evidence for the existence of behavioral addictions, researchers now consider computer game playing, exercise, sex, and the internet to have addictive potential (Griffiths & Davies, 2005, p. 359). While no official diagnosis currently exists for these supposed addictions, the introduction of pathological gambling in the DSM-III and its reworked presence in the DSM-IV (American Psychiatric Association, 2000) under the label of 'impulse control disorder' does suggest behavioral addictions are a possibility. As a result, some argue in favor of a unified addiction concept spanning both substance and behavioral addiction (Potenza, 2006), while others argue in favor of creating specific diagnoses for several behavioral addictions, such as internet addiction, in the upcoming fifth edition of the DSM (Block, 2008).

Unfortunately, internet addiction is a misleading term by itself. People do not seem develop problems with the medium itself, but rather with the various activities enabled by the internet. As the field of internet addiction research matures, it becomes increasingly necessary to distinguish between the medium of internet and its specific applications, i.e. chatting, mailing, surfing, gaming, or social networks. Davis refers to this distinction as Specific versus Generalized Pathological Internet Use (2001). Unfortunately, the exact relationship between various software applications and internet addiction has not yet been established.

However, there is some speculation about the addictive potential of various applications. Some postulate socializing as the culprit: "The capacity of the internet for socialization is a primary reason for the excessive amount of time people spend having real-time interactions using e-mail, discussion forums, chat rooms, and online games" (Byun et al., 2009, p. 1). This standpoint was confirmed in a study examining 12 applications among adults: longitudinally, visiting sex sites was the strongest predictor of Compulsive Internet Use in adults, but cross-sectionally chatting and gaming were shown to have the strongest correlations with Compulsive Internet use or CIU (Meerkerk et al., 2006). A study among adolescents by our own research group showed a positive longitudinal association between instant messenger use and CIU six months later (Van den Eijnden et al., 2008). Thus, it seems that the capacity for socializing plays a significant role in the addictive nature of various internet applications. Given the suspected role of socializing, it is not surprising that the introduction of social interaction in video games has been accompanied by a parallel increase in reported cases of 'video game addiction' (Griffiths & Davies, 2005; Grüsser et al., 2007).

Video games also share many of the structural characteristics of slot machines, which are known to play a role in pathological gambling (Griffiths, 1991; Wood, Griffiths, Chappell, & Davies, 2004). For example, games contain aural and visual stimulus rewards, peer group attention/approval, the requirement of total concentration, the keeping of a digital score, and incremental rewards for winning which reinforce 'correct' behavior. A major factor of online gaming is that it adds social context and social interaction to this mix, i.e. you can show off in-game rewards in a virtual environment. Additionally, online games often demand more time from the gamer than offline games. Especially online role-playing games (in which the gamer develops a character over time) are very time consuming. In fact, both Korean and Western researchers specifically report Massive Multiplayer Online Role Playing Games (MMORPGs) as the main culprit in cases of online video game addiction (Chappell et al., 2006; Council on Science and Public Health, 2007; M. S Lee et al., 2007).

The present study contributes to the literature by specifically exploring the relationship between the various internet applications (including online and casual games) and CIU in a large sample of adolescents. CIU is measured with the validated Compulsive Internet Use Scale (CIUS) (Meerkerk et al., 2009). The CIUS covers five dimensions of behavior addiction, i.e. loss of control, preoccupation, withdrawal symptoms, mood modification, and conflict. Although most internet applications have a social nature, online gaming is the only example that combines a distinct reward structure, an open-ended design, and a strong social component. This means that online games are likely to be more demanding or 'addictive' than the other internet applications. We therefore hypothesize that, compared to other applications, CIU will be most strongly correlated with online game playing among adolescents (H1).

If CIU and online gaming are found to be related, we can also hypothesize that over time an increase in online gaming should be associated with an increase in CIU, and a decrease in online gaming with a decrease in CIU. Longitudinally, we therefore hypothesize that changes in time spent playing online video games are more strongly associated with changes in CIU over time than changes in other internet applications (H2). There are two main arguments for specifically studying change in CIU. First, it contributes to the limited theoretical understanding of change in CIU by isolating change in the use of applications. Second, knowing which activities contribute to increased or decreased CIU is relevant for future efforts in the prevention and/or treatment of CIU.

## 2.2 Methods

### Procedure

The Dutch 'Monitor Study Internet and Youth' provided data for the current study (Van Rooij & Van den Eijden, 2007). This ongoing longitudinal study uses stratified sampling to select schools for participation based upon region, urbanization, and education level. Participating classes are included on a school-wide basis, and repeated yearly participation in the study is encouraged.

Every year, participating adolescents fill out a one-hour questionnaire in the classroom, supervised by a teacher. Written instructions are provided to the teacher, and questionnaires are returned in closed envelopes to ensure anonymity. Given the non-invasive nature of the study, passive informed consent is obtained from parents every year. Specifically, parents receive a letter with information about the planned questionnaire study on internet use and well-being. If parents do not agree with their child's participation, they can inform the school coordinator and/or the researchers in which case the child is excluded from participation. Children can refuse participation either by informing their parents or their schoolteachers. Refusal by parents or children rarely occurred.

### Sample

The current study utilizes the 2007 (T1) and 2008 (T2) Monitor Study samples. Total response rate was 71% in 2007 (N = 4920) and 79% in 2008 (N = 4753). Non-response is largely attributable to entire classes dropping-out due to internal scheduling problems, and the withdrawal of one large secondary school from

the study at T1. As a result, 24% of all classes did not return any questionnaires at T1 and 13% did not return questionnaires at T2. For the remaining classes, the average per student response rate was 92% at T1 and 90% at T2.

Analyses in the current study will utilize T1 and T2 samples that include the first three classes of secondary school (average ages of 13, 14, and 15 years, respectively). At T1 nine secondary schools participated in the study (N = 3873), while 12 secondary schools participated at T2 (N = 3924). Average age was 14.06 years at both T1 (SD = 1.05) and T2 (SD = .93). The T1 sample had slightly more boys (51%) than girls, while T2 had slightly less boys (49%). Most respondents were of Dutch origin: 77% at T1 and 78% at T2. The remainder of the respondents were of different origins (having at least one parent who was born in another country), mainly Turkey and Morocco (7% and 6%, respectively), Surinam or the Dutch Antilles (5% and 5%, respectively), and various Western countries and non-Western countries (5% and 5%, respectively). Education level was slightly higher at the second measurement: 61% (T1) and 66% (T2) of the respondents were involved in higher secondary education (i.e. preparatory college and pre-university education) as opposed to lower secondary education (i.e. vocational training).

Due to repeated school-wide class measurements in six of the schools, a longitudinal cohort could be identified which participated in both the 2007 and 2008 measurements (N = 1421). This latter cohort includes the transitions from the first to the second class and from the second to the third class. Attrition analysis was done to check for possible differences between the longitudinal cohort and the dropped-out respondents that were eligible for transition. Logistical regression analysis ( $p < .001$ ) revealed that the students who had dropped-out between T1 and T2 were more often enrolled in the higher secondary education program (72% versus 47%, respectively;  $p < .001$ ), but showed no significant differences in gender ( $p = .186$ ), age ( $p = .258$ ), or cultural background ( $p = .511$ ).

## Measures

**Online communication, games, and other internet functions.** In the present study, two different types of online video gaming are distinguished. The first type is multiplayer online games, which are video games played with other people over the internet (e.g. Call of Duty, Team Fortress 2, Runescape, or World of Warcraft). The second type is casual games, which are simple and free games played online via the web browser, e.g. [freebrowsergames.com](http://freebrowsergames.com). Time spent on internet activities (including gaming) was assessed by questions with answers (using a 5-point scale) ranging from 'never', '1 day per week or less', '2/3 days per week', '4/5 days per week', to '(almost) daily'. The following activities were included: surfing, e-mailing, downloading, social networking (including forums), (we)blogging, Habbo Hotel (a virtual world/chat room), casual games (browser based), online games (multiplayer online), chatting (anonymous), MSN (rebranded to Windows Live Messenger in 2005), and a miscellaneous category 'other'. With the exception of emailing and surfing, each of the activities listed several Dutch examples. The 'other' category in the T1 and T2 samples was examined and manually recoded back into one of the main categories where appropriate.

**Compulsive Internet use (CIU).** The 14-item version of the CIUS (Meerkerk et al., 2009) was used to measure CIU, with its Dutch phrasing slightly adjusted for adolescents. The 5-point scale covers several core components typical of compulsive behavior: withdrawal symptoms, loss of control, salience, conflict and coping (Meerkerk et al., 2009), and includes questions such as “Have you unsuccessfully tried to spend less time on the internet?” and “Do you neglect your daily obligations (work, school, or family life) because you prefer to go on the internet?” The CIUS has shown to be reliable (Meerkerk et al., 2006; Meerkerk et al., 2009; Meerkerk, 2007), and showed good reliability in the current samples (Cronbach’s  $\alpha = .88$  at T1 and  $.88$  at T2).

## Analyses

Before hypothesis testing, the relationships between the various applications were explored using correlations. The main goal of this analysis was to establish whether the applications are indeed separate variables and do not overlap too much. To test the first hypothesis (H1), we performed cross-sectional multiple linear regression analyses. More specifically, CIU was predicted from the time spent on the various internet applications (in days per week) from both the T1 and T2 sample in two cross-sectional models. As the samples overlap only partially, replicating the analysis provides a more reliable overall result than using a single sample.

A multiple regression analysis was used to test the second hypothesis (H2). However, in this case change in time spent on various activities (T2 minus T1) was used to predict change in CIU (T2 minus T1). Modeling change scores removes the influence of cross-sectional correlations between subjects and allows the analysis to focus exclusively on within-subject change (Kollen, Van de Port, Lindeman, Twisk, & Kwakkel, 2005).

## 2.3 Results

Table 2.1 shows the number of days per week adolescents spend on various internet applications, and the percentage of adolescents using the application. Almost all adolescents utilize both MSN and surfing, while a smaller group utilizes online games. The percentage of adolescents using social networking shows a 20% increase between T1 and T2.

**Table 2.1 Days per week spent per internet application.**

Days per week <sup>a</sup>	T1					T2				
	Use <sup>b</sup>	Mean	Mode	SD	N	Use <sup>b</sup>	Mean	Mode	SD	N
MSN	94%	3.73	5	1.43	3901	89%	3.99	5	1.26	3835
Surfing	92%	2.84	3	1.15	3802	89%	2.91	3	1.12	3729
Downloading	84%	2.85	2	1.36	3819	81%	3.03	2	1.38	3773
Mail	83%	2.70	2	1.27	3854	84%	2.66	2	1.24	3768
Casual games	66%	2.18	2	1.16	3888	67%	2.22	1	1.21	3819
Social Network	50%	2.96	1	1.58	3829	71%	2.19	1	1.47	3763
Online games	41%	1.97	1	1.44	3897	39%	2.01	1	1.44	3830
(We)blogging	29%	1.31	1	0.76	3832	20%	1.44	1	0.85	3386
Chatting	15%	1.30	1	0.84	3822	16%	1.28	1	0.79	3735
Habbo Hotel	14%	1.13	1	0.54	3858	7%	1.23	1	0.68	3295

<sup>a</sup> Answers: 1 to 5, or 'never', '1 day per week or less', '2/3 days per week', '4/5 days per week', to '(almost) daily'

<sup>b</sup> Respondent answered at least "1 day per week or less" or higher

Table 2.2 presents exploratory correlations between days spent on internet activities at T1 and T2. Neither online games nor browser games have a strong positive relationship with the other internet applications. The strongest positive correlate for online gaming is chatting ( $r = .17, p < .01$ ), while the strongest negative correlate for online gaming is social networks ( $r = -.18, p < .01$ ). These weak ties between online gaming and other internet applications implicate online gaming as a separate, independent internet application.

**Table 2.2 Spearman's correlations between the number of days spent on internet activities for the T1 (N=3873) and the T2 sample (N=3924).**

	MSN		Mail		Surfing		Chatting		Downloading	
	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
Mail	.29***	.25***	1	1						
Surfing	.15***	.20***	.21***	.22***	1	1				
Chatting	.09***	.09***	.11***	.10***	-.01	-.06***	1	1		
Downloading	.42***	.45***	.21***	.20***	.21***	.23***	.07***	.15***	1	1
Social network	.42***	.54***	.30***	.27***	.09***	.13***	.09***	.05**	.28***	.35***
Habbo Hotel	.09***	.06***	.11***	.05**	.05**	-.03	.21***	.15***	.07***	.07***
(We)blogging	.24***	.16***	.26***	.20***	.12***	.11***	.16***	.17***	.18***	.19***
Online games	-.09***	-.04*	-.09***	-.05**	-.00	.03*	.17***	.17***	.08***	.16***
Casual games	.01	-.03*	.05**	.05**	.03*	.05**	.07***	.05**	-.04*	-.04**

	Social network		Habbo Hotel		(We)blogging		Online games		Casual games	
	T1	T2	T1	T2	T1	T2	T1	T2		
Social network	1	1								
Habbo Hotel	.13***	.07***	1	1						
(We)blogging	.27***	.22***	.18***	.13***	1	1				
Online games	-.18***	-.16***	.11***	.14***	-.03	.05**	1	1		
Casual games	-.06***	-.01	.11***	.10***	.07***	.06***	.11***	.14***	1	1

\* p < .05, \*\* p < .01, \*\*\* p < .001

Table 2.3 presents a linear regression model predicting CIU from the various internet activities for T1 and T2. The predictive value of the included demographic variables (step 1) is relatively low for both T1 ( $R^2 = .01$ ,  $F(4, 3062) = 8.02$ ,  $p < .001$ ) and T2 ( $R^2 = .01$ ,  $F(4, 3803) = 4.68$ ,  $p < .05$ ). After adding the 10 different internet functions in the second step, the final model predicts a more sizable part of CIU, namely  $R^2 = .21$ ,  $F(14, 3052) = 56.70$ ,  $p < .001$  at T1 and  $R^2 = .18$ ,  $F(14, 3793) = 56.70$ ,  $p < .001$  at T2. While various activities are associated with CIU, online gaming has the strongest association at both T1 ( $\beta = .27$ ,  $t(3052) = 14.07$ ,  $p < .001$ ) and T2 ( $\beta = .24$ ,  $t(3793) = 13.63$ ,  $p < .001$ ).

**Table 2.3 Cross sectional multiple linear regression model: Compulsive Internet Use (T1 and T2) predicted from activities at T1 and T2.**

Step		T1, model 1 ( $R^2 = .01$ ***)			T1, model 2 ( $R^2 = .21$ ***, N=2606)			T2, model 1 ( $R^2 = .05$ *)			T2, model 2 ( $R^2 = .18$ ***, N=3338)		
		B	SE	$\beta$	B	SE	$\beta$	B	SE	$\beta$	B	SE	$\beta$
	(Constant)	.01	.16		-.05	.15		1.62	.15		.64	.15	
1	Sex (Male/Female)	.02	.02	.02	.11	.02	.10***	-.01	.02	-.01	.10	.02	.09***
	Age	.04	.01	.07***	.03	.01	.06**	.00	.01	.00	-.00	.01	-.01
	Education (low/high)	.02	.02	.02	.06	.02	.05**	-.00	.02	-.00	.02	.02	.02
	Ethnicity (Dutch/Non Dutch)	.05	.01	.07***	.07	.01	.09***	.05	.01	.07***	.05	.01	.07***

Step		T1, model 1 (R <sup>2</sup> = .01***)			T1, model 2 (R <sup>2</sup> = .21***, N=2606)			T2, model 1 (R <sup>2</sup> = .05*)			T2, model 2 (R <sup>2</sup> = .18***, N=3338)		
		B	SE	β	B	SE	β	B	SE	β	B	SE	β
2	Online games				.11	.01	.27***				.10	.01	.24***
	Social network				.05	.01	.13***				.04	.01	.11***
	Downloading				.05	.01	.12***				.03	.01	.08***
	Chatting				.08	.01	.11***				.06	.01	.09***
	MSN				.05	.01	.10***				.04	.01	.10***
	(We)blogging				.05	.01	.07***				.07	.01	.09***
	Casual games				.03	.01	.05**				.03	.01	.05**
	Habbo Hotel				.04	.02	.04*				.06	.01	.06***
	Surfing				.01	.01	.01				.00	.01	.00
	Mail				.00	.01	.01				.01	.01	.03

\* p < .05, \*\* p < .01, \*\*\* p < .001

Table 2.4 presents a multiple regression model in which change scores (T2 minus T1) are utilized. The change in CIUS score is predicted from the change in time spent on the various internet activities. The explanatory value of the demographic variables (step 1) is low (R<sup>2</sup> = .01, F(4, 1035) = 2.01, N = 1322). The change scores for the 10 internet activities explain a large portion of the variance, increasing the variance explained by the final model to R<sup>2</sup> = .17, F (14, 1025) = 9.74, p < .001. With the exception of Surfing and Mailing, changes in all internet activities are associated with changes in CIU. Similar to the cross-sectional results and consistent with our hypothesis, online gaming is most strongly associated with CIU (β = .15, t (1025) = 4.94, p < .001), followed by downloading and the use of social network sites.

**Table 2.4** Longitudinal multiple linear regression analysis (T1 to T2), predicting change in Compulsive Internet Use from change in activities between T1 and T2.

		Model 1 (R <sup>2</sup> = .01, n.s.)			Model 2 (R <sup>2</sup> = .17***, N=816)		
		B	SE B	β	B	SE B	β
	(Constant)	-.34	.32		-.39	.31	
Step 1	Sex (Male/Female)	.04	.03	.04	.07	.03	.06*
	Age	.01	.02	.02	.01	.02	.02
	Education (low/high)	.08	.04	.07*	.06	.03	.06
	Ethnicity (Dutch/non Dutch)	-.01	.02	-.14	-.00	.02	-.00
Step 2	Difference score Online games				.06	.01	.15***
	Difference score Downloading				.05	.01	.13***
	Difference score Social Network				.03	.01	.10**
	Difference score MSN				.03	.01	.08*
	Difference score Habbo Hotel				.05	.02	.08*
	Difference score Chatting				.04	.02	.07*
	Difference score Casual games				.03	.01	.07*
	Difference score (We)blogging				.04	.02	.07*
	Difference score Surfing				.01	.01	.03
	Difference score Mail				-.01	.01	-.03

\* p < .05, \*\* p < .01, \*\*\* p < .001

## 2.4 Discussion

This study shows that various internet applications are associated with CIU. In our adolescent sample downloading, social networking, MSN use, Habbo Hotel, chatting, blogging, online games, and casual games are all associated with CIU. However, at both T1 and T2 the regression model shows ‘online gaming’ to be most strongly associated with CIU, confirming our first hypothesis. No relationship was found between CIU and surfing or emailing, although surfing is one of the most popular activities on the internet. The absence of an association for surfing and the presence of online gaming as the strongest association indicate that there are differences in the ‘addictive’ potential of the various internet activities. One might argue that some applications, such as surfing, are by nature less time intensive. However, although there is some correlation, CIU is more than simply spending a lot of time online (Meerkerk et al., 2009).

A similar pattern is found for the associations between changes in CIU and changes in activity usage over time (T1 to T2). As online gaming increases so does CIU, and as online gaming decreases so does CIU.

With the exception of surfing and mailing, this relationship was found for various other internet activities. However, in confirmation of our second hypothesis, changes in CIU are most strongly associated with changes in online gaming. This means that, when compared to other applications, changes in online games relate to the largest amount of change in CIU. Combined, these findings demonstrate a clear relationship between CIU and gaming.

It may be argued that the subgroup of internet addicts who play online games could be relabeled as 'online game addicted', a concept examined in several survey studies (Ng & Wiemer-Hastings, 2005; Smahel, Blinka, & Ledabyl, 2008; Wan & Chiou, 2006). As MMORPGs seem to be more addictive than other game types (M. S Lee et al., 2007), a case can also be made for distinguishing specific game types in future studies. This seems a practical starting point for exploring the specific addictive elements in games (Griffiths, 1991; Wood et al., 2004), as it is currently unknown which elements in games make some games more addictive than others.

An unexpected outcome (in both the cross-sectional and longitudinal models) is the strong association between CIU and the activity of downloading. To our knowledge, there have been no reports of pathological downloading. Conceptually one would assume that downloading is a passive activity. However (as shown in Table 2.2), downloading shares a moderate correlation with various other activities (such as MSN use), which suggests that the two activities might be related (downloading being done in the background while the adolescent uses MSN).

This explanation also fits well with other results: online gaming, MSN, and social networking, Habbo Hotel, and chatting are all associated with CIU. They share a strong social nature and a relatively rapid feedback (unlike, for example, email), thus confirming the relevance of the social aspect in applications. Social networking is an interesting case, since it has the strongest association with CIU after gaming and shows a strong rise in utilization (see Table 2.1). However, like downloading, it shares a moderate correlation with MSN use, which might mean that the two activities are related. In further research, cluster analysis might be helpful to distinguish several subtypes of internet users.

Beside its strengths, the current study has some limitations. Firstly, the longitudinal subsample differs from the main sample in that it contained slightly more adolescents with a lower education level. The change score results fit in the overall picture presented in separate analyses of the T1 and T2 samples, but some biasing towards lower education levels cannot be ruled out. Secondly, internet applications were measured on a scale of days per week whereas hours per week would have been more informational. Thirdly, rapid developments in internet use and human-computer interface technology are taking place. This means that the distinctions between different activities on the internet might not be as clear-cut as assumed in the current paper. For example, it is possible to be involved in an MSN conversation on a Smartphone during the two-minute wait for a virtual boat in World of Warcraft, while at the same time a news feed automatically refreshes on a second monitor. However, we do not believe this invalidates the present results because online gaming (unlike other activities such as downloading) is highly involving and claims a large part of the gamers' attention.

In conclusion, this study demonstrated a link between online video game use and CIU. Furthermore, over a one-year period, changes in CIU were shown to be most strongly related to changes in online gaming. Therefore, we advise future research on internet addiction to take into account the distinct characteristics of the various online applications, specifically online gaming. In addition, we argue that a subgroup of compulsive internet users should be reclassified as 'compulsive online gamers', a group which deserves further study.



## chapter 3

identification

# Online Video game Addiction: Identification of Addicted Adolescent Gamers



# Chapter 3

## Online Video game Addiction: Identification of Addicted Adolescent Gamers

**Published as:**

Van Rooij, A. J., Schoenmakers, T. M., Vermulst, A. A., Van Den Eijnden, R. J., & Van De Mheen, D. (2011). Online video game addiction: identification of addicted adolescent gamers. *Addiction*, 106(1), 205-212. doi:10.1111/j.1360-0443.2010.03104.x

## Abstract

### **Aims**

To provide empirical data-driven identification of a group of addicted online gamers.

### **Design**

Repeated cross-sectional survey study, comprising a longitudinal cohort, conducted in 2008 and 2009.

### **Setting**

Secondary schools in the Netherlands.

### **Participants**

Two large samples of Dutch schoolchildren (aged 13-16 years).

### **Measurements**

Compulsive internet use scale, weekly hours of online gaming, and psychosocial variables.

### **Findings**

This study confirms the existence of a small group of addicted online gamers (3%), representing about 1.5% of all children aged 13-16 years in the Netherlands. Although these gamers report addiction-like problems, relationships with decreased psychosocial health were less evident.

### **Conclusions**

The identification of a small group of addicted online gamers supports efforts to develop and validate questionnaire scales aimed at measuring the phenomenon of online video game addiction. Findings contribute to the discussion on the inclusion of non-substance addictions in the proposed unified concept of 'Addiction and Related Disorders' for the DSM-V by providing indirect identification and validation of a group of suspected online video game addicts.

### 3.1 Introduction

Studies have consistently demonstrated the existence of a small subgroup of video gamers that is seemingly 'addicted' to games (Gentile, 2009; Grüsser et al., 2007; Lemmens, Valkenburg, & Peter, 2009). Although video game addiction is not a new phenomenon (Keepers, 1990), the introduction of an online component in the current generation of games has probably increased the size and scope of the problem. This online component in gaming led to the initiation of (private and public) treatment programs targeting gaming addiction (Lin-Liu, 2006; Sharples, 2009; Telegraph (UK), 2009). Consequently, there is increasing focus on online games when studying video game addiction (Hussain & Griffiths, 2009a; Peters & Malesky, 2008; Van den Eijnden et al., 2010; Wood, 2008b).

Both Korean and Western researchers specifically report that Massive Multiplayer Online Role Playing Games (MMORPGs) are the main culprit in cases of online video game addiction (Chappell et al., 2006; Council on Science and Public Health, 2007; M. S Lee et al., 2007). In a MMORPG the player develops one or more characters (avatars) over time in a persistent virtual world. Examples include World of Warcraft, Age of Conan, and Runescape. Typically, higher levels require players to cooperate to achieve goals. Moreover, MMORPGs can not be completed: due to the regular introduction of new content it is practically impossible to finish all assignments. This places a considerable burden on the players' time as they are required to continue playing to 'keep up' with the game. Research among a sample of World of Warcraft players identified a group of 10% that played an average of 63 hours per week and showed considerable negative symptoms (Longman et al., 2009). Grüsser et al. sampled readers of an online gaming magazine in an online survey and found that 12% of those gamers fulfilled diagnostic criteria of addiction concerning their gaming behavior (Grüsser et al., 2007).

These findings demonstrate the existence of a small subgroup of online gamers that can potentially be classified as 'online video game addicts'. This group is likely to have various psychological and social problems, as game overuse can be severely disruptive to school, work, and 'real-life' social contacts (Grüsser et al., 2007; Chappell et al., 2006; Wan & Chiou, 2006). Drawing parallels to the internet addiction literature, we hypothesize that this 'flight from reality' may be associated with negative self-esteem, depressive mood, social anxiety, and/or loneliness (Caplan, 2007, 2003; Ha et al., 2007; H. K. Kim & K. E. Davis, 2009). However, the relationship between psychosocial health and online games is potentially more complicated, as social and psychological benefits from playing online games have also been reported (Longman et al., 2009; Lim & Roselyn Lee, 2009; C. C. Wang & C. H. Wang, 2008). Moreover, effects might differ based on the psychological profile of the gamer, i.e. there may be a group of addicted heavy gamers that suffer as a result of their unbalanced lifestyle, and another group of heavy gamers that benefit from having multiple social environments. Given the former, and the fact that the vast majority of gamers does not report addictive tendencies (Gentile, 2009), we hypothesize that a second group of heavy gamers is likely to exist. These non-addicted heavy gamers will probably not show negative psychosocial outcomes or addictive symptoms, or perhaps to a lesser extent.

Unfortunately, there is no consensus on an operational definition of video game addiction (Wood, 2008b, 2008a; Blaszczynski, 2008; N. E. Turner, 2008). Despite the ongoing debate on diagnosis and definition, several methods are used to increase our understanding of game addiction. Researchers construct new scales to measure game addiction (Gentile, 2009; Lemmens et al., 2009), avoid using standardized scales altogether (Grüsser et al., 2007), or approach the specific group of online games indirectly through more established measures of internet addiction (C. H. Ko et al., 2009; Van den Eijnden et al., 2010). Estimates of the size of the group of 'addicted gamers' are subsequently made by applying various cut-off points to scales measuring symptoms of video game addiction or internet addiction (Gentile, 2009; Lemmens et al., 2009; Griffiths & Hunt, 1998). This results in a wide variety of estimates, depending on the selected cut-off points and composition of the sample. In the absence of consensus on a definition, the absence of a gold standard with which to compare results, and the lack of clinical studies using these instruments, these efforts are speculative at best.

The present study contributes to the debate on video game addiction by applying a different approach. It seeks to provide empirical, data-driven evidence for the assumed subgroup of addicted online video gamers, using two large-scale samples from the Dutch 'Monitor Study Internet and Youth'. Results provide a basis for data-based scale validation and cut-off scores. Identification of this group will be done through a combination of two indirect measures: game addiction severity and time spent on online gaming.

In the present study, internet addiction is thought to be an appropriate measure of online game addiction severity for several reasons. Firstly, previous work by our group (utilizing an earlier Monitor Study sample), established cross-sectional and longitudinal relationships between online gaming and internet addiction, referred to as Compulsive Internet Use (CIU) (Van den Eijnden et al., 2010). Secondly, the latter study found low correlations between various internet activities and online video gaming among adolescents (Van Rooij et al., 2010), in line with its immersive nature (Yee, 2006), thus confirming that online gaming is a monolithic activity for adolescents (these findings were replicated for the samples utilized in the present study). In combination with the inclusion of a measure of time spent on online gaming, this reduces the risk of misidentification (i.e. erroneously measuring addiction to various other applications). Consequently, the combination of a high score on CIU with many hours of online gaming per week is hypothesized to identify addicted online gamers. Note that we choose to utilize the term 'addiction' for the sake of consistency with other studies: the group is more precisely defined as heavy online gamers that score high on criteria for non-substance addiction. These criteria are theorized to be applicable to online behavior (Gentile, 2009; Lemmens et al., 2009), also: see Measures (CIUS).

From this, several research questions emerge. Can the two hypothesized groups of heavy online gamers (addicted and non-addicted) be identified using a data-driven approach? If so, how large are these groups? Finally, the present study explores the psychosocial correlates for the addicted versus the non-addicted heavy gamers, to further elucidate the theoretical relationship between game addiction and psychosocial well-being.

## 3.2 Methods

### Procedure

The Dutch 'Monitor Study Internet and Youth' provided data for the current study (Van den Eijnden et al., 2010). This ongoing longitudinal study uses stratified sampling to select schools for participation based upon region, urbanization, and education level. Participating classes are included on a school-wide basis, and repeated yearly participation in the study is encouraged. Every year, participating adolescents fill out a one-hour questionnaire in the classroom, supervised by a teacher.

Written instructions are provided to the teacher, and questionnaires are returned in closed envelopes to ensure anonymity with regards to other students and teachers. Given the non-invasive nature of the study, passive informed consent is obtained from parents every year. More specifically, parents receive a letter with information about the planned questionnaire study on 'Internet use and well-being'. If parents do not agree with their child's participation, they can inform the school coordinator and/or the researchers, in which case the child is excluded from participation. Children can refuse participation either by informing their parents or their teachers. Refusal by either parents or children rarely occurred.

### Sample

The current study utilizes the 2008 (T1) and 2009 (T2) samples of the Monitor Study. Total response rate was 79% at T1, and 83% at T2. Non-response is mostly attributable to entire classes dropping-out due to internal scheduling problems on schools; 13% of all classes did not return any questionnaires at T1 and 12% did not return questionnaires at T2. For the remaining classes, the average per class response rate was 89% at T1 and 92% at T2. Twelve secondary schools participated in the study at T1 and ten secondary schools participated at T2. Of these schools, eight participated in both years.

Given the aim of the study, i.e. identification of a group of online gamers, the full sample is restricted to a subsample of online game players for both T1 (35%, N=1572) and T2 (40%, N=1476). Secondly, a longitudinal subsample, namely a cohort of online gamers who were included in both samples, can be identified between T1 and T2 (N=467). Analyses in the present study span the first four classes of Dutch secondary school (average per year ages of 13, 14, 15, and 16 years, respectively). Table 3.1 presents demographic information on the subsamples for gender, ethnicity (Dutch/non-Dutch), higher secondary education (i.e. preparatory college and pre-university education) or lower secondary education (i.e. pre-vocational training), and average age.

**Table 3.1 Demographic information on the subsamples.**

	Full sample		Online gamers		Online gamers, cohort
	T1	T2	T1	T2	T1 - T2 <sup>a</sup>
Participating schools	12	10	12	10	8
Overall sample size (N)	4559	3740	1572	1476	467
Gender (% boys )	49%	52%	82%	81%	90%
Dutch ethnicity (%)	78%	78%	78%	80%	80%
Higher education level (%)	66%	62%	64%	58%	62%
Mean average age (SD)	14.35 (1.18)	14.34 (1.04)	14.21 (1.12)	14.24 (1.01)	13.76 (0.79)

<sup>a</sup> Values for T1 are reported

## Measures

**Compulsive Internet Use.** The 14-item version of the Compulsive Internet Use Scale (CIUS) (Meerkerk et al., 2009) was used to measure CIU, with its Dutch phrasing slightly adjusted for adolescents. This questionnaire (employing a 5-point scale) covers several core components typical of behavioral addiction: withdrawal symptoms, loss of control, salience, conflict, and coping (mood modification) (Meerkerk et al., 2009), and includes questions such as “Have you unsuccessfully tried to spend less time on the internet?” and “Do you neglect to do your homework because you prefer to go on the internet?” The CIUS showed to have a good validity (Meerkerk et al., 2009) and internal reliability (Meerkerk et al., 2006; Meerkerk et al., 2009; Meerkerk, 2007), and showed good reliability in the current samples (Cronbach’s  $\alpha = 0.88$  at both T1 and T2).

**Weekly hours online gaming.** Hours per week spent on online gaming were calculated by combining results from two questions (answers on a 5-point scale) measuring days per week of online gaming (ranging from ‘never’, ‘1 day per week or less’, ‘2/3 days per week’, ‘4/5 days per week’, to ‘(almost) daily’), and a 7-point scale measuring average hours of use on a gaming day (ranging from ‘don’t use’, ‘less than 1 hour’, ‘1 to 2 hours’, ‘2 to 4 hours’, ‘4 to 6 hours’, ‘6 to 8 hours’, to ‘8 hours or more’). These questions were recoded to an interval scale and multiplied to get an approximation of number of hours per week. Note that although ‘online game playing’ includes more than just MMORPGs, an open question in the Monitor Study revealed that MMORPGs and First Person Shooters (shooting games utilizing a first person perspective, i.e. Call of Duty or Counterstrike) were the most popular types of online game (Van Rooij et al., 2008).

**Psychosocial outcome measures.** The psychosocial measures in the present study were: the Rosenberg’s Self-Esteem Scale (H. K. Kim & K. E. Davis, 2009; Rosenberg, 1989), the UCLA Loneliness Scale (Ghassemzadeh, Shahraray, & Moradi, 2008; Russell, Peplau, & Cutrona, 1980), the Depressive Mood List (Engels, Finkenauer, Meeus, & Deković, 2001; Kandel & Davies, 1982, 1986), and the Revised Social Anxiety Scale for Children (la Greca, Dandes, Wick, Shaw, & Stone, 1988; la Greca & Stone, 1993; Gross, 2004).

These scales have been used in Dutch studies and demonstrated good reliability in the past (Meerkerk, 2007; Van den Eijnden et al., 2008) and in the current samples (Cronbach's  $\alpha > 0.80$ ). For all four scales, a higher score indicates more reported problems. To facilitate comparison between the scales, the present study reports standardized results.

## Statistical Analyses

**Latent class analysis.** Mplus 5.1 was used to perform a latent class analysis (LCA) (L. K. Muthén & B. O. Muthén, 2007). LCA is an example of a mixture modelling technique used to identify meaningful groups of people (classes) that are similar in their responses to measured variables (Nylund, Asparouhov, & B. O. Muthén, 2007). In the present study, these groups were based on scores for the variables CIU and Weekly Hours Online Gaming.

The present study used LCA in an exploratory manner, aiming to establish the presence of a (small) subgroup of addicted online video gamers. Besides fitting with this theoretical expectation, goodness of fit indices should be used to select a model of sufficient quality (Marsh, Ludtke, Trautwein, & Morin, 2009). Two kinds of indices are used: measures of parsimony of the model and statistical tests to evaluate if the  $k+1$  solution is superior to a  $k$  class solution (Van der Vorst, Vermulst, Meeus, Dekovic, & Engels, 2009). The preferred measure of parsimony is the Bayesian information criterion (BIC) (Schwarz, 1978), as shown in simulation studies (Nylund et al., 2007; C. Yang, 2006). Lower BIC values indicate a more parsimonious model. Statistical evaluation of model improvement was done with the Bootstrap Likelihood ratio test (BLRT) (Nylund et al., 2007). Significant values for the BLRT indicate that the tested model ( $k$ ) is superior to the previous model ( $k-1$ ). After selecting a solution (see Results), identified class membership was transferred to SPSS 17 to examine longitudinal transition.

The data were standardized to facilitate interpretability and comparability of classes (groups). Standardized psychosocial correlates were explored through a Wald chi-square test for mean equality of potential latent class predictors (Asparouhov & B. O. Muthén, 2007), followed by post-hoc tests to test for between-class differences. This test has the advantage of taking the probabilistic nature of class membership into account, leading to less biased estimates.

## 3.3 Results

### Latent class identification

Table 3.2 gives the model fit indicators for the 1 through 6 latent class models when identifying classes on the basis of CIU and Weekly Hours Online Gaming (Online Gaming). The BLRT consistently reports significant outcomes ( $p < 0.001$ ) and BIC values are decreasing, indicating that each model is superior to the previous one. Entropy values are consistently high, indicating good classification quality.

**Table 3.2 Bayesian information criterion (BIC) values and entropy for different latent class analysis models.**

Classes	T1 (N=1572)		T2 (N=1476)	
	BIC	Entropy	BIC	Entropy
1	8941	-	8399	-
2	8071	0.977	7437	0.981
3	7594	0.968	6973	0.967
4	7221	0.965	6619	0.967
5	6690	0.972	6264	0.962
6	6353	0.989	5847	0.989

A subgroup of assumed addicted gamers, with a higher amount of weekly online gaming and a higher score on CIU, is identified from the three class solution onward. This group remains stable in the four and five class solutions for both time points (T1: n=56; N=1572; T2: n=75, N=1476). For the three, four, and five class solutions the relationship between CIU and online gaming seems to have a linear nature: classes are distributed along a straight line, where increases in online gaming are linearly related to simultaneous increases in CIU. The six-class model breaks this trend, as it splits the class with the highest CIU into two groups.

Table 3.3 shows that the first group (class five) has a moderate increase in hours spent on online gaming, while CIU scores remain stable or drop. Thus, class five identifies the non-addicted heavy gamers. The second group shows a moderate increase in hours spent on online gaming, accompanied by a disproportionate increase in CIU. As this group (class six) identifies the hypothesized group of addicted online gamers, the six-class model is selected as final model.

Table 3.3 gives the standardized and unstandardized means for this six class model, revealing consistent class identification in both years. Unstandardized results are reported to illustrate the actual number of hours played and to support future development of cut-off scores for the CIUS. This result can be partially attributed to repeated measurement. However, the longitudinal cohort represents approximately 30% of the respective samples (T1 and T2). From this, it is assumed that the classes are both stable and replicable. When the data are weighed against national statistics (Statistics Netherlands, 2010) (using learning year, region, gender, ethnicity, and education level) to obtain a nationally representative estimate for the Netherlands, the percentage of addicted heavy online gamers (i.e. class six) translates to 1.6% of the entire population aged 13-16 years in the Netherlands at T1 and 1.5% at T2.

**Table 3.3 Six latent class model, standardized and unstandardized results for the six classes.**

Class	T1						T2					
	N	%	Online Gaming (hours per week)		Compulsive Internet Use Scale		N	%	Online Gaming (hours per week)		Compulsive Internet Use Scale	
			Z-score	h/week	Z-score	CIUS			Z-score	h/week	Z-score	CIUS
1	813	51.7%	-0.65	1.8	-0.21	1.7	773	52.4%	-0.64	1.7	-0.22	1.7
2	421	26.8%	-0.01	9.3	-0.04	1.8	374	25.3%	-0.05	9.3	0.00	1.8
3	198	12.6%	0.87	19.7	0.36	2.1	179	12.1%	0.77	19.8	0.23	2.0
4	84	5.3%	1.94	32.5	0.56	2.2	75	5.1%	1.76	32.5	0.48	2.1
5	18	1.1%	3.04	45.5	0.30	2.0	27	1.8%	2.76	45.5	0.51	2.1
6	38	2.4%	3.86	55.3	1.75	2.9	48	3.3%	3.52	55.3	1.65	2.8
Total	1572						1476					

## Examination of psychosocial correlates

Table 3.4 presents the six class model through comparison of standardized psychosocial variables across the various classes. Significant overall differences were found for Depressive Mood (T2,  $p < 0.05$ ), Loneliness (T1,  $p < 0.01$ ), and Negative Self-Esteem (T2,  $p < 0.01$ ). Visual inspections of the table shows overall higher mean scores for all four psychosocial variables in class 6 (the most addicted group). Post-hoc tests comparing the most addicted class (6) with the other classes revealed several significant differences for Depressive Mood (T2), Loneliness (T1, T2), and Negative Self-Esteem (T1, T2). Focusing specifically on the two groups of heavy gamers (addicted, class 6 and non-addicted, class 5) only one significant difference was found, i.e. at T2 the addicted gamers were more depressed than the heavy gamers.

**Table 3.4 Six class model classes compared on standardized psychosocial outcome measures within T1 and T2.**

	Class	Depressive Mood		Loneliness		Social Anxiety		Negative Self-Esteem	
		T1	T2	T1	T2	T1	T2	T1	T2
T1	1	0.05	0.02 **	0.06	-0.01 *	0.00	0.00	0.03	0.04 **
	2	-0.11	-0.02 **	-0.12 *	-0.05 *	-0.03	-0.02	-0.07	-0.11 ***
	3	0.00	-0.14	0.08	-0.11	0.06	-0.06	-0.03 *	-0.16
	4	-0.08	-0.03	-0.16 **	0.04	-0.06	0.11	0.04	0.03 *
	5	-0.05	-0.21 **	-0.37	0.41	0.02	0.01	-0.15	0.13
	6	0.31	0.47	0.16	0.67	0.13	0.27	0.39	0.67
	X+	9.89	11.42	19.96	10.59	1.70	2.90	8.62	20.56
	P	0.078	0.044	0.001	0.06	0.889	0.715	0.125	0.001

Comparisons are made between group six and the other groups (\*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ ). Standardized values are reported for all four psychosocial outcome measures. Higher values indicate more reported problems on the respective scale.

## Longitudinal persistence of class membership

Table 3.5 presents longitudinal (year-to-year) transitions for the various classes. Results show that, apart from the first class, retention for the sixth class is higher than for other classes. In this cohort, although the absolute number of people in the sixth class is low, results indicate that half of the addicted online gamers at T1 (n=6) are still addicted at T2 (n=3).

**Table 3.5 Latent class membership and longitudinal persistence.**

		T2						N
		1	2	3	4	5	6	
T1	1	60.6%	24.6%	10.3%	3.4%	0.5%	0.5%	203
	2	37.5%	38.2%	14.6%	6.3%	0.0%	3.5%	144
	3	25.3%	25.3%	34.2%	11.4%	1.3%	2.5%	79
	4	17.2%	27.6%	17.2%	24.1%	10.3%	3.4%	29
	5	0.0%	16.7%	16.7%	16.7%	16.7%	33.3%	6
	6	0.0%	16.7%	0.0%	0.0%	33.3%	50.0%	6
	N	202	135	75	33	8	14	467

## 3.4 Discussion

The present study has successfully identified two distinct groups of gamers: one group of addicted heavy online gamers and another group of heavy but non-addicted online gamers, thus confirming our main hypothesis. The addicted heavy online gamers differed only slightly from the non-addicted heavy gamers (and various other groups) in terms of psychosocial health. However, some of these addicted gamers showed persistence over time, i.e. half of the addicted online gamers were still addicted one year later.

Two large-scale samples from a nationally representative study were used to classify online gamers with CIU. Using a data-driven approach, analyses showed the existence of six distinct groups within the data. The vast majority of online gamers (95%) are located in four groups, which show a linear increase in CIU as the hours per week of gaming increase. The fifth and sixth groups break this trend. The fifth group is identified as a group of heavy online gamers who play many hours per week, but show stability or even a drop in addiction (2008) when compared to the previous groups. This group of non-addicted heavy online gamers is relatively small (about 1% to 2% of the online gamers, see Table 3.3).

The sixth group, which contains about 3% of the online gamers in the period 2008/2009, spends many hours on online gaming and reports more symptoms of CIU than other groups. Thus it is identified as a group of addicted heavy online video gamers. These numbers translate to an average national estimate of 1.5% (2008) and 1.6% (2009) of addicted heavy online gamers among all Dutch adolescents in the first

four classes of secondary education (aged 13-16 years). These adolescents report an average of 55 hours per week on gaming.

Subsequently, psychosocial correlates were examined for the addicted online video gamers. Visual inspection of the data shows higher scores on depressive mood, loneliness, social anxiety, and negative self-esteem for addicted online gamers compared to other online gamers. However, post hoc testing revealed that most of the actual bilateral relationships are non-significant from the perspective of the addicted online gamers. When compared to non-addicted heavy gamers, only one significant difference was found: in 2009 the addicted heavy gamers were more depressed than the non-addicted heavy gamers.

These ambiguous results illustrate the complexity of the relationship between online video game use, online video game addiction, and psychosocial health. Especially in the case of outcome variables with a strong social element, such as loneliness and self-esteem, video gaming may well have a dualistic effect. First, it expands the horizon of the gamer by offering a second environment to experiment in (Jansz, 2005) and, later on, it may constrain social options in 'real-life' when the second life starts to overshadow the first (Hussain & Griffiths, 2009a). In this way, depressive symptoms, loneliness, and negative self-esteem might decrease for some gamers as they find refuge in online games; on the other hand, these correlates may increase for others because relying exclusively on online relationships may fail to provide the full spectrum of social contacts and support the gamer needs in real-life. This hypothesis fits well with earlier theoretical work on 'problematic internet use' by Caplan (Caplan, 2007, 2003). Further examination of these complex relationships in the case of online gaming might benefit from using statistical methods focusing on modeling, such as Structural Equation Modeling. Clinical studies will have to be utilized to establish the actual harm and treatability of the problems associated with 'online video game addiction'.

The identification of a small group of addicted heavy online gamers supports future efforts to develop and validate questionnaire scales aimed at measuring the phenomenon of 'online video game addiction'. It also confirms the existence of the group through an alternative approach, thereby confirming earlier results for the subgroup of online gamers (Gentile, 2009; Lemmens et al., 2009). Additionally, it provides a basis on which to establish empirically supported cut-off points for scales aiming to measure online video game addiction. Although an addicted group of gamers was found, substantial caution should be exercised before the creation of a new 'disorder', due to the modest impairment and longitudinal persistence.

The current study has several strengths. It provides a data-driven prevalence estimate for 'video game addiction' in the Netherlands, based on two large-scale samples. Additionally, it provides some of the first longitudinal data on the development of this phenomenon over time. However, the study also has some limitations. Firstly, the study uses self-report data, which is known to carry the risk of bias (P. M. Podsakoff, MacKenzie, J. Y. Lee, & N. P. Podsakoff, 2003); this should be taken into account when comparing estimates with external outcome variables, such as the number of people reporting for clinical treatment with game addiction as the main complaint. Secondly, the 'hours per week' variable was the result of a multiplication and might be affected by ceiling effects; as such, it should be viewed as an estimate and not as an absolute value. Thirdly, clinical measures were restricted to psychosocial measures and a measure of addiction:

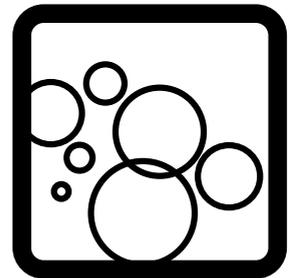
future research might benefit from the inclusion of specific clinical measures of, for example, hyperactivity and mania. Finally, different types of online video games are available. Whereas 'online video games' are an advancement of the unified 'video games' approach, future research may benefit from further differentiation, e.g., by distinguishing online First Person Shooter games from online Role Playing Games.

In summary, this study confirms the existence of a small percentage (3%) of addicted online gamers. This group represents approximately 1.5% of all children aged 13 to 16 years in the Netherlands. Although these gamers report addiction-like problems, relationships with decreased psychosocial health were less evident. While survey-based data cannot determine the exact clinical nature of game addiction, the present findings contribute to the discussion on the proposed unified concept of 'Addiction and Related Disorders' (which includes non-substance addictions) in the DSM-V (APA, 2010).



chapter 4

**Videogame Addiction Test (VAT):  
validity and psychometric  
characteristics**



# Chapter 4

## Videogame Addiction Test (VAT): validity and psychometric characteristics

**Submitted for publication as:**

Van Rooij, A. J., Schoenmakers, T. M., Van den Eijnden, R. J. J. M., Vermulst, A. A., & Van de Mheen, D. (n.d.).  
Videogame Addiction Test (VAT): validity and psychometric characteristics.

# Abstract

## **Aims**

To explore the reliability, validity and measurement invariance of a new Video game Addiction Test.

## **Design**

Large-sample paper-and-pencil questionnaire study, conducted in 2009.

## **Setting**

Secondary schools in the Netherlands.

## **Participants**

Large sample of schoolchildren (aged 13-16 years).

## **Measurements**

Compulsive Internet Use Scale, Video game Addiction Test, Game Addiction Scale, weekly hours spent on various game types, and several psychosocial variables.

## **Findings**

The Video game Addiction Test demonstrated excellent reliability, excellent construct (convergent and discriminant) validity, a one-factor model fit, and a high degree of measurement invariance across gender, ethnicity and learning year, indicating that the scale outcomes can be compared across different subgroups with little bias.

## **Conclusions**

The Video game Addiction Test can be helpful in the further study of video game addiction and contributes to the debate on possible inclusion of behavioral addictions in the upcoming DSM-V.

## 4.1 Introduction

In light of the upcoming edition of the DSM-IV (the DSM-V), the phenomenon of internet addiction is receiving renewed attention (APA, 2010; Tao et al., 2010; Block, 2008). Historically, internet addiction is often modeled along the framework proposed by Mark Griffiths which is derived from the DSM-IV criteria for pathological gambling. Griffiths defined the following components of behavioral addiction: Tolerance, Withdrawal symptoms, Relapse, Salience, Conflict, and Mood Modification (Griffiths, 2005a).

Our group operationalised these criteria in the 14-item Compulsive Internet Use Scale (CIUS) (Meerkerk et al., 2009). In order to fit the nature of internet specific problems, the CIUS operationalised Relapse as Loss of Control, while Tolerance was not incorporated in the scale due to lack of relevance (Meerkerk et al., 2009, p. 2). The Internet Addiction Test (IAT), another well-known internet addiction scale, also does not incorporate tolerance (Widyanto & McMurrin, 2004; K. S. Young, 1998). The CIUS contains the following components: loss of control, conflict, preoccupation/salience, coping/mood modification, and withdrawal symptoms. The CIUS is one of the few validated internet addiction scales which has been subjected to a confirmatory factor analysis (Caplan, 2010), i.e. it supports a one-dimensional measurement structure (Meerkerk et al., 2009).

While proposals for an Internet Addiction Disorder diagnosis are being made (Tao et al., 2010), it remains highly questionable whether people are actually addicted to the 'internet' as such. In fact, actual problematic behavior tends to centre around applications: i.e. people develop problems controlling their time spent in online video games (Mehroof & Griffiths, 2010; Wan & Chiou, 2006), online erotica (Meerkerk et al., 2006), or instant messaging services (Van den Eijnden et al., 2008). Utilizing the CIUS, gaming and online erotica were shown to have the strongest relationships with internet addiction for adults (Meerkerk et al., 2006). In a study focusing on adolescents, playing online video games was shown to have the strongest relationship with internet addiction (Van Rooij et al., 2010); subsequently, a follow-up study identified a small group of gamers scoring high on both internet addiction and on hours per week online gaming. This group is hypothesized to contain highly involved or 'addicted' online gamers (Van Rooij et al., 2011).

While several studies have demonstrated the existence of a small subgroup of highly involved gamers (Gentile, 2009; Grüsser et al., 2007; Peters & Malesky, 2008), no consensus has been achieved regarding measurement of game addiction. The present study aims to address this issue by constructing a new scale, the Video game Addiction Test (VAT), which is a modified version of the CIUS that aims to measure video game addiction. Using data derived from the 2009 sample of the ongoing Monitor Study 'Internet and Youth', the current study explores various psychometric properties of the proposed VAT scale.

More specifically, the present study tests the reliability, validity and measurement invariance of this new Video game Addiction Test. Convergent validity is tested by cross comparisons with related scales, the CIUS (Meerkerk et al., 2009) and the Game Addiction Scale (GAS) (Lemmens et al., 2009), and discriminant validity is tested by comparison with several discriminant variables, i.e. relevant measures of psychosocial well-being (Van Rooij et al., 2011; Caplan, 2007; Ha et al., 2007) and time spent on various game

types. Finally, our earlier study (Van Rooij et al., 2011) already identified a group of internet addicted online gamers using the CIUS and a measure of time spent on gaming in the 2009 sample of same dataset. This allows cross comparisons to be made between this group and the VAT.

## 4.2 Method

### Sample

The present study utilizes the 2009 sample of the yearly Monitor Study 'Internet and Youth', being the first sample to include the Game Addiction Test items in the survey. The sample includes ten Dutch secondary schools and contains information from 171 classes. Total sample response rate was 83%, which results in 4074 completed questionnaires. Non-response is mainly attributable to entire classes dropping-out due to internal scheduling problems: 12% of all classes did not return any questionnaires. The average per class response rate for the remaining classes was 92%. For specific details on the procedure see (Van Rooij et al., 2010; Van Rooij et al., 2011).

The proposed items of the VAT were skipped by adolescents who did not play games at all ( $n=1024$ ). For the purpose of scale validation, adolescents who completed less than four of the items on the Video game Addiction Test were removed from the dataset ( $n=156$ ). This resulted in a final dataset consisting of 2894 cases. Note that this subsample consists exclusively of gamers, which results in a skewed gender division: the percentage of boys is 62%. Furthermore, 80% of the sample has a Dutch or Western European ethnicity, while the remaining 20% has a non-Western European ethnicity. The sample was distributed over four learning years: 31% of the adolescents attended the first class (average age 13.3 years), 42% of the adolescents attended the second class (average age 14.2 years) and the remainder attended the third and fourth class (average age 15.5 years). Total average age was 14.3 ( $SD=1.0$ ) years.

### Measures

**Compulsive Internet Use (CIUS).** The 14-item version of the CIUS (Meerkerk et al., 2009) was used to measure CIU (with its Dutch phrasing slightly adjusted for adolescents), and includes questions such as "Have you unsuccessfully tried to spend less time on the internet?" and "Do you neglect to do your homework because you prefer to go on the internet?" The CIUS contains the following components: loss of control (4 items), conflict (4 items), preoccupation/salience (3 items), coping/mood modification (2 items), and withdrawal symptoms (1 item). The CIUS has good validity (Meerkerk et al., 2009) and internal reliability (Meerkerk et al., 2009; Meerkerk et al., 2006; Van Rooij et al., 2010). It also shows good reliability in the current sample (Cronbach's  $\alpha=0.89$ ).

**Video game Addiction Test (VAT).** The items that compose the CIUS were rephrased into the 14 proposed items for the VAT (Table 4.1 in Results section). Note that while we strongly suspect that online games play a particularly important role in the development of video game addiction (Council on Science and Public Health, 2007), playing multiple game types is not unusual (Van Rooij et al., 2010, p. 54) and excessive use of other game types cannot be ruled out. Thus, the phrasing was kept universal (i.e. 'game' instead of 'online game').

**Game Addiction Scale (GAS).** The seven-item (brief) version of the Game Addiction Scale developed by Lemmens et al. was included (2009). Six of the seven items each measure one of Griffiths' components of behavioral addiction, while one question measures 'problems' related to gaming (Mehroof & Griffiths, 2010). The seven-item version of the GAS showed high correlation with time spent on games ( $r=0.58$ ), and medium correlation with loneliness ( $r=0.31$ ), life satisfaction ( $r=-0.29$ ), social competence ( $r=-0.18$ ) and aggression ( $0.27$ ), which was interpreted as evidence of good concurrent validity (Lemmens et al., 2009). The GAS shows good reliability in our current sample (Cronbach's  $\alpha=0.84$ ).

**Weekly hours online gaming, casual browser gaming, and offline gaming.** Three types of games are distinguished: (multiplayer) online games, which are video games played with other people over the internet (e.g., Call of Duty, Team Fortress 2, Runescape, or World of Warcraft), casual browser games, which are simple games that are played online via the web browser (e.g., freebrowsergames.com), and finally offline games which do not utilize the internet (e.g. Sims 2). Hours per week spent on these game types were obtained by multiplication of results from two questions measuring days per week of gaming and average hours of gaming per day, similar to the procedure in our previous study (Van Rooij et al., 2011).

**Psychosocial measures.** Psychosocial measures were incorporated in the present study in order to study discriminant validity. The measures were the following: Rosenberg's Negative Self-Esteem Scale (Van Rooij et al., 2010; Rosenberg, 1989), the UCLA Loneliness Scale (Ghassemzadeh et al., 2008; Russell et al., 1980), the Depressive Mood List (Engels et al., 2001; Kandel & Davies, 1982, 1986), and the Revised Social Anxiety Scale for Children (la Greca et al., 1988; la Greca & Stone, 1993; Gross, 2004). These scales have been used in Dutch studies and have demonstrated good reliability in the past (Meerkerk, 2007; Van den Eijnden et al., 2008; Van Rooij et al., 2011) and in the current sample (Cronbach's  $\alpha>0.80$ ). For all four scales, a higher score indicates more reported problems.

## Strategy of analyses

Firstly, a confirmatory factor analysis (CFA) was used to confirm if the one-factor structure which was supported for the CIUS also holds for the VAT. For this, the Mplus software package (version 5.1) was utilized (L. K. Muthén & B. O. Muthén, 2007). To deal with missing data, the Full Information Maximum Likelihood estimation technique was used. This means that all available information in the data is used. Because the respondents are nested within schools and classes, the data have a multilevel structure and scores can be dependent on these two levels. To correct for this nonindependency (complexity) in the data at both levels simultaneously (schools and classes), the COMPLEXTWOLEVEL procedure was used in Mplus to get unbiased estimates of the standard errors of the parameters. However, anticipating the results, the combined procedure did not work due to software limitations. Therefore we applied the COMPLEX procedure for schools and classes separately and then compared both results. Because the differences between the two analyses were negligible we decided to report the results corrected for classes, as this is the most feasible position (adolescents are more likely to influence each other's gaming behavior within the same class than within the same school). The COMPLEX procedure uses a robust maximum likelihood estimator (robust to non-normality and non-independence of the data) resulting in robust chi-square values. Model fit is reported in robust chi-square values and estimated degrees of freedom, the Comparative Fit Index (CFI)

(Bentler, 1990) and the Root Mean Squared Error of Approximation (RSMEA) (Byrne, 1998). A CFI+0.95 and an RSMEA+0.05 are considered to indicate good model fit (Hu & Bentler, 1999; D. Kaplan, 2000; Rigdon, 1996).

Having established model quality for the one-dimensional 14-item scale, the second step was the establishment of measurement invariance. Various forms of measurement invariance can be distinguished (Gregorich, 2006): configural, metric, scalar and strict factorial invariance. Configural invariance requires that each common factor has the same set of items across groups. If the fit of the CFA model is acceptable across different groups, configural invariance is supported. Metric invariance requires that the factor loadings ( $\lambda$ ) of corresponding factors are invariant (and thus have the same meaning) across groups. Scalar (or strong) invariance requires that the item intercepts ( $\tau$ ) of corresponding factors are invariant across groups: this makes comparisons of group means meaningful. Strict factorial invariance requires that the residual variances of corresponding items of a factor are invariant across groups. If this requirement is fulfilled, comparisons of group variances are possible. Because this latter form is of limited practical value (Gregorich, 2006), we restrict our group comparisons to configural, metric and scalar invariance.

The three forms of measurement invariance were tested for three demographic characteristics of the sample: gender, ethnicity (Dutch or Western European versus non-Western European ethnicity) and learning year. Learning year was operationalised through learning years one, two, and a mixed group containing years three and four (the fourth learning year has a relatively small sample size;  $n=120$ , and was thus added to the third year). After fitting a baseline (non-invariant) model (representing configural invariance) with no constraints, metric and scalar invariance are tested by constraining factor loadings (metric invariance) and intercepts (scalar invariance) subsequently across groups. If the increase in chi-square (from the baseline model to  $\lambda$ -constrained model or from the  $\lambda$ -constrained model to the  $\tau$ -constrained model) is non-significant, metric and/or scalar invariance is supported. The robust chi-square values are first rescaled to standard chi-square values to compute a correct chi-square difference.

However, a large sample size can lead to incorrect chi-square results: "The difference in  $\chi^2$  -difference test applied to nested models has essentially the same strengths and weaknesses as the  $\chi^2$  - test applied to any single model, namely, the test is directly affected by sample size, and for large samples trivial differences may become significant" (Schermelleh-Engel, Moosbrugger, & H. Müller, 2003, p. 34). Therefore, we examined statistical significance, but also assessed the fit indices (CFI and RMSEA) from the constrained and the unconstrained models.

The third step utilized simple Pearson's correlations to study the validity of the VAT, specifically focusing on construct validity. Construct validity can be subdivided into two subtypes: convergent and discriminant validity. Convergent validity is demonstrated if the VAT shows a strong relationship with comparable constructs: in the present study this is operationalised through a measure of internet addiction, the CIUS (Meerkerk et al., 2009) and the GAS (Lemmens et al., 2009). Discriminant validity is indicated if the scale does not duplicate a related but different construct. The suspected candidates for discriminant validity are time spent on gaming and various measures of decreased psychosocial well-being.

Finally, previous work utilizing the same data set identified six clusters of gamers on the basis of online gaming and compulsive internet use (Van Rooij et al., 2011). The first five clusters increase in time spent on online gaming and compulsive internet use in a linear manner, while the sixth cluster breaks this trend and shows a moderate increase in hours spent on online gaming accompanied by a disproportionate increase in CIU. Thus, this sixth cluster was hypothesized to identify a group of addicted gamers. As this group was identified through a data driven method (cluster analysis), it provides an additional way to test the validity of the VAT. An ANOVA was executed in PASW statistics 17.03, which allows us to test the assumption that the addicted gamers (cluster 6) should have the highest VAT score. This analysis also provides information on the range of VAT scores per cluster.

## 4.3 Results

### Step 1. Confirmatory Factor Analysis (CFA)

A fully unconstrained model showed moderate fit:  $\chi^2(77)=2758.93$ , RMSEA=0.110 and CFI=0.780. However, in the adult CIUS, which provides the basis for the current item pool, the error terms of the several items were correlated on grounds of overlapping content. This means that for the proposed VAT, the following error terms should also be correlated on grounds of overlapping content: items 1 and 2, items 6 and 7, items 8 and 9, items 11 and 12, and items 13 and 14. For example, items 1 and 2 both deal with stopping behavior, items 6 and 7 both deal with thoughts about gaming when not actually playing, etc. Additionally, as the current scale is specifically formulated with regards to adolescents, the error term for item 3 was correlated with item 8 (and thus, indirectly, with 9), on grounds of content overlap. After correlating the error terms, the fit of the model improved considerably:  $\chi^2(71)=549.564$ , RMSEA=0.048 and CFI=0.961. Table 4.1 provides an overview of the items and the factor loadings for this final model. The VAT shows an excellent reliability (Cronbach's  $\alpha=0.93$ ).

**Table 4.1** Factor loadings and item phrasing for the fourteen Video game Addiction Test (VAT) items.

Item	How often...	Standardized factor loadings
1	... do you find it difficult to stop gaming	0.72
2	... do you continue to use the games, despite your intention to stop?	0.71
3	... do others (e.g., parents or friends) say you should spend less time on games?	0.69
4	... do you prefer to game instead of spending time with others (e.g., friends or parents)?	0.72
5	... do you not get enough sleep because of gaming?	0.69
6	... do you think about gaming, even when you're not online?	0.76
7	... do you look forward to the next time you can game?	0.75
8	... do you think you should be gaming less often?	0.65
9	... have you unsuccessfully tried to spend less time on gaming?	0.64
10	... do you feel restless, frustrated, or irritated when you cannot game?	0.78
11	... do you rush through your homework in order to play games?	0.70
12	... do you neglect to do your homework because you prefer to game?	0.68
13	... do you game because you are feeling down?	0.64
14	... do you game in order to forget about problems?	0.62

## Step 2. Measurement invariance

Measurement invariance was tested across gender, ethnicity and age (learning year). Table 4.2 summarises the results for the unconstrained model, the model with constrained factor loadings (metric invariance), and the model with constrained intercepts and constrained factor loadings (scalar invariance). Configural invariance is supported by the high values of CFI (>0.95) and low values of RMSEA (<0.05). Note that for all three demographic variables, the models demonstrated metric invariance: we accepted a significance value of  $p < 0.01$  by dividing the conventional value of 0.05 by the number of tests (6), known as the Bonferroni correction for multiple tests. The  $\chi^2$  differences showed p-values of 0.03 or higher. With respect to scalar invariance, the  $\chi^2$  difference values have p-values < 0.001, supporting scalar non-invariance. Analysis of intercepts shows that, at comparable test scores, boys tend to have slightly higher true scores than girls, adolescents with a Dutch or Western European ethnicity have slightly higher true scores than those with a non-Western European ethnicity, and older children tend to have higher true scores than younger children. Note that these differences are very small, to the point of being trivial. Furthermore, as noted in the Strategy of Analysis,  $\chi^2$  difference tests are sensitive to large samples. Therefore we also looked at the fit measures (CFI and RMSEA) of the constrained models, which revealed hardly any deterioration of the model fit. Therefore, we conclude that metric invariance is fully supported and that scalar variance is supported to a high degree.

**Table 4.2 Tests of invariance constraints (metric and scalar) for gender, ethnicity, and learning year.**

Hierarchical invariance testing steps		CFI	RMSEA	$\chi^2$ test of Model Fit			$\chi^2$ difference		
				Value	$\Delta f$	p	$\Delta\chi^2$	$\Delta f$	p
Tests of invariance constraints for male and female respondents									
1	Non-invariant	0.961	0.046	578.37	142	0.000			
2	$\lambda$ invariant	0.960	0.045	601.80	155	0.000	24.17	13	0.030
3	$\lambda\tau$ invariant	0.956	0.045	661.86	168	0.000	66.91	13	0.000
Tests of invariance constraints for ethnicity (Dutch or Western European versus Non-Western European)									
1	Non-invariant	0.959	0.049	605.12	142	0.000			
2	$\lambda$ constrained	0.958	0.047	629.58	155	0.000	23.58	13	0.035
3	$\lambda\tau$ invariant	0.954	0.048	689.69	168	0.000	66.18	13	0.000
Tests of invariance constraints learning year (First year / Second year / Third and Fourth year)									
1	Non-invariant	0.961	0.050	726.98	213	0.000			
2	$\lambda$ constrained	0.961	0.047	754.81	239	0.000	29.34	26	0.296
3	$\lambda\tau$ invariant	0.956	0.048	843.33	265	0.000	92.07	26	0.000

CFI: Comparative Fit Index

RMSEA: Root Mean Squared Error of Approximation

### Step 3. Convergent and discriminant validity

Table 4.3 shows that both the convergent and discriminant validity of the VAT are excellent: strong relationships are found with related scales, i.e. the GAS ( $r=0.74$ ) and the CIUS ( $r=0.61$ ), while weak relationships are found with discriminant scales, i.e. the various scales measuring psychosocial well-being and the time spent on various game types ( $r<0.40$ ). It should be noted that of the various game types, online gaming (measured in hours per week) shows the strongest relationship with the VAT ( $r=0.37$ ).

**Table 4.3 Pearson's correlations between game and internet addiction scales, psychosocial outcome measures, and measures of time spent on various game types.**

	1	2	3	4	5	6	7	8	9
1. Video game Addiction Test	1.00								
2. Video game Addiction Scale	0.74***	1.00							
3. Compulsive Internet Use Scale	0.61***	0.63***	1.00						
4. Depressive Mood List	0.29***	0.27***	0.40***	1.00					
5. UCLA Loneliness scale	0.29***	0.23***	0.23***	0.38***	1.00				
6. Social Anxiety for Children Revised	0.22***	0.20***	0.22***	0.45***	0.47***	1.00			
7. Rosenberg Self-Esteem Scale	0.22***	0.18***	0.27***	0.50***	0.54***	0.46***	1.00		
8. Online games (hours per week)	0.37***	0.38***	0.37***	0.03	0.09**	0.04	0.07*	1.00	
9. Casual browser games (h.p.week)	0.19***	0.17***	0.19***	0.09***	0.12***	0.07***	0.07***	0.08**	1.00
10. Offline games (hours per week)	0.25***	0.25***	0.11***	0.01	0.01	0.00	0.00	0.22***	0.24***

\* p<0.05; \*\* p<0.01; \*\*\* p<0.001

Table 4.4 contains a cross-comparison of the VAT with clusters established in previous work on the basis of internet addiction and hours per week of online gaming (Van Rooij et al., 2011). The table shows descriptive statistics which demonstrate a consistent increase on VAT scores. Overall between-group differences for the VAT were found with a one-way ANOVA test ( $F=46.10$ ,  $df=5$ ,  $p<0.001$ ) with regards to the VAT. As expected, group six demonstrates the highest average scores; this was shown to be a significant difference using Bonferonni post-hoc testing ( $p<0.001$ ).

**Table 4.4** Descriptive statistics: scores on the Video game Addiction Test compared to latent classes found in the variables internet addiction and time spent on gaming as described Van Rooij et al. (2010)

Class	Video game Addiction Test					Compulsive Internet Use Scale		Hours per week of online gaming	
				95% Confidence Interval for Mean					
	n	Mean	Standard deviation	Lower Bound	Upper Bound	n	Mean	n	Mean
1	679	1.64	0.59	1.60	1.69	679	1.69	679	1.73
2	357	1.80	0.60	1.73	1.86	355	1.82	357	9.23
3	174	1.94	0.70	1.83	2.04	174	1.96	174	19.83
4	72	2.15	0.81	1.96	2.34	72	2.12	72	32.47
5	24	2.22	0.72	1.92	2.52	24	2.09	24	45.50
6	46	2.96	1.01	2.66	3.26	46	2.89	46	55.25
Total	1352					1350		1352	

## 4.4 Discussion

The present study proposes a new, one-dimensional scale to measure video game addiction: the Video game Addiction Test (VAT). The VAT demonstrated excellent reliability, a one-factor model fit, and measurement invariance across gender, ethnicity, and learning year, indicating that the scale outcomes can be compared across different subgroups with little bias. Additionally, good construct validity was established: the VAT showed strong relationships with comparable constructs such as Compulsive Internet Use Scale (CIUS) and an alternative measure of game addiction (GAS), while showing weaker relationships with discriminant variables such as several measures of psychosocial health and time spent on various game types.

With regards to scale invariance, configural and metric invariance of the factor loadings were supported by the data, as well as a high degree of scalar invariance. Scalar invariance is established only to a high degree, which means that there are some indications that (at comparable test scores) boys, adolescents with a Dutch or Western European ethnicity, and older adolescents might have slightly higher true scores than their counterparts. Although these group differences make sense and are small (i.e., there is a well-known gender divide in video game playing), they should nonetheless be taken into account when developing norm groups for the scale.

A variety of direct and indirect attempts have been made to measure video game addiction (Gentile, 2009; Grüsser et al., 2007; Lemmens et al., 2009; Wöfling & K. W. Müller, 2010). Although this earlier work has been fruitful (note the high correlation between the VAT and the game addiction scale by Lemmens et al.),

the problem has remained that internet addiction and game addiction are generally studied independently, while it is evident that most game-addiction problems are strongly linked to internet enabled online games.

The VAT addresses this issue. Firstly, the relationship between the VAT and a well- defined internet addiction scale (the CIUS) is clear, both theoretically and empirically ( $r > 0.61$ ). In line with Davis' distinction between generalized and specific problematic internet use (R. A. Davis, 2001), online game addiction problems may be viewed as a specific subtype of internet addiction. Secondly, the connection with the CIUS allowed us to cross-check VAT scores against an empirically identified group of internet addicted online gamers (Van Rooij et al., 2011). Our results show that the VAT scores are indeed significantly higher in the group which contains the internet addicted online gamers. As such, the VAT can be employed in further survey research. Moreover, findings should provide a starting point for further clinical validation of the VAT.

An obvious limitation of the current study is the use of self-reported data. Although we know that a subgroup of adolescents report having problems with controlling their gaming behavior, it is unknown if this translates into actual clinical problems. This means that it is impossible to rule out whether the extreme group is psychologically dependent on games or merely very highly involved. Future research will benefit from more clinically-oriented studies. A second limitation is that the VAT is by nature culturally loaded: e.g., item 4: *"... do others (e.g., parents or friends) say you should spend less time on games?"* As societal acceptance of gaming increases parents will be less likely to complain about their child's gaming behavior which, in turn, might result in changing answer patterns on the scale.

In summary, the current study demonstrates the psychometric quality of a new instrument to measure video game addiction: the Video game Addiction Test. The instrument shows excellent psychometric characteristics and has the major benefit of being strongly linked to the CIUS, an existing internet addiction scale. Finally, VAT scores were shown to be significantly higher in for a group of internet addicted online gamers which was identified in earlier research. This finding should facilitate future epidemiological research on the prevalence and incidence of game addiction. Thus, the VAT can be helpful in the further study of video game addiction.



well-being

chapter 5

**Video game addiction  
and psychosocial well-being:  
the role of friendship quality**



# Chapter 5

## Video game addiction and psychosocial well-being: the role of friendship quality

**Submitted for publication as:**

Van Rooij, A. J., Schoenmakers, T. M., Van den Eijnden, R. J. J. M., Vermulst, A. A., & Van de Mheen, D. (n.d.).  
Video game addiction and adolescent psychosocial well-being: the role of online and real-life friendship quality.

## Abstract

### **Aims**

This study investigates the moderating role of the quality of online and real-life friendship on the relationship between video game addiction and psychosocial well-being.

### **Design**

Large-sample paper-and-pencil questionnaire study conducted in 2009.

### **Setting**

Secondary schools in the Netherlands.

### **Participants**

A large sample (n=4054) of schoolchildren (aged 13-16 years), reduced to a subsample of online gamers (n=1468).

### **Measurements**

Video game Addiction Test, Negative Self-Esteem, Loneliness, Depressive Mood List, Social Anxiety, Quality of online friendship, and the Quality of real-life friendship.

### **Findings**

A clear relationship was found between psychosocial problems and video game addiction. Furthermore, the study revealed three instances of moderation of this relationship by quality of online friendship (for loneliness) and quality of real-life friendship (for social anxiety and loneliness). For those with high-quality friendships, the relationship between game addiction and decreased psychosocial health was found to be weaker.

### **Conclusions**

These findings demonstrate that the quality of online and real-life friendship play a role in the severity of problems associated with video game addiction.

## 5.1 Introduction

Previous research has convincingly demonstrated the existence of a small group of over-involved online video game players that can be classified as 'video game addicts' (Chiu, Jie-Zhi Lee, & D. Huang, 2004; Gentile, 2009; Grüsser et al., 2007; Peukert, Sieslack, Barth, & Batra, 2010; Van Rooij et al., 2011). Established criteria which conceptualize behavioral addictions (Griffiths, 2005a) have now been modified to fit the specific nature of internet addiction (Meerkerk et al., 2009) and video game addiction (Van Rooij et al., n.d.). This leads to the definition of video game addiction as an addiction-like behavioral problem which presents as: a loss of control, an increase in conflict, preoccupation with gaming, the utilization of games for purposes of coping/mood modification, and withdrawal symptoms if the gamer is forced to quit (Van Rooij et al., n.d.).

Many researchers have found a relationship between measures of psychosocial problems and measures of video game addiction (Lemmens et al., 2009; Rehbein, Psych, Kleimann, Mediasci, & Mößle, 2010; Van Rooij et al., 2011). In cross-sectional studies, although these relationships are shown to be of moderate size, they are not strong enough to warrant the conclusion that game addiction is simply isomorphic with psychosocial problems (Skoric, Teo, & Neo, 2009). If game addiction is indeed a direct manifestation of underlying psychosocial problems, a stronger relationship would be expected. However, the findings do indicate a relationship between psychosocial problems and video game addiction. This also makes sense on a practical level, as one would expect some degree of harm to be associated with an addictive form of behavior. Therefore, we hypothesize that a moderate, positive relationship exists between psychosocial problems and video game addiction (hypothesis 1).

Furthermore, accounts of video game addiction are almost invariably linked to relatively new, social, 'online' games (Council on Science and Public Health, 2007; Van Rooij et al., 2010), and specifically to Massive Multiplayer Online Role Playing Games or 'MMORPGs' (Bergmark-Helmersson & Bergmark, 2009; Hussain & Griffiths, 2009b; Rehbein et al., 2010; Smahel et al., 2008). While game addiction on its own may well be related to negative psychological outcomes (C. H. Ko, J. Y. Yen, C. C. Chen, S. H. Chen, & C. F. Yen, 2005; Mehroof & Griffiths, 2010; Ng & Wiemer-Hastings, 2005; Wood, Gupta, Derevensky, & Griffiths, 2004), MMORPGs also provide '*highly socially interactive environments providing the opportunity to create strong friendships and emotional relationships*' (Cole & Griffiths, 2007, p. 575). Online gamers who are firmly embedded in an online subculture, with high-quality online relationships, may well find support in those relationships which may alleviate or even prevent the negative outcomes that are thought to accompany their behavior, as indicated by Longman et al. (2009).

While the phenomenon of having exclusively online friendships might be new, real-world or 'real-life' friendships have been around for much longer. Active gamers are likely to be embedded in a gaming subculture, and might discuss the games they play with their real-life friends. In fact, gamers are not the socially disconnected group of online dwellers that some have suspected: "*Rather, they were more functional individuals who maintained contact with real-world friends and relatives in a more complex manner online.*" (Hussain & Griffiths, 2008, p. 47). In general, close friendships have been associated with lower

social anxiety (La Greca & Lopez, 1998; Vernberg, Abwender, Ewell, & Beery, 1992), higher self-esteem, and better psychosocial adjustment (Buhrmester, 1990; Compas, Slavin, Wagner, & Vannatta, 1986; La Greca & Harrison, 2005). These results also translate to the online arena: for example, Valkenburg and Peter demonstrated that instant messaging, mostly used to communicate with real-life friends, positively predicts well-being via the quality of these friendships (Valkenburg & Peter, 2007).

A previous study by our research group identified a group of highly involved 'addicted' online gamers (Van Rooij et al., 2011). However, the study also identified a relatively large variation in psychosocial condition within this group, based on the answers derived from four scales that measure various aspects of psychosocial well-being: i.e. negative self-esteem, loneliness, depressive symptoms, and social anxiety (Van Rooij et al., 2011). This variation indicates that some addicted gamers suffer less psychological problems than others. As social interaction plays a crucial role in online games and has been linked to psychological well-being, we assume that the quality of online and real-life friendships may play a role in explaining these variations. A study on the relationship between online activity and psychosocial well-being suggested that friendship quality may play a moderating role through the rich-get-richer hypothesis and the social compensation hypothesis (Selfhout, Branje, Delsing, Ter Bogt, & Meeus, 2009).

Firstly, the social compensation hypothesis suggests that individuals who are not socially successful in real life should benefit from high-quality online social interaction as it provides an ideal way to explore their identity in a safe environment (Cole & Griffiths, 2007; Selfhout et al., 2009). Translated to online video gaming, this would mean that high-quality online friendships should protect online gamers against negative psychosocial consequences. For example, an adolescent who is lonely and socially anxious at school can find social comfort and practice social skills in a 'safe' online game (where communication is structured and the rules are clear). However, if such a person fails to create a high-quality online social network as well, this might result in even deeper social isolation. Therefore, the positive association between game addiction and psychosocial problems is thought to be weaker for adolescents high in online friendship quality than for adolescents low in online friendship quality (hypothesis 2).

Secondly, the rich-get-richer hypothesis (Kraut et al., 2002; Morahan-Martin, 2005) suggests that online social interaction might have beneficial effects for those individuals who already have existing social support in the form of high-quality real-life friendships, because it presents a way to maintain these friendships and even expand upon them. Applying this idea to game addiction, this means that high-quality real-life friendships should protect addicted online gamers against negative psychosocial consequences. More heavily addicted gamers are expected to suffer more psychosocial problems, but this effect would be stronger for adolescents with low real-life friendship quality. Thus, the positive association between game addiction and psychosocial problems is thought to be weaker for adolescents high in real-life friendship quality than for adolescents low in real-life friendship quality (hypothesis 3).

Implemented and modified in the previous manner, the two hypotheses are not contradictory and can be seen as working in parallel. The association between video game addiction and psychosocial problems is thus thought to be weaker for those with high-quality *online* friendships (hypothesis 2) as well as those

with high-quality *real-life* friendships (hypothesis 3). Besides the explorative work describing a preference for online communication over real-life communication among heavy gamers (Hussain & Griffiths, 2008), no structured efforts have been made to examine the moderating role of friendship quality in this relationship between video game addiction and psychosocial well-being. Nevertheless, it is clear that social relationships are an integral part of multiplayer online video games and need to be taken into account in the study of video game addiction. Therefore, the current study explores the three proposed hypotheses using a large-scale sample from the Monitor study Internet and Youth.

## 5.2 Method

### Sample

The study utilizes the 2009 sample of the yearly Monitor Study 'Internet and Youth'. The sample includes ten Dutch secondary schools and contains information from 171 classes. The total sample response rate was 83%, resulting in 4074 completed questionnaires. After accounting for some missing values on demographic variables, an effective sample size of 4054 was established (see Table 5.1 below). Non-response is mainly attributable to entire classes dropping-out due to internal scheduling problems: 12% of all classes did not return any questionnaires. The average response rate per class for the remaining classes was 92%. For specific details on the procedure we refer to our earlier publications (Van Rooij et al., 2010; Van Rooij et al., 2011).

A subsample of online multiplayer gamers was identified as those gamers who spend at least 1 hour per week on online multiplayer games. This resulted in a subsample consisting of 1468 cases. This subsample consists exclusively of gamers, which results in some skewed demographic characteristics: i.e. the percentage of boys is 81%. The online gamer subsample has a slightly lower average age than the full sample, while education level is slightly lower (visually). Both the main and the subsample are, on average, more highly educated than the 44% which is the national Dutch average (Statistics Netherlands, 2010).

**Table 5.1** Descriptive statistics for the full sample and a subsample of online multiplayer gamers.

	Original sample	Online gamer subsample
Sample size (N)	4054	1468
Gender (% boys )	50%	81%
Higher education level (%)	59%	58%
Average age (years): mean (SD)	14.3 (1.1)	14.1 (1.0)

### Measures

**Video game Addiction Test (VAT).** The items that compose the Compulsive Internet Use Scale or CIUS (Meerkerk et al., 2009) were 'rephrased' into the 14 proposed items for the Video game Addiction Test. The scale was validated using the same sample utilized for the current study: the scale demonstrated a high reliability (Cronbach's  $\alpha=0.93$ ) and good convergent and discriminant validity (Van Rooij et al., n.d.).

A strong relationship ( $r=0.74$ ) was found with a related scale, namely with the Game Addiction Scale by Lemmens et al. (2009). The VAT also demonstrates discriminant validity: weaker relationships are found with various scales measuring psychosocial well-being and the time spent on various game types ( $r<0.40$ ). Items include: 'How often do you find it difficult to stop gaming' and 'How often do you think about gaming, even when you're not online?' and answer options range from 'never' to 'very often' on a five-point scale.

**Psychosocial outcome measures.** In the present study, psychosocial measures were incorporated to examine discriminant validity. The following measures were used: Rosenberg's Negative Self-Esteem Scale (Van Rooij et al., 2010; Rosenberg, 1989), the UCLA Loneliness Scale (Ghassemzadeh et al., 2008; Russell et al., 1980), the Depressive Mood List (Engels et al., 2001; Kandel & Davies, 1982, 1986), and the Revised Social Anxiety Scale for Children (la Greca et al., 1988; la Greca & Stone, 1993; Gross, 2004). The Revised Social Anxiety Scale combines two subscales, the SAD-G (4 items measuring general social avoidance) and the SAD-New (6 items measuring social avoidance and distress specific to new situations). These scales have demonstrated good reliability in earlier Dutch studies (Meerkerk, 2007; Van den Eijnden et al., 2008; Van Rooij et al., 2011), as well as in the current sample (Cronbach's  $\alpha>0.80$ ). For all four scales, a higher score indicates more reported problems.

**Quality of online and real-life friendship.** To assess the quality of friendships, we used Buhrmester's relationship inventory (Furman & Buhrmester, 1985) which was previously utilized and translated into Dutch (Valkenburg & Peter, 2007). Valkenburg and Peter also split the questionnaire into two versions: one pertaining to exclusively online relationships and one to real-life friendships. The scale consists of three items measuring relationship 'satisfaction', three items measuring 'approval', and three items measuring 'support'. Examples of questions are: "How often are you happy with your relationship with these friends?" (satisfaction), "How often do these friends praise you for the kind of person you are?" (approval), and "How often do you turn to these friends for support with personal problems? (support) (Valkenburg & Peter, 2007, pp. 1174-1175). In the current sample, both the real-life (Cronbach's  $\alpha=0.90$ ) oriented and the online oriented scale (Cronbach's  $\alpha=0.93$ ) demonstrated excellent reliability.

## Strategy of analyses

PASW 17 was utilized to establish descriptive statistics and zero-order correlations for the four psychosocial variables, the two scales measuring quality of online friendship (QOF) and real-life friendships (QRF), and the Video game Addiction Test (VAT) scores. To explore the main relationships between the four aspects of psychosocial well-being and VAT (hypothesis 1), QOF (hypothesis 2), and QRF (hypothesis 3), stepwise hierarchical multiple linear regression models were used. The analysis is repeated for each of the four psychosocial variables: depression, loneliness, social anxiety, and negative self-esteem. The first step enters demographic variables and the second step enters the main variables VAT, QRF and QOF.

To examine the possible moderation of the relationship between VAT and the selected psychosocial by online and real-life quality, in the third step the interaction terms were added for VAT and QRF, VAT and QOF, and QRF and QOF (Selfhout et al., 2009; Spijkerman, Van den Eijnden, & Huiberts, 2008). Tested interactions were restricted to the directly hypothesized relationship between the VAT and the friendship

scales, and the potential interaction between the two friendship quality scales themselves, to avoid chance capitalization. After identification of an interaction through the regression models, the post-hoc procedure and PASW macro developed by Hayes and Matthes was used to probe and plot the nature of the identified moderation effects (2009).

The macro replicates established interactions identified in the regression model (see Table 5.4): i.e., predicting loneliness (dependent) from VAT (focal predictor) and moderator (QOF and QRF), while controlling for the other variables. The procedure is repeated for social anxiety (utilizing QRF). The conditional effect of the various predictors was established for various values of the moderator variable, using three groups: one SD above the mean (high), one SD below the mean (low), and the mean itself (Hayes & Matthes, 2009; Selfhout et al., 2009).

## 5.3 Results

### 1. Zero-order correlations

Table 5.2 presents the correlations for the various psychosocial variables, the quality of online friendships (QOF), the quality of real-life friendships (QRF), and the Video game Addiction Test (VAT). In line with hypothesis 1, medium positive correlations are found between VAT and the various psychosocial variables ( $r=0.29$  or higher,  $p<0.001$ ). A higher QOF is positively related to QRF ( $r=0.25$ ,  $p<0.001$ ), and positively related to depressive mood, social anxiety, and negative self-esteem ( $r<0.20$ ,  $p<0.001$ ). However, no significant correlation is found between QOF and Loneliness. Furthermore, a higher QRF is related to better psychosocial well-being: QRF is negatively related to all four psychosocial problems: most strongly to loneliness ( $r=-0.41$ ,  $r<0.001$ ), moderately to social anxiety ( $r=-0.16$ ,  $r<0.001$ ), negative self-esteem ( $r=-0.18$ ,  $r<0.001$ ), and depression ( $r=-0.07$ ,  $p<0.05$ ). Finally, VAT has a positive relationship with QOF ( $r=0.18$ ,  $p<0.001$ ) and a negative relationship with QRF ( $r=-0.13$ ,  $p<0.001$ ).

**Table 5.2** Pearson correlations for psychosocial measures, friendship quality, video game addiction, and online gameplay for a sample of online game players (as at 2009).

	1	2	3	4	5	6	7
1. Video game Addiction Test	1.00						
2. Quality of Online Friendships	0.18***	1.00					
3. Quality of Real-life Friendships	-0.13***	0.25***	1.00				
4. Depressive Mood List	0.38***	0.17***	-0.07*	1.00			
5. Loneliness scale	0.33***	-0.03	-0.41***	0.41***	1.00		
6. Social Anxiety for Children	0.30***	0.11***	-0.16***	0.48***	0.49***	1.00	
7. Negative Self-esteem Scale	0.29***	0.12***	-0.18***	0.51***	0.56***	0.48***	1.00

\*  $p<0.05$ , \*\*  $p<0.01$ , \*\*\*  $p<0.001$

## 2. Three-step linear regression model

The first step of the regression model (not presented in the table) predicts the four psychosocial measures from gender, education level, and age. Results show that the female online gamers tend to score higher on depression ( $p<0.001$ ), social anxiety ( $p<0.001$ ), negative self-esteem ( $p<0.001$ ), and loneliness ( $p<0.01$ ). Lower education level is associated with more loneliness ( $p<0.001$ ) and more negative self-esteem ( $p<0.001$ ), and being younger with more negative self-esteem ( $p<0.01$ ).

Table 5.3 presents the beta coefficients for the second step of the regression model which predicts the four psychosocial measures from VAT, QOF, and QRF. Overall results replicate the findings in the previous zero-order correlation overview. Again, in line with hypothesis 1, positive relationships are found between VAT and the four psychosocial measures. Positive (but weaker) relationships are also found for QOF and the psychosocial measures, with the exception of loneliness. Finally, negative relationships are found with QRF and most strongly between QRF and Loneliness.

**Table 5.3 Prediction of the various psychosocial measures from the Video game Addiction Test score and friendship quality for a sample of online gamers.**

	Depression ( $R^2=0.24$ , $p<0.001$ )		Loneliness ( $R^2=0.27$ , $p<0.001$ )		Social anxiety ( $R^2=0.15$ , $p<0.001$ )		Negative Self-Esteem ( $R^2=0.23$ , $p<0.001$ )	
	$\beta^a$	$\Delta R^2$	$\beta^a$	$\Delta R^2$	$\beta^a$	$\Delta R^2$	$\beta^a$	$\Delta R^2$
(Constant)								
Gender (0/1=girl)	0.27***		0.17***		0.20***		0.28***	
Education level (0/1=high)	0.01		-0.07*		0.01		-0.10***	
Age	0.01		-0.01		0.00		-0.09**	
		0.06***		0.03***		0.03***		0.10***
VAT	0.38***		0.29***		0.28***		0.28***	
QOF	0.09**		-0.02		0.08**		0.08**	
QRF	-0.10**		-0.36***		-0.15***		-0.19***	
		0.18***		0.24***		0.12***		0.13***

Note: QRF = quality of real-life friendships, QOF = quality of online friendships, VAT = Video Game addiction Test

\*  $p<0.05$ , \*\*  $p<0.01$ , \*\*\*  $p<0.001$

<sup>a</sup> Coefficients for the two-step model are reported

Table 5.4 presents the coefficients for the third step of the regression model which includes the interaction terms for QRF and VAT, QOF and VAT, and QOF and QRF. Overall, the beta coefficients remain the same as for step 2, while the third step identifies several interaction terms, albeit minor ones. The interaction identified for depression is ignored as the third step does not add significant explanatory value to the model ( $\Delta R^2=0.00$ ), which means that three terms are identified, namely QRF\*VAT and Loneliness ( $-0.07$ ,  $p<0.05$ ), QOF\*VAT and Loneliness ( $-0.09$ ,  $p<0.01$ ), and QRF\*VAT and Social Anxiety ( $-0.12$ ,  $p<0.01$ ). To facilitate

interpretation of the interaction terms, the three interactions are now explored further using graphs and statistical probing (see section 3: Moderation probing’).

**Table 5.4 Prediction of the various psychosocial measures from the Video game Addiction Test score, psychosocial measures, friendship quality, and hypothesized interaction terms for a sample of online gamers.**

	Depression (R <sup>2</sup> =0.24, p<.001)		Loneliness (R <sup>2</sup> =0.28, p<0.001)		Social anxiety (R <sup>2</sup> =0.16, p<0.001)		Negative Self- Esteem (R <sup>2</sup> =0.23, p<0.001)	
	β <sup>a</sup>	ΔR <sup>2</sup>	β <sup>a</sup>	ΔR <sup>2</sup>	β <sup>a</sup>	ΔR <sup>2</sup>	β <sup>a</sup>	ΔR <sup>2</sup>
(Constant)								
Gender (0/1=girl)	0.27***		0.18***		0.20***		0.28***	
Education level (0/1=high)	0.01		-0.07*		0.01		-0.10**	
Age	0.01		-0.01		0.00		-0.09**	
		0.06***		0.03***		0.03***		0.10***
VAT	0.36***		0.29***		0.24***		0.29***	
QOF	0.10**		0.02		0.08*		0.10**	
QRF	-0.07*		-0.33***		-0.12**		-0.19***	
		0.18***		0.24***		0.12***		0.13***
QRF * VAT	-0.07*		-0.07*		-0.12**		0.03	
QOF * VAT	-0.01		-0.09**		0.00		-0.02	
QOF * QRF	0.02		0.04		-0.01		0.04	
		0.00		0.02***		0.01**		0.00

Note: QRF = quality of real-life friendships, QOF = quality of online friendships, VAT = Video Game addiction Test

<sup>a</sup> Coefficients for the three-step model are reported

\* p<0.05, \*\* p<0.01, \*\*\* p<0.001

### 3. Moderation probing

Figure 5.1, Figure 5.2, and Figure 5.3 visualize the moderating effect of friendship quality. VAT scores are mean centered (mean=1.6). Figure 5.1 shows the moderating effect of the quality of online friendships for loneliness. For those with high online friendship quality, higher VAT predicts less loneliness (b=0.17, p<0.001), while for those with a low online friendship quality, higher VAT is related to (relatively) more loneliness (b=0.28, p<0.001).

Figure 5.1 Conditional effects of online friendship quality on the prediction of loneliness by video game addiction (VAT).

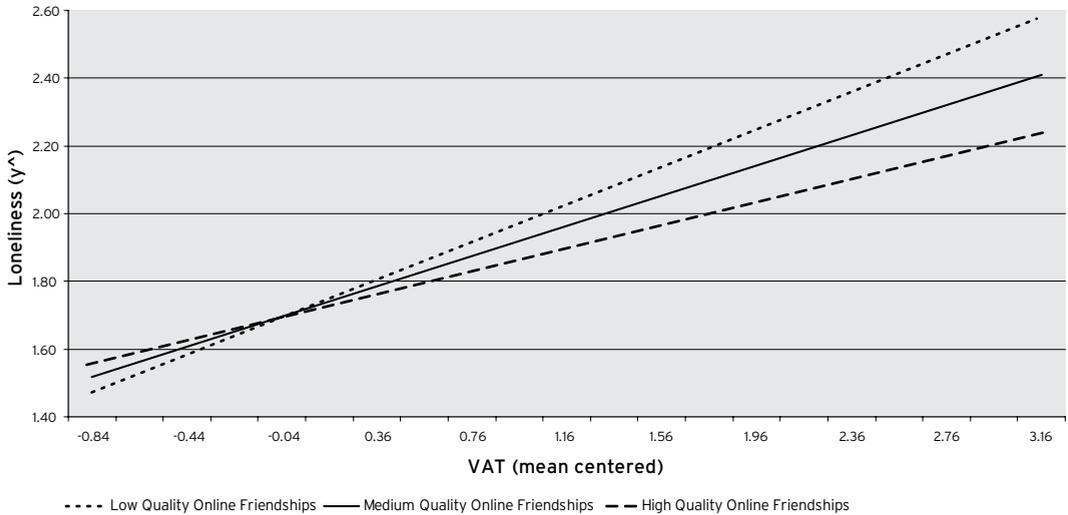


Figure 5.2 shows the moderating effect of the quality of real-life friendships for loneliness. For those with high real-life friendship quality, higher VAT predicts less loneliness ( $b=0.20, p<0.001$ ), while for those with a low real-life friendship quality, higher VAT is related to (relatively) more loneliness ( $b=0.26, p<0.001$ ). The difference is less pronounced than for online friendships.

Figure 5.2 Conditional effects of real-life friendship quality on the prediction of loneliness by video game addiction (VAT).

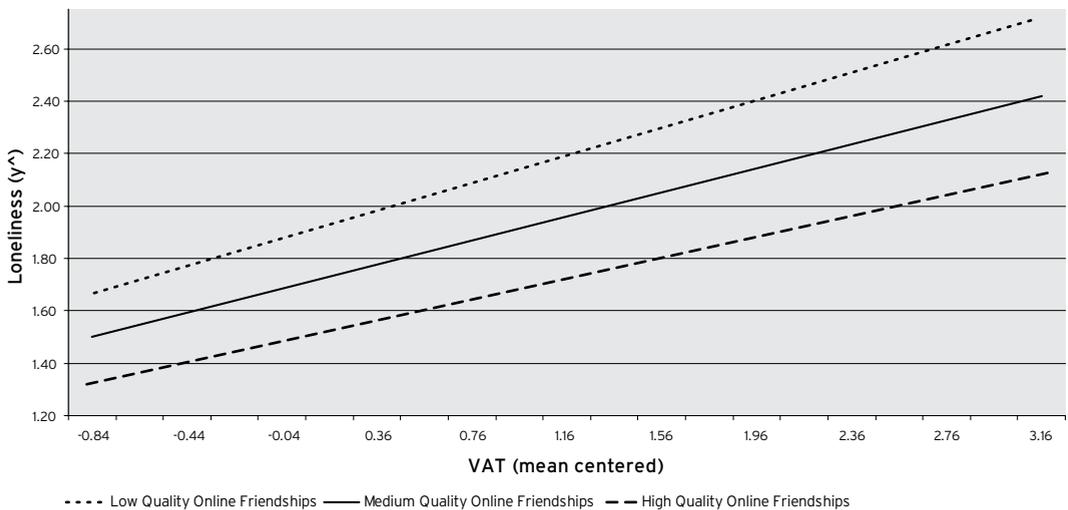
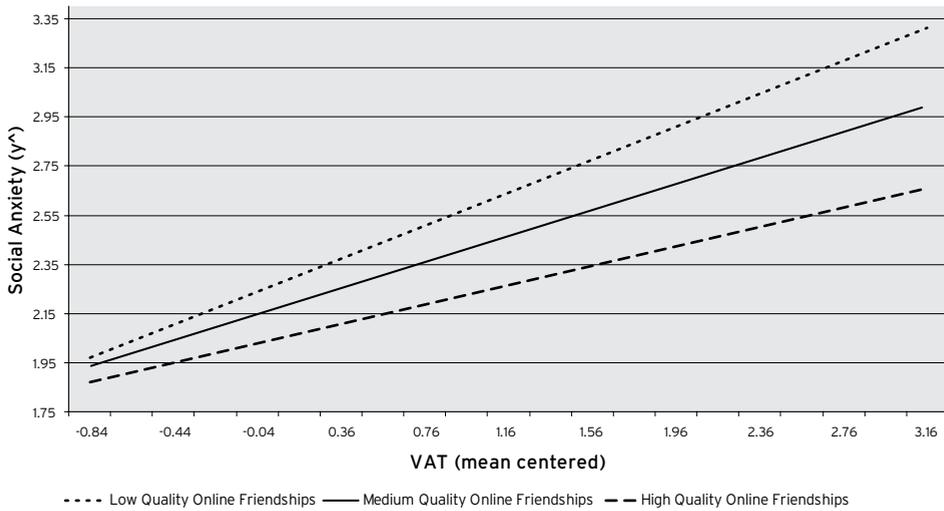


Figure 5.3 shows the moderating effect of the quality of real-life friendships for social anxiety. For those with high real-life friendship quality, higher VAT predicts less social anxiety ( $b=0.20, p<0.001$ ), while for those with a low real-life friendship quality, higher VAT is related to (relatively) more social anxiety ( $b=0.34, p<0.001$ ).

Figure 5.3 Conditional effects of real-life friendship quality on the prediction of social anxiety by video game addiction (VAT).



## 5.4 Discussion

This study investigated the relationship between video game addiction and psychosocial well-being, focusing on the moderating role of online and real-life friendship quality in this relationship. Findings demonstrate a positive relationship between video game addiction and psychosocial problems, thus confirming hypothesis 1. Furthermore, a higher quality of real-life friendships is related to having less psychosocial problems. However, having higher quality online friendships is associated with higher psychosocial problems, i.e. depression, social anxiety, and negative self-esteem (not loneliness).

In line with hypotheses 2 and 3, the relationship between video game addiction and certain aspects of psychosocial well-being was found to be moderated by the quality of online and real-life friendships. Three specific instances of moderation were found. Gamers with low-quality online and real-life friendships are lonelier at higher levels of video game addiction, compared to gamers with (respectively) high-quality online and real-life friendships. Thirdly, gamers with a low quality of real-life friendships demonstrate more social anxiety at higher levels of game addiction, compared to gamers with a high quality of real-life friendships.

Due to the cross-sectional nature of the current study, no causality can be attributed to these findings. However, the direction of the three instances of moderation is consistent with the expectations posed in hypothesis 2 and 3. The second hypothesis was based on the idea of social compensation, which indicates that online gamers who are more addicted would greatly benefit from their high-quality online friendships to alleviate negative psychosocial feelings. The findings for loneliness fit with this hypothesis: those with high-quality *online* friendships tend to be less lonely at higher levels of video game addiction in comparison to those with low-quality *online* friendships.

Although few data are available on the moderating role of online/real-life friendship quality on the relationship between psychosocial well-being and video game addiction, positive effects of being involved in online communities on psychosocial well-being have been reported in qualitative research (Cole & Griffiths, 2007). These effects might be at work here. However, this is probably not the only mechanism involved, because the other results shows that higher online friendship quality is related to more game addiction and more depression, social anxiety, and negative self-esteem. It seems feasible that the social benefits of becoming involved in an online environment (i.e. high-quality online friendships) do not fully compensate for the negative consequences of the heavy gaming.

Our findings also fit with the rich-get-richer hypothesis (hypothesis 3) and its reverse, the poor-get-poorer hypothesis. Those who maintain high-quality *real-life* friendships at higher levels of game addiction tend to be less lonely and less socially anxious, while those with low-quality *real-life* friendships tend to be more socially anxious and lonely. It is possible that those with a higher level of game addiction, especially if they have low-quality real-life friendships, have less opportunity to practice real-life social skills, and this results in higher social anxiety (Beidel et al., 2007; Bonetti, Campbell, & Gilmore, 2010). On the other hand, the causality might be reversed: those with social anxiety could be more prone to have low-quality real-life

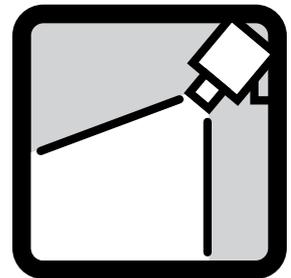
friendships and escape into video game addiction. Given the cross-sectional nature of the current study, both explanations could be true.

The current study has several limitations. First, this study uses cross-sectional data, which means that all results should be interpreted as relationships between variables - and certainly not as 'effects' or 'causes'. Given the scarcity of research in this area, although this study provides valuable insights, future research in this area would benefit from a longitudinal perspective. Second, the study necessarily uses self-report data, which carries the risk of various forms of bias, e.g. social desirability bias (P. M. Podsakoff et al., 2003). Third, the study shows relatively weak relationships. While the findings present a valuable contribution to existing knowledge, they should be interpreted in the light of their epidemiological nature, and care should be taken in extrapolating findings to real-life scenarios. Fourth, the study focuses on the quality of friendships in order to fit the theoretical expectations; however, quality of friendships is just one aspect of adolescent social life. One could expand on this topic by including, for example, the number of friends that each adolescent has (Valkenburg & Peter, 2007).

In summary, the current study explored the relationship between psychosocial problems and video game addiction, and the possible moderation of this relationship by the quality of online and real-life friendships. A clear relationship was found between psychosocial problems and video game addiction. Furthermore, the study demonstrated three instances of moderation of this relationship by online friendship quality (for loneliness) and real-life friendship quality (for social anxiety and loneliness). In these cases, the relationship between game addiction and lower psychosocial health is found to be weaker for those with high-quality online and offline friendships. These findings demonstrate that online and real-life friendship quality play a role in the severity of problems associated with video game addiction.

## chapter 6

# Treating internet and game addiction with cognitive- behavioral therapy



# Chapter 6

## Treating internet and game addiction with cognitive-behavioral therapy

**Published as:**

Van Rooij, A. J., Zinn, M. F., Schoenmakers, T. M., & Van de Mheen, D. (n.d.). Treating internet addiction with cognitive-behavioral therapy: A thematic analysis of the experiences of therapists. *International Journal of Mental Health and Addiction*. doi:10.1007/s11469-010-9295-0

## Abstract

In 2009, one of the major Dutch addiction care organizations initiated a pilot program to explore the possibility of using an existing Cognitive Behavioral Therapy and Motivational Interviewing based treatment program ('Lifestyle Training') to treat internet addiction. The current study evaluates this pilot treatment program by providing a qualitative analysis of the experiences of the therapists with the treatment of 12 self-proclaimed internet addicts. Therapists report that the program, which is ordinarily used for substance dependence and pathological gambling, fits the problem of internet addiction quite well. Interventions mainly focused on controlling and reducing internet use, and involved expanding (real-life) social contacts, regaining a proper daily structure, constructive use of free time, and reframing beliefs. Therapists further indicated that the treatment achieved some measure of progress for all of the twelve treated patients, while patients reported satisfaction with the treatment and actual behavioral improvements.

## 6.1 Introduction

Within Dutch addiction care, there is a growing interest in the treatment of internet addiction. A recent report concluded that while the prevalence is low, each of the ten largest Dutch public addiction treatment organizations is aware of a small, slowly growing group of patients that can be seen as 'internet addicts' (Meerkerk et al., 2009). Most of these patients experience problems controlling their use of internet pornography or online videogames. Counselors in addiction care are often unaccustomed to the specific needs and problems of people struggling to control internet use, and there are no evidence-based therapy protocols available yet. Thus, within addiction care facilities, there is a need for information and training with regard to internet addiction and a need for evidence-based treatment options to treat these patients.

Internet addiction can be considered "an impulse-control disorder that does not involve, but does share characteristics of, substance dependency" (Tao et al., 2010, p. 557). While no consensus on a diagnosis or clinical definition has been reached, the debate on the exact nature of internet addiction is receiving renewed attention in the light of the upcoming major revision of the standard psychiatric manual, DSM-V (APA, 2010; Block, 2008; Science, 2010; Tao et al., 2010). Of special interest is the observation that substance addiction and non-substance addiction may well share the same neurological foundation (Brewer & Potenza, 2008; Potenza, 2006).

Given the implication that we may be dealing with a new psychiatric disorder, there is a surprising lack of well-documented clinical interventions on internet addiction in the literature. Besides occasional clinical descriptions of patients with internet addiction (Bernardi & Pallanti, 2009), only one Australian study utilizing a Chinese sample of internet addicts (Beard & E. M. Wolf, 2001) provided a full description of a treatment of internet addiction using group Cognitive Behavior Therapy (CBT) in class rooms (Du, Jiang, & Vance, 2010). When compared to an untreated control group, the group receiving the CBT showed improvements in emotional state, regulation ability, and self-management. In light of the neurological, psychological, and behavioral similarities between internet addiction and traditional addiction problems, it makes sense to explore the feasibility of using slightly modified existing addiction treatment options to accommodate the treatment of internet addiction.

In 2009, one of the major Dutch addiction care (and treatment) organizations, namely Brijder Addiction Care, initiated a pilot program to explore the possibility of using an existing CBT and Motivational Interviewing (MI) based oriented treatment program ('Lifestyle Training') to treat self-proclaimed internet addicts. The Lifestyle Training program focuses specifically on addiction, including pathological gambling. The goal of the current study is to evaluate this pilot treatment. Before studying treatment effectiveness, the first step is to explore the fit of the program to the problems at hand. To this end, the current study focuses on a qualitative analysis of the experiences of therapists. This will form a starting point for determining the characteristics of proper treatment of internet addiction (Tao et al., 2010). The research thus contributes to a better understanding of both the treatment of internet related emotional, behavioral, and social problems, as well as the clinical presentation of these problems.

## 6.2 Method

### Participants

A website called 'internet-under-control' [www.internetondercontrole.nl] was launched in November 2008. The site launch was nationally covered by the mainstream Dutch media. One of the objectives of the website was to recruit a sample of self-proclaimed internet addicts. In order to be included patients had to report an inability to control their internet use. Exclusion criteria were the following: being younger than 18, being suicidal, or not having the mental capacity to actively participate in the therapy.

The website offered both a brief online self-test for internet addiction based on the Compulsive Internet Use Scale (Meerkerk et al., 2009) and a link to an intake form for those interested in actual treatment. The brief online self-test offered on the website was completed by almost 2000 individuals over the course of a year - indicating a group of interested individuals (or their families) found their way to the site. A relatively small group of 17 people filled out the actual full intake form for the (free) pilot treatment program. While all 17 people were approached, five of them did not enter the treatment program due to the following reasons: two could not be reached by mail or phone, one mistakenly thought the treatment would be internet based, one had already agreed on rules about internet use with his wife, and one person had enrolled in another treatment program.

Thus, 12 people started the treatment program. Each patient was assigned to one of the five participating therapists. The group of therapists consisted of one male junior psychologist, one female junior psychologist, two female social workers (counselors), and one female senior clinical psychologist/psychotherapist. All of the therapists had multiple years of experience in the treatment of addiction problems using the Lifestyle Training program (see: Treatment section), and had completed obligatory courses in Cognitive Behavioral Therapy (CBT) and Motivational Interviewing (MI), as well as on-the-job training in Lifestyle Training programs. Additionally, they were subject to supervision by the senior therapist who is qualified to supervise both CBT and MI and has an extensive track record with regards to this type of therapy.

These patients were fully informed about the treatment program and the parallel scientific study before participating and signed a consent form to that effect. As the evaluation of the treatment was non-invasive, utilized secondary sources (no direct patient contact), and focused on the experiences of therapists with both the patients and therapy process, no permission from the medical-ethical board was required under applicable law. Permission for the study was obtained from the board of directors of the addiction care institute where the trial was held and the procedure was checked by the head of research at the institution.

### Treatment: a manual based CBT

The current study utilizes the standard 'Lifestyle Training' program, a manual based treatment program (De Wildt, 2000, 2010, p. 50; Oudejans, 2009, p. 45). The therapy combines Cognitive Behavioral Therapy (CBT) and Motivational Interviewing or MI (Miller & Rollnick, 2002; Rollnick & Allison, 2004). It focuses on eliciting and strengthening motivation to change, choosing a treatment goal, gaining self control, relapse prevention, and the training of coping skills (Marlatt & Donovan, 2005; Monti, 2002). The program consists

of 10 outpatient sessions of 45 minutes, 7 of which preferably take place within a period of 10 weeks, the remaining 3, if necessary, within a period of three months. For each session the original treatment manual (De Wildt, 2000) provides recommendations for interventions and homework. Sessions follow a fixed format: introduction, evaluation of current status, discussing homework, explaining the theme of the day, practicing a skill, receiving homework, and finally closing the session. The various interventions per session are summarized below in Table 6.1.

**Table 6.1 Overview of the Lifestyle Training program, applied techniques per session.**

#	Session overview
1	Introduction and getting acquainted. Introduction of homework, for second session: keeping a diary of use and summarizing the disadvantages / advantages of the problematic behavior and the absence thereof in a balance sheet.
2	Setting treatment goals, based on the homework. Patient is asked to invite a supporting person to join the third treatment session.
3	Functional analysis (FA) of the behavior. Homework includes completing the functional analysis and continuing the diary.
4	Craving: discussing and training several cognitive and behavioral techniques for dealing with craving. Homework includes keeping track of experiences with (successful or failed) application of these techniques.
5	Social pressure to use: discussing and role-playing refusing skills. Homework includes practicing this skill.
6	Dealing with relapse and developing an emergency plan. Homework includes finishing the emergency plan, and once again inviting the supporting person to join the next (evaluation) session.
7	Evaluation of treatment goals, preferably in the presence of a significant other.
8,9,10	Optional themes like managing free time, dealing with group pressure, enhancing the social network, social skills, relaxation skills, dealing with a depressive mood or anger, problem solving skills.

## Procedure

Data were collected during three stages of the treatment process. Before treatment, patients filled out an application form, and an intake questionnaire after being accepted for the treatment. During the treatment, therapists filled out extensive, semi-structured reports per session. Additionally, one case-review meeting with all therapists and researchers was organized by the researchers halfway through the treatment. After finishing treatment, an exit questionnaire was filled out by the patients, and a final case-review meeting was organized and attended by all therapists and the researchers. Please note that while data was collected from patients, the therapists' session reports and the case review meeting minutes were the main data source and provided the central data. The following Table 6.2 summarizes the various data sources utilized in the process.

**Table 6.2 Information collection overview during treatment program.**

	Patient	Therapist	Therapists and researchers
Before treatment	Application form		
Intake	Intake questionnaire		
Sessions 1 through 5		Session reports	
After session 5			Case review meeting
Sessions 5 through 10		Session reports	
After treatment	Exit questionnaire		Final case review meeting
Written report		Manuscript review	

## Data sources

**Session reports.** The therapists maintained written records of their sessions by following a semi-structured session report format provided by the researchers. The questions in this format dealt with the session theme, session goals, interventions, achieved results, planned actions for the following sessions, specific focus for the next session, the perceived fit of the treatment to the specific problems of the patient, and ideas for improvement.

**Case review meeting minutes.** Two evaluating meetings were held, one halfway through the pilot treatment program and one at its conclusion. During these meetings, attended by the treating therapists and led by two researchers, all participating patients were reviewed and the fit of the treatment was discussed. The researchers wrote detailed minutes, which were checked for accuracy by the head therapist.

**Questionnaires.** The questionnaires contained various scales, aimed at measuring internet addiction, time spent online and self-reported confidence about prevention of lapse. The Compulsive Internet Use Scale (Meerkerk et al., 2009) was used to measure internet addiction. Time spent on the internet (online) was explored through a question which, for the last week, asked patients to indicate how many hours they used the internet per day. Finally, the Brief Situational Confidence questionnaire (BSCQ) was modified to refer to internet and utilized to assess the patients' confidence to resist the temptation to start using the internet again in various situations (Breslin, L. C. Sobell, M. B. Sobell, & Agrawal, 2000). Please note that the questionnaire data is utilized purely as supportive information, the main focus in analyses is placed on the therapists' experiences, derived from session reports and case review minutes.

## Data analysis

The qualitative, written data (group meeting minutes, session reports for the full treatment of each of the twelve patients (multiple sessions), and the qualitative parts of the intake/exit questionnaires) were processed and structured in a database using the QSR Nvivo software for qualitative analysis. As the goal of the study is not to construct new theory, but rather to describe the collected information in an accessible format, a thematic analysis was performed (Braun & Clarke, 2006; Hussain & Griffiths, 2009a).

Thematic analysis aims to identify themes within qualitative data. As such, it can summarize the actual data in more condensed form, while generating themes and subthemes from the data.

The current study utilized an iterative process for data coding which resembles the approach utilized by Hussain and Griffiths (2009a). First, three patients (#11, #01, #07) treated by three different therapists were coded using a free approach. Subsequently a preliminary overall coding scheme was developed. All 12 patients (session reports and intake / exit questionnaires) and the session-minutes were coded according to this scheme in the QSR Nvivo software. The subthemes were given final definitions and structure by condensing the coded text for each theme to several pages of summarized text. The second author checked this reduction process. This text was the foundation for the reported result, which were member-checked by mailing them back to the therapists for comments (Erlandson, Harris, Skipper, & Allen, 1993).

## Attrition

Five out of twelve exit questionnaire results are missing. This is the result of three patients aborting the treatment, one patient switching to a more intensive form of psychotherapy, and one patient not returning the questionnaire by mail. One of the three patients who aborted treatment quit after two sessions because he did not see a need for treatment himself; he had joined largely due to social pressure. Two patients quit just before the end of the program - one patient stopped treatment after his girlfriend found out he was cheating on her and the other patient quit after experiencing a deterioration of his depressive symptoms. According to the treating therapists, both patients had previously shown improvement in their control over internet behavior.

## 6.3 Results

The thematic analysis yielded two main themes: the patient observations by the therapists, supported by patient self-report questionnaire data, and secondly the therapists' perspective on the fit of the treatment. The patient observations are divided into three general subthemes: observations of actual problematic behavior, the function of the behavior for the patient, and the reported consequences of the behavior. Having established a descriptive background of the various patients, the second, main theme focuses on the experiences of the therapists with the actual treatment of the problems. For this theme (treatment), the core components of the Lifestyle Training treatment protocol are utilized as subthemes, with the addition of discussing the overall treatment process.

### Patient observations: a brief summary of self-report patient data

Table 6.3 provides an overview of the collected data for the various participants. In order to preserve privacy, all patients received an alias and a unique identification number. Given the sample size, no statistical testing was done; scale results serve as an indicator of individual, self-reported change. Note that all patients who finished the treatment report an increase in Situational Confidence and a decrease in Internet Addiction (CIUS). The change in the amount of days spent on the internet in the last week fluctuates: some patients report an increase (Mark, #06), some show stability (Robert, #02; Joseph, #04), and the rest show a drop in days spent. Finally, the reported hours of internet per week have decreased for

virtually all patients except Joseph (#04), who was not spending a lot of time on the internet to begin with (one hour per day, now spends two hours per day).

Note that the number of hours per day for some patients (Richard, #07; Joseph, #04) is low, even at the start of the treatment. The first explanation for this finding is that some activities - such as paid webcam sex sites - can be experienced as problematic without taking up large amounts of time, due to high costs and shame. Most of the patients that report a low number of hours per day consume online erotica, as can be seen in the table. Secondly, the self-reported hours provide an underestimation for at least some patients, as patients lose themselves in their internet use and forget the time. Robert (#02), for example, claimed to spend 3 to 4 hours per day on the internet during intake, while after registering his behavior it turned out to be twice that amount. Thirdly, the head therapist reports that many patients had reduced their use before the treatment, but started the treatment as they experienced how difficult this was to maintain.

Table 6.3 Collected data for the various participants.

#	Alias <sup>c</sup>	Gender	Age	Problematic behavior	Session reports	Treatment	Internet addiction (CIUS) <sup>a</sup>		Situational confidence (BSCQ) <sup>b</sup>		Internet use in the last week			
							Intake	Exit	Intake	Exit	Days per week		Hours per day	
											Intake	Exit	Intake	Exit
01	James	Male	49	Online erotica			3.9	3.3	6.0	8.0	7.0	5.0	2.9	2.8
02	Robert	Male	27	Forums and profile sites	8	Completed	3.7	2.2	5.0	7.0	7.0	7.0	3.1	0.9
03	William	Male	27	Social networking	10	Completed	3.6	2.0	4.5	8.1	6.0	2.0	1.8	0.5
04	Joseph	Male	22	Online erotica	6	Completed	3.4	2.7	3.6	6.9	6.0	6.0	1.0	1.9
05	Lex	Male	20	Web Surfing	8	Completed	3.4	2.2	4.3	9.0	7.0	4.0	6.3	0.9
06	Mark	Male	47	Surfing, forums	17	Completed	3.1	2.6	6.8	9.4	6.0	7.0	2.1	1.3
07	Richard	Male	62	Online erotica	8	Completed	3.1	2.6	5.5	8.9	5.0	2.0	0.9	0.3
08	Jane	Female	27	Online communication	5	Completed	3.9		6.3		7.0		4.3	
09	Luke	Male	38	Blogging, porn / erotica	4	Switched	4.1		4.6		7.0		2.9	
10	David	Male	37	Online games	8	Aborted	4.0		7.0		7.0		4.5	
11	Jeff	Male	28	Social networking	8	Aborted	2.8		8.9		7.0		2.4	
12	Steven	Male	25	Blogging	2	Aborted	3.8		4.9		7.0		5.0	

<sup>a</sup> Scores on the CIUS indicates the frequency of experiencing specific complaints, ranging from 1 (never) to 5 (very often). The average score over all 14 items is reported, as intended by Meerkerk et al. (2009)

<sup>b</sup> Scores on the BSCQ range from 1 through 10. Average values are reported.

<sup>c</sup> Note that no real names are used in the current report, the given names are aliases.

## Patient observations: a summary of therapists' reports

Please note that the following patient observations are written from the patients' perspective for sake of narrative flow, but that all observations originate from the treating therapists.

### **Problematic behavior: long hours, hoarding and sorting**

The problematic behavior involved a wide variety of internet applications. As noted in table 6.3, erotica, forums, web-surfing, online games, blogging and social networking were all mentioned. During the interviews, one patient (Jeff, #11) even identified e-mailing as problematic. He received a wide variety of mostly useless information by email which he felt obligated to follow up. This behavior ended up costing significant amounts of time and led to considerable stress for the patient. In practice, the behavior involved using various applications, but collecting (or hoarding) of porn, photos, and other files was also frequently reported. Also, some patients spent considerable time on organizing and sorting material on their computers. Lex (#05) described his behavior as 'associative internet use', starting at one point on a useful website and moving to loosely related subjects.

While most of the patients indicated having problems controlling their internet use at home, Mark (#06) reported major problems avoiding websites at work and spent up to four hours a day on the internet at work. This time was spent on the retrieval of prices for software and photography equipment, but mostly on large web forums. He repeatedly checked his personal mail at work (up to four times per hour). He felt uncomfortable with this behavior because it interfered with his regular work and he was afraid of getting caught. Two of the patients reported that a change of context can be helpful in avoiding the behavior. Once they are on vacation, there is no problem in being without internet access. To illustrate the various problems that patients experience, three brief case descriptions are presented for Jane, Joseph, and David in Table 6.4. The examples demonstrate that the problems often also have a historical context for the patients: Jane was chatting before the internet was available (to her), Joseph was already calling sex lines at the age of 13, and David has always been interested in fixing computers.

**Table 6.4** Some case study examples of problematic behavior.

Example	
Jane	For Jane (#08), the behavior started when she got home from her part time job. She reports turning on her Personal Computer immediately after she got home. Dinner for her often consisted of a premade dinner or junkfood. For her, the main problem was Live Messenger (an instant messenger chat program, previously known as MSN). She has a large group of social contacts through the internet, most of whom she met through chat boxes. When she was living with her parents she already chatted a lot, through television chat boxes. As the bills stacked up her parents revoked her internet access. When flat fee internet was introduced she returned to chatting several hours a day. Outside the virtual world she does not have friends - nor does she want to have them. She likes the distance of online contacts: when she is not in the mood to respond, she does not have to respond. She spends most of the time between 8 pm and 1 am behind the computer.
Joseph	For Joseph (#04) the behavior seems to be an extension of lifelong problems controlling sexual behavior. He started weekly calls to sex lines at the age of 13, got caught by his parents. Later he started using internet sex sites. First free ones, later paid sites (credit cards and phone connections). Currently he watches sex sites in the bathroom at work (using a mobile phone), and has alienated several female friends by asking them to perform sexual acts over the webcam.
David	David (#10) has been using computers since he was eleven years old. He has always been interested in fixing and improving computers. Firstly he only used the computer for typing letters, sending an email and playing games. He then moved on to (online) first person shooting games, such as Gears of War, Left for Death, and Crysis. Especially multiplayer games are 'very seductive' according to him. He started eating earlier and earlier to spend more time on the computer, started eating behind the computer and finally the gaming started to influence his sleeping patterns.

### Function of internet use: escapism entangled with comorbid problems

Almost invariably, the various patients suffer from psychological problems; fear, compulsions, depressive symptoms, attention and concentration problems, and a lack of self-confidence were all mentioned. In some cases these complaints were severe enough to warrant suspicion of an actual clinical diagnosis. Three patients (Lex #05, Luke #09, and James #01) were thought to have some form of ADHD in the current treatment. Steven (#12) has received a diagnosis (so he says) for paranoid personality disorder in the past. Luke (#09) experiences some problems that resemble dissociation from reality (reliving video footage) and compulsive behavior. One patient (Joseph, #04) suffers from a sex addiction, while three other patients also report problems with sexual behavior (Luke, #09; Richard, #07; and James #01). Several patients indicate thinking they are sensitive to addiction as they drink, smoke, gamble, or use cannabis (#03, #09, #11, #12).

These problems are strongly entangled with the function of internet use. Obviously the internet can be seen purely as the means to an end, for example for Joseph (#04), who utilizes the internet to satisfy his urge to see erotic stimuli. The motive of escapism, or procrastination, is more subtle. Steven (#12) summarizes this motive as follows: "The computer controls my life. I'm not getting around to doing anything. Problems are not getting handled. And in order not to think about that you crawl back behind the computer®". Escape can also be interpreted more broadly; as some patients actually lack meaningful alternative behavior, they return to internet use. Thus, one could argue that for some patients, another, underlying problem is the cause of the behavior, and internet use is merely the tool to fulfill a need - be it for sex, social contact, or escape.

But not all motives are negative in nature. Firstly, internet use is fun and provides psychological rewards. Using the internet provides a variety of short term benefits, such as relaxation, inspiration, satisfying curiosity, keeping up with the news, and being entertained. One patient compares watching porn to driving his car, as both constitute a moment of private time, a moment for himself. But while the internet provides a variety of functions, the current group of patients has self-admitted problems controlling use; the treatment focused on the negative consequences involved in the behavior, which are now discussed.

### **Consequences: missed opportunities 'in real-life'**

The reported consequences of internet addiction tend to be the result of a severely unbalanced lifestyle. The extreme amounts of time spent on one type of behavior reflect on the relationship with others and translate to missed opportunities 'in real-life' - both in a lack of (social) skill development and the lack of real world (offline) performance. The one-sided lifestyle often translates to a disturbed daily structure. For Jane (#08), the behavior translated in serious weight gain and physical self-neglect, perhaps fueling her desire to avoid real-life contacts with others. The neglect also seriously impacts her real-world relationships.

Besides time, two other patients report that internet porn can cost significant amounts of money - especially in the case of webcam girl chat sites, which Joseph (#04) and Richard (#07) frequently visit. Shame also plays a role in the behavior - shame about watching porn, but also about not having a job (at a certain age), about not having life sorted out, and about a lack of real-life performance. This translates to an overall low self-esteem for most of the patients, something that is often accompanied by depressive thoughts, as their current lifestyle does not fit the self-image.

For those patients with a romantic relationship, the partner often complains about the internet use, causing both stress and arguments. The social circle also decreases in size due to the behavior - or moves almost exclusively to internet. On the other hand, the social network can also provide some support, such as in the case of Jeff (#11), whose immediate family and friends encouraged him to seek out the current treatment and change his behavior.

In summary, the (longer term) consequences of the internet addiction problems are mostly negative. Patients spend excessive amounts of time, money or both on the internet. In some cases, patients stop caring for themselves and suffer decreased performance in the 'real world', develop problems with social relationships, or suffer psychologically (low self-esteem, depressive thoughts) as a result of their inability to control internet use.

## **The therapists' perspective on treatment**

### **Establishing a starting point: monitoring use seems beneficial**

Three techniques are used to establish a starting point for treatment (see Table 6.1), but not all techniques seem equally effective when treating internet addiction. Firstly, the treating therapists are divided over the applicability of the *disadvantage/advantages balance* exercise, as it is most beneficial for people still contemplating change. In this case, most patients are already motivated to change. On the other hand, it does seem beneficial for patients to write out the (long-term) disadvantages of behavior, which are

more easily downplayed in conversation. As such, it can provide a useful starting point for employing Motivational Interviewing techniques.

*Monitoring use* is another important technique, and a continuous part of the treatment procedure. It serves a dual purpose: firstly the patient gains insight in his or her internet behavior, and secondly it serves as a reminder of progress (or lack of progress) for the patients. Thus, all patients keep a diary to monitor their use during the course of the treatment. Treating therapists indicate that monitoring use is effective for internet addiction. Thirdly, the *functional analysis* (FA) aims to identify antecedents (risk factors) for the behavior, the actual behavior, and its consequences. The therapists consider the FA technique usable with regard to internet addiction, but indicate that the behavioral sequence can be attended to without using the full, time-consuming FA-form, since risk factors and consequences were clarified and attended to from the beginning of treatment.

#### **Setting goals for the treatment: gaining control, reducing use, and learning to fill free time**

All of the patients share the same global goal: they want to regain control over their internet use. For most of the patients internet use has become a strong habit that either fills up a lot of free time (and for one patient, his time at work) or has other negative effects. Thus, the main goal for most patients is to reduce the amount of time spent on their favorite internet application. Among the therapists, one of the main issues with regards to goal setting was the matter of 'abstinence' versus controlled use. As internet use is a necessary component of day-to-day life, most patients aimed to achieve a reduction of use or abstinence from their problematic application; full abstinence from internet use was not the goal.

If patients are successful in reducing time on the internet, a large amount of time immediately opens up for the patient, which leads to a second treatment goal: learning to satisfactorily spend and structure free time in order to avoid getting bored and relapsing into heavy internet use. This goal involves finding new activities that do not involve the internet and have more constructive payoffs in terms of combating loneliness and the other consequences of an unbalanced lifestyle (dancing lessons, restarting an old sport). For some patients this also means that they need to improve their social skills in order to deal with new social encounters and contacts in 'real-life'.

As noted before, time spend at/on internet use was not actually the main problem for some patients. In those cases, alternative goals were set by the therapists. Examples are Richard (#07), who aims to spend less money on webcam sex sites, and James (#01), who is dealing with tension in his relationship. In practice this meant that for some patients, the therapy focus sometimes switched from controlling internet use to, for example, relationship counseling.

#### **Planning change: patients are inventive in self-control but abstinence is undesirable**

The therapists indicate the patients are inventive in coming up with measures to control their own behavior. Examples include: deciding what to do before actually turning on the computer, removing automated notifications of new mail, dividing mail into groups and not answering irrelevant mail, posting do-not-disturb messages on social networking sites, using a laptop instead of a computer (this is more uncomfortable over time), blocking the credit card, and tracking time spent on the behavior using a stop-

watch. One patient removed the power cable from the computer after using it and handed it to his girlfriend to help him control his behavior. However, for many patients the best intervention seems to be the simple act of monitoring use.

An interesting approach used by some of the therapists was to implement one internet free day, as a way for the patient to get used to the idea of filling free time with other activities than internet use. Unfortunately patients were less happy about this approach (which might well be considered symptomatic of their problems). Two of them even refused to try this option. Finally, therapists note that most of the patients are somewhat overconfident in setting goals, which they often have to adjust during treatment because they turn out to be unobtainable. The main cause for this is the fact that internet use is more necessary for day-to-day functioning than patients initially assume.

### **Lapse and relapse prevention: many similarities with substance addiction**

Much like in standard addiction therapy, lapse - and relapse - is to be expected and indeed happened. While controlled use is often the goal, in practice this goal is often harder to reach than total abstinence. Therapists dealt with lapse by normalizing the behavior, and discussing the situation in which the lapse happened (Marlatt & Donovan, 2005). Depressive feelings seem to be a risk factor for lapse, as well as being alone, lack of structure in the day, and being tired. Interesting is the regularly observed transference of the problem to other applications during treatment. For example, Jeff (#11) found that his mail traffic strongly increased after quitting social networking sites, while Mark (#06) started writing in Word on non-work related topics after his internet got disconnected.

Therapists note the surprising similarity of dealing with wanting-to-use (craving) in this therapy compared to regular addictions. Several techniques were reported to be helpful avoiding lapse: finding distractions (including: leaving the house), using an alarm clock to time use, and not automatically starting the webcam with the computer. The most extreme technique is actually removing the computer (or the internet), which seems to work well. Note that these techniques merely assist the patient in making the change - without solving the underlying problem (such as the lack of alternative behavior or the lack of meaningful activities), these techniques alone are not enough.

### **Treatment: therapists appreciate the program, but regular case reviews are needed**

The treatment lasted five to ten sessions. Sessions in the Lifestyle Training protocol last 45 minutes, which is the default session length in the Netherlands. For one patient the treatment took up seventeen sessions because the internet was disconnected and later reconnected at work, which required extra guidance according to the treating therapist. The senior therapist suggested that, had there been more patient evaluations, this patient would probably have been tested for Obsessive Compulsive Disorder and been referred to a specialist to treat his OCD. Regular case reviews, in which a therapist discusses his or her patients with colleagues, could have prevented this. Given the diversity of the problems encountered with patients, regular case reviews seem necessary, especially for non-psychologists.

Therapists remark that the necessity of the optional sessions (sessions 7 through 10) varies: for some patients they are helpful, for others not so much. Some of the optional topics were included earlier in the treatment regularly: expanding the social network and managing free time were important topics. While patients are happy with the treatment program, therapists indicate more time in the (45 minute) introduction session would have been practical. This would help patient and therapist to get to know another and establish the type of internet activities and behavior involved in the problems. This is partly a result of the internet based intake procedure; which meant that the therapist and patient met face to face for the first time in the first session: a separate intake session with face to face contact should be beneficial. Nonetheless, most of the patients achieved a reduction of their internet use and reported satisfaction with the treatment.

## 6.4 Discussion

Therapists report that the combined Cognitive Behavioral Treatment and Motivational Interviewing program 'Lifestyle Training', which is ordinarily used for substance dependence and pathological gambling, fits the problem of internet addiction quite well. Interventions focused at controlling and reducing internet use, and involved expanding (real-life) social contacts, regaining a proper daily structure, constructive use of free time, and reframing beliefs. Therapists further indicated that the treatment achieved some measure of progress for all of the twelve treated patients, while patients reported satisfaction with the treatment and improvements in actual behavior.

The twelve patients who volunteered for the pilot treatment all reported suffering from internet addiction - i.e. they had problems controlling their behavior on the internet. However, the patient group was quite diverse in practice. Actual internet use involved a wide variety of applications, including erotica, forums, web-surfing, online games, blogging, social networking, and even email. Most of the patients suffered from comorbid psychological problems, which were often related to the internet behavior.

Several aspects of the treatment were reported to be particularly effective for treating internet addiction. Firstly, monitoring internet use with a diary helped greatly to establish a starting point for change and give patients a realistic idea of the amount of time (or money) they were spending online. Secondly, the patients were inventive in self-control measures. These measures might be helpful for future treatment. Thirdly, exercises aimed at finding alternative ways to spend leisure time and expanding the social network were important after reducing use. Finally, established techniques for preventing (re)lapse into the internet behavior - such as structuring free time - seem to work well.

Some points of the therapy could benefit from adjustment to better fit the specific problems. Firstly, it is not clear if ten full sessions are necessary for treatment, as some therapists report that the most useful topics of the last three optional sessions (social network, dealing with free time) are included in the treatment earlier on out of necessity. Also, it is important for therapists to be up to date on technology and specific internet applications, as this considerably helps create a basis for understanding the behavior,

which is appreciated by patients. With regard to goal setting, therapists sometimes encourage abstinence (even for just 1 day per week), which did not suit most of the patients early on in the treatment. Thus, building contacts and activities in the 'real world' while concurrently treating internet problems is crucial. A complicating factor is the fact that the internet is necessary for day-to-day life. This means that full abstinence is not an option, while controlled use is often difficult as losing track of time is one of the symptoms of internet addiction to begin with.

Results fit with recently published findings which demonstrate that applying a CBT approach to internet addiction can show positive results (Du et al., 2010). Also, the pattern of escalation of the internet use reported by several patients fits well with Caplan's (2003) theory of preference for online social interaction - patients, such as Jane, with low psychosocial health preferred online interaction, which in turn led to more negative outcomes. Given the diversity of patient group and relatively high incidence of comorbid psychological pathology, we should ask ourselves if we are not dealing with a variety of problems that are by-chance clustered as 'internet addiction' simply because the internet is becoming the dominant medium of this age. This finding fits well with Wood's observation that the majority of cases of video game addiction can just as well be explained from another, underlying pathology (Wood, 2008b).

The current study has several limitations. The first, and foremost, is that the study deals with self-reported information by treating therapists on the level of process evaluation. Further research is required to establish treatment effects. Secondly, both patients and therapist in the current study were particularly motivated to participate - patients had nothing to lose as treatment was free of charge, while therapists volunteered for this pilot treatment out of curiosity and personal affinity with the subject. If the treatment becomes more common, this initial enthusiasm might diminish, which may affect the treatment process. Thirdly, the act of observing changes the observed: both patients and therapists were aware that the study was being evaluated, and several extra steps were involved for both the therapist (session reports) and the patient, who had extra questionnaires to fill out - this might have a therapeutic effect in and by itself, as it gets patients thinking about their behavior. Finally, while per-session reports were kept by the treating therapist and sufficed for the current study, future studies might benefit from looking at the specific treatment session components to obtain even richer information.

In conclusion, treating therapists agree that a manual-based Cognitive Behavioral Therapy (CBT) and Motivational Interviewing (MI) treatment program, such as the 'Lifestyle Training' program, can be suitable for treating internet addiction. Patients reported less internet addiction, an increased ability to control behavior, and spending less time on the internet after treatment. Given the favorable first impression of this kind of treatment, future research should aim to execute this type of treatment for internet addiction in a larger, and more controlled setting (randomized controlled trial), perhaps in comparison to other treatment options. This would provide information on measurable effects of the treatment, which is necessary for a wide-scale implementation of the treatment program.

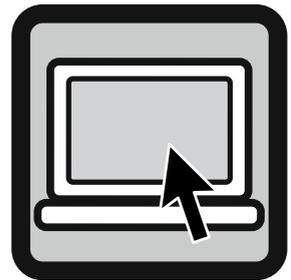
# PART II

## **Reflection**



# chapter 7

## Video game addiction and social responsibility



# Chapter 7

## Video game addiction and social responsibility

**Published as:**

Van Rooij, A. J., Meerkerk, G. J., Schoenmakers, T. M., Griffiths, M., & Van de Mheen, D. (2010).  
Video game addiction and social responsibility. *Addiction Research & Theory*, 18(5), 489-493. doi:  
10.3109/16066350903168579

## Abstract

In recent years, several studies have demonstrated that at least a small group of gamers has trouble controlling their online video game playing. Excessive amounts of time spend on playing online video games can be severely disruptive to school, work, and 'real-life' social contacts. It seems that online games, especially multiplayer online role playing games, are more often associated with video game addiction. Drawing parallels to other industries - such as gambling - which are heavily regulated, the issue of social responsibility of the video game industry is explored. Presently, online video game publishers provide neither referral services nor customer care with regards to video game addiction. In our opinion, a dual approach is necessary. Firstly, consumers should be informed about potential addiction risks that can be attributed to playing online video games. Secondly, game publishers should implement proper referral services. Providing customer care and referral services might be in the best interest of the video game industry at this point, as it may very well prevent revenue restricting governmental intervention. Therefore, taking action on the issue of social responsibility will benefit both the consumer - who will be better informed and properly referred - and the game industry alike.

## 7.1 Introduction

“Take everything in moderation (even World of Warcraft).” In 2007, this message suddenly appeared on the loading screen of World of Warcraft (WoW), the most popular online video game in the world (*Blizzard Entertainment*, 2008). Another message presented to the aspiring Warcraft player asserted “Bring your friends to Azeroth, but don’t forget to go outside of Azeroth with them as well.”

Warning messages about overuse risks have never appeared before on leisure products such as bicycles, swings, soccer balls, and guitars, making these specific warning messages very atypical and unusual. *Blizzard Entertainment* is not alone either; Japanese developer *Square Enix* featured the following message in its online game *Final Fantasy XI* (Pet Food Alpha, 2008): “(...) we have no desire to see your real-life suffer as a consequence. Don’t forget your family, your friends, your school, or your work.”

These types of message are analogous with the health warning messages used on tobacco and alcohol packaging (Greenfield, Graves, & Kaskutas, 1999). An obvious question follows from this: why is the entertainment software industry warning players not to overuse their product? Can video games be addictive? Are simple warning messages enough or do the companies have a greater social responsibility?

In recent years several studies have demonstrated that at least a small group of gamers has trouble controlling their video game playing (Chiu et al., 2004; Ng & Wiemer-Hastings, 2005; Smahel et al., 2008; Wan & Chiou, 2006; Hussain & Griffiths, 2009b). The resulting excessive amounts of time spend on playing video games can be severely disruptive to school, work, and ‘real-life’ social contacts (Chappell et al., 2006; Grüsser et al., 2007; Wan & Chiou, 2006).

Utilizing generalized criteria for behavioral addiction, namely salience, mood modification, tolerance, withdrawal, conflict and relapse (Griffiths, 2005a), 12% of gamers (n=7069) fulfilled at least three diagnostic criteria of addiction regarding their gaming behavior (Grüsser et al., 2007). In addition, a recent study using functional Magnetic Resonance Imaging (fMRI) demonstrated that for ‘addicted’ gamers, *World of Warcraft* imagery activated the neural substrate associated with craving in substance dependence (C. H. Ko et al., 2009). Academic debate continues on whether or not excessive, out of control gaming should truly be labeled an addiction (Griffiths, 2008; Wood, 2008a). For now, it is clear that some gamers do have problems controlling their video game use, which is referred to as ‘video game addiction’ in the following text.

In 2007, the Council on Science and Public Health specifically referred to the subgenre of massively multi-player online role-playing games (MMORPGs), such as *WoW* or *Everquest*, as being more associated with ‘video game overuse’ than other game types (Council on Science and Public Health, 2007). Both Korean and Western research confirms this assertion: “Role playing game users showed significantly higher internet addiction scores than web board and sports game users” (M. S Lee et al., 2007, p. 278) and “It is clear that the accounts presented by players and ex-players appear to be ‘addicted’ to *Everquest* in the same way that other people become addicted to alcohol or gambling” (Chappell et al., 2006).

Gaming is not a negative activity *per se*. Williams and colleagues reported that online gamers (*Everquest 2*, a role playing game) have a lower Body Mass Index (BMI) when compared to the general population (Williams, Yee, & Caplan, 2008). Additionally, MMORPGs provide a highly social environment where strong friendships - and sometimes even romantic relationships - are forged (Cole & Griffiths, 2007). In this regard, online gaming provides a medium in which players can explore different aspects of their personality in a safe and anonymous environment (Hussain & Griffiths, 2008).

## 7.2 Social responsibility

Both psychologically and behaviorally, there are many similarities between video games and gambling - especially slot machine gambling (Griffiths, 2005b). Furthermore, the behavioral problem of video game addiction resembles the problem of pathological gambling. Common components such as salience, mood modification, tolerance, withdrawal, conflict, and relapse have been identified and used in various studies (Griffiths, 2005a).

The gambling industry has a long history of forced governmental regulation. As a result, over the last decade, social responsibility in gambling has arguably become the biggest single issue for the gambling industry (Griffiths & Wood, 2008; Griffiths, Wood, J. Parke, & A. Parke, 2007). Collins (2007; 2006) reviewed the evidence on the impact of social responsibility in gambling and concluded that if a jurisdiction introduces new forms of gambling **and does nothing else**, it will most likely see an increase in problem gambling. However, if the jurisdiction combines the introduction of new forms of gambling with an appropriate social responsibility infrastructure, it is likely to decrease numbers of problem gamblers. Collins and Barr (2006) further note in the national South African gambling prevalence study that the country witnessed a decline in problem gambling over a two-year period following the introduction of the National Responsible Gambling Program. Perhaps the public needs to be protected, because the opening of new gambling establishments without social responsibility measures has been linked to an increase in gambling problems in the same city (Room, N. E. Turner, & Ialomiteanu, 1999). Additionally, early research into online gambling shows that gambling websites were taking minimal responsibility for the social impact of their business model (Smeaton & Griffiths, 2004).

Unlike gambling, online video game addiction has largely escaped governmental action so far in the Western world, in spite of being a topic of much discussion in the media and in scientific papers. In Asia the situation is different. For example, China has restricted the hours that young gamers can play online games (China Daily, 2007), while South Korea has government agencies organising an annual 'no internet day' (Rahn, 2006).

The website for the Entertainment Software Association (ESA), a major United States industry organisation, produced a special report addressing the fallacy of linking aggression to video games (ESA, 2008). However, the same website does not display any information on potential 'addiction' risks (as of July 2009). Therefore, it seems that the online video game industry - like the online gambling industry - is not taking action on the issue of excessive play and video game addiction.

If companies continue to refuse to take this issue of social responsibility into their own hands, governments will eventually get involved. For example, Thailand's government banned *'Grand Theft Auto 4'* after a cab driver got carjacked in a similar fashion to the game (Reed, 2008). Additionally, the Australian classification board refused the original version of *Fallout 3* for having explicit drug references, thus forcing its developer (*Bethesda Softworks*) to release a censored version (Yug, 2008). Finally, the Council of the European Union addressed concerns about the inappropriate content for minors in games by establishing a Pan European Game Information (PEGI) age rating system in cooperation with the video game industry (Lievens, Dumortier, & Ryan, 2006; The Council of the European Union, 2002).

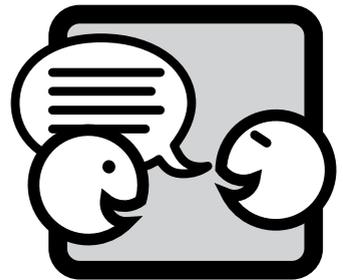
While discussing the concept of video game addiction, Wood concisely noted that responsible videogame operators should strive to minimise harm to consumers: "good game design, customer care, and referral services can all help to achieve this" (Wood, 2008a, p. 192). Presently, the publishers provide neither referral services nor customer care with regards to video game addiction. In relation to game design, some down tuning of gameplay mechanisms that encouraged excessive gaming have been introduced by the publisher of *World of Warcraft*. For example, a symbolic and unique in-game title rewarded players who progressed their character to the maximum level of 80 fastest (server first titles). After several pages of forum debate in which players expressed their concern about people "taking unhealthy amounts of time off school and work", an official *Blizzard* representative announced the removal of the title from the game (J. Kaplan, 2008).

Such efforts should be greatly extended. Warning messages on loading screens and minor game design adjustments are not enough. In our opinion, a dual approach is necessary. Firstly, consumers should be informed about potential addiction risks - however minor - that can be attributed to playing online video games. The most logical path for this would be a re-evaluation of the existing Pan European Game Information (PEGI) age rating system. The recently launched 'PEGI online' system might be a good place to start (Reding, 2007). Secondly, game publishers should implement proper referral services. While time constraints, as in China, might not be realistic in Europe, an alternative would be for the company to contact gamers that spend an extreme amount of time in the game and offer them contact information for a referral service. Similar initiatives are already in place in the gambling industry (Griffiths et al., 2007), including empirical studies showing that social responsibility tools are appreciated by players (Griffiths, Wood, & J. Parke, 2009; Wood & Griffiths, 2008).

While history has taught us that the interests of a free market industry are sometimes at odds with public health (Munro & de Wever, 2008), providing proper customer care and referral services might be in the best interest of the video game industry at this point. This may very well prevent revenue restricting governmental intervention. Therefore, taking action on the issue of social responsibility will benefit both the consumer - who will be better informed and properly referred - and the game industry alike.

# chapter 8

## General discussion



# Chapter 8

## General discussion

### 8.1 Introduction

The world of video games presents researchers with a fast-moving target. Markets are rapidly developing, and access to various forms of video gaming is becoming more and more ubiquitous. Even during the time span of writing this thesis, various technological innovations have been introduced. With the Microsoft Xbox Kinect and Playstation Move, it is now possible to control game systems using your body motion only. With the successful introduction of Apple's iPad in 2010, multi-touch control is becoming more and more widespread (Warman, 2010a). The new Nintendo DS handheld device presents a 3D image without the need for 3D glasses, and the first augmented reality games (which use the device's camera to project game components over the 'real' world) are being introduced. One of the more interesting developments is the introduction of a remote access option for the World of Warcraft in-game auction houses, which means that players of the most popular MMORPG will be able to access game mechanics from virtually anywhere using their internet-enabled mobile phone.

These kinds of development make the current thesis even more relevant. Those who have problems controlling their video game use will find it increasingly harder to avoid games, due to their increased availability. Moreover, the easier availability of the internet and the continuing diversification of the video game industry will undoubtedly involve a larger segment of the population in online video gaming in particular. This effect seems to be already underway, as a recent market research report indicates that gamers are rapidly switching to online gaming through both multiplayer online games and social networking sites (Warman, 2010b). While this switch has many scientifically interesting aspects, from the perspective of video game addiction these developments are troubling because online video games are most often associated with addictive behavior.

Meanwhile, the scientific field of video game addiction research is still in its infancy. This means that researchers approach the subject employing a variety of instruments and methodology, often borrowing from comparative research topics such as substance addiction or pathological gambling. Unfortunately, this diversification also makes it difficult to compare study results and make well-organized advancement in this field. On the other hand, policymakers and health care practitioners cannot always wait for answers; they are directly and increasingly faced with the consequences of some adolescents spending unhealthy amounts of time and energy on video games.

The current thesis therefore took a pragmatic approach to the study of video game addiction. It aimed to sidestep some of the main issues – such as the lack of consensus on definition and clinical measurement – in order to provide some preliminary answers. This pragmatic approach is visible in the study designs used in chapter 2 (Internet addiction: the role of online gaming and other applications), chapter 3 (Online Video game Addiction: Identification of Addicted Adolescent Gamers), and chapter 6 (Treating internet and game addiction with cognitive-behavioral therapy), which use indirect identification of the addicted gamers. This approach proved to be fruitful, and provided the basis for the more fundamental studies in chapters 4 (Videogame Addiction Test (VAT): validity and psychometric characteristics) and 5 (Video game addiction and psychosocial well-being: the role of friendship quality). Following these empirical studies, chapter 7 (Video game addiction and social responsibility) and the current chapter 8 (General discussion)

This chapter addresses some theoretical and practical points arising from the work in this thesis, discusses implications for both clinical practice and research, and makes recommendations for future studies in this field.

## 8.2 Summary of main findings

Based on the six research questions, the main findings are summarized below.

### **What is the relationship between online gaming, other internet applications, and internet addiction?**

The second chapter addresses the cross-sectional and longitudinal relationship between the time (days per week) spent on online gaming, various other internet applications, and a measure of internet addiction, namely Compulsive Internet Use, in a large sample of adolescents. The 2007 and 2008 samples of the Monitor Study provided data for regression models in which internet addiction was predicted from the time spent on the various internet applications. Furthermore, the 2007-2008 convenience-cohort subsample was utilized for one longitudinal regression model in which changes in behavior were related to changes in internet addiction.

Various applications, such as downloading, social networking, MSN use, Habbo Hotel, chatting, blogging, online games, and casual games were shown to be associated with internet addiction. However, online gaming was shown to have the strongest cross-sectional associations with internet addiction. Moreover,

changes in online gaming were most strongly associated with changes in internet addiction over time for the longitudinal cohort. In summary, the results show that, of the various internet applications, online gaming has the strongest relationship with internet addiction. From these findings, it is argued that a subgroup of addicted internet users exists, which should potentially be classified as addicted gamers.

## **What is the size of the hypothesized group of internet addicted online gamers?**

The third chapter attempts to provide empirical data-driven identification of the group of addicted online gamers which was hypothesized in the first study. Again, two Monitor Study samples were used, this time the 2008 and 2009 samples. The newer 2008 and 2009 samples were used as they include a more specific measure of time (hours per week) spent on applications than in the 2007 sample. Using a cluster analysis technique (latent class analysis), the study confirms the existence of the group through analysis of patterns in internet addiction and weekly hours of online gaming. An extreme group of online gamers was identified which display a disproportionately high score on internet addiction. This small group of addicted online gamers (3%) represents about 1.5% of all adolescents aged 13-16 years in the Netherlands. In this study, although these gamers report addiction-like problems, associations with psychosocial problems were less evident.

The findings provide three paths for follow-up research. Firstly, identification of the group supported the effort to develop and validate a questionnaire aimed at measuring the phenomenon of online video game addiction, which is explored in the fourth chapter. Secondly, relationships with psychosocial problems remained unclear. This was an unexpected finding as video game addiction is defined as a loss of control which results in significant harm (see section 1.3). Establishing the role of psychosocial problems as an indicator of potential harm related to video game addiction is explored in chapters 5 and 6. Chapter 5 pursues this thought from an epidemiological approach while chapter 6 provides data and findings from a clinical perspective.

## **How can we standardize measurement of video game addiction?**

The fourth chapter explores the reliability, validity and measurement invariance of a new 14-item Video game Addiction Test (or VAT), which was derived from the Compulsive Internet Use Scale (CIUS) (Meerkerk et al., 2009). The CIUS uses a modified version of Griffiths' components model (Griffiths, 2005a) which, in turn, is derived from the diagnostic criteria used to identify pathological gambling (American Psychiatric Association, 2000). This leads to the definition of video game addiction as an addiction-like behavioral problem which presents as: a loss of control, an increase in intra- and interpersonal conflict, preoccupation with gaming, the utilization of games for purposes of coping/mood modification, and withdrawal symptoms if the gamer is forced to quit.

As the measure was introduced in 2009, validation analyses were performed on this sample. The VAT demonstrated excellent reliability, excellent construct (convergent and discriminant) validity and a one-factor model fit. It also shows a high degree of measurement invariance across gender, ethnicity and learning year. This indicates that the scale outcomes can be compared across different subgroups with

little bias. The VAT scores for the group of internet-addicted online gamers identified in chapter 3 were significantly higher than for the other five groups.

### **What is the relationship between video game addiction and psychosocial well-being, and which roles do the quality of online and real-life friendships play in this relationship?**

The fifth chapter examines the relationship between video game addiction and psychosocial problems. Online (social) games are most often implicated in video game addiction. Also, studies focusing on internet use in general demonstrate the relevance of a social component with regard to psychosocial condition (Selfhout et al., 2009). Therefore, the moderating role of online and real-life friendship quality was investigated in a subsample of online gamers derived from the main 2009 monitor study sample.

The results reveal a clear relationship between video game addiction and psychosocial problems, i.e. negative self-esteem, depressive mood, loneliness, and social anxiety. The study shows three instances of moderation of this relationship by online friendship quality (for loneliness) and real-life friendship quality (for social anxiety and loneliness). For those with high-quality friendships, the relationship between game addiction and decreased psychosocial health was found to be weaker.

Looking at direct associations, a higher quality of real-life friendships is related to lower scores on the four types of psychosocial problems. However, a higher quality of online friendships is associated with having more psychosocial problems, namely depression, social anxiety, and negative self-esteem (but not loneliness). It is possible that the social benefits of an online community do not fully compensate for the negative consequences of the heavy gaming.

The study found three instances of moderation of the relationship between psychosocial problems and video game addiction by **online** friendship quality (for loneliness) and **real-life** friendship quality (for social anxiety and loneliness). For those with high-quality friendships, the relationship between game addiction and psychosocial problems was found to be weaker, indicating that high-quality friendships may prevent psychosocial problems for addicted gamers. These findings demonstrate the relevance of online and real-life friendship quality with regards to the severity of problems associated with video game addiction.

### **To what extent can conventional therapeutic approaches, such as a combination of CBT and MI, be applied to the issue of video game and internet addiction?**

In 2009, one of the major Dutch addiction care organizations initiated a pilot program to explore the possibility of using an existing *Cognitive Behavioral Therapy and Motivational Interviewing* based treatment program ('Lifestyle Training') to treat internet addiction. The sixth chapter evaluates this pilot treatment program by providing a qualitative analysis of the experiences of the therapists with the treatment of 12 self-proclaimed internet addicts.

Therapists report that the manual-based Cognitive Behavioral Therapy (CBT) and Motivational Interviewing (MI) treatment program 'Lifestyle Training', which is normally used for substance dependency and pathological gambling, is also well suited for the problem of internet addiction. Interventions mainly focused on controlling and reducing internet use, and involved expanding (real-life) social contacts, regaining a proper daily structure, constructive use of free time, and reframing beliefs. While the patients indicated serious social and psychological problems as a result of their excessive behavior, the patient group was very diverse in terms of actual behavior (ranging from gaming to online erotica) and had a high incidence of comorbid psychological problems. This finding fits well with Wood's observation that another, possibly underlying, pathology is present in the majority of cases of video game addiction.

Therapists indicated that the treatment achieved some measure of progress for all 12 patients, while patients themselves reported improvements and satisfaction with the treatment. As such, the study provides preliminary support for the treatment of behavioral addiction-like problems with existing treatment programs. Moreover, the findings demonstrate that, in spite of the diversity in observed problems and the variety of applications, a universal treatment protocol can be applied successfully.

### **What responsibility does the video game industry have with regard to video game addiction?**

Having established the existence of a small group of gamers which has trouble controlling their online video game playing, the seventh chapter addresses the role of the video game industry. Drawing parallels with other industries (such as gambling) which are heavily regulated, the issue of social responsibility of the video game industry is explored. In our opinion, a dual approach is necessary. Firstly, consumers should be informed by the industry about potential addiction risks that can be attributed to playing online video games. Secondly, game publishers should implement proper referral services. Providing information on game addiction risks and providing referral services might be in the best interest of the video game industry, as this may prevent revenue-restricting governmental intervention. Therefore, taking action concerning the issue of social responsibility will benefit both the consumer (who will be better informed and properly referred) and the game industry alike.

The main findings of this thesis are summarized in Table 8.1.

**Table 8.1 Summary of the main conclusions emerging from the presented studies.**

Chapter	
2	Of the various internet applications, online gaming has the strongest relationship with internet addiction. This indicates that a subgroup of addicted internet users should be classified as addicted online gamers.
3	A subgroup of heavily gaming and internet addicted adolescents was identified, which confirms the existence of a small group of addicted online gamers. This group consists of 3% of the online gamers in the age group 13 to 16 years, which translates to 1.5% of all Dutch adolescents in this age group
4	The Video game Addiction Test (VAT), a new 14-item scale, was developed and shown to be a reliable and valid approach for the measurement of game addiction. The test uses a modified version of Griffiths' components model which was shown to be valid in the measurement of Internet Addiction.
5	The relationship between video game addiction and various psychosocial problems, i.e. negative self-esteem, depressive mood, loneliness, and social anxiety, was demonstrated. The study found three instances of moderation of this relationship by online friendship quality (for loneliness) and real-life friendship quality (for social anxiety and loneliness). For those with high-quality friendships, the relationship between game addiction and psychosocial problems was found to be weaker.
6	Therapists report that a modified Cognitive Behavioral Therapy and Motivational Interviewing program 'Lifestyle Training', which is normally used for substance dependence and pathological gambling, seems applicable for the treatment of internet and game addiction.
7	Presently, online video game manufacturers/publishers do not provide either referral services or information on addiction risks with regard to video game addiction. Suggested options for improvement are the implementation of proper referral services for addicted gamers and providing information on video game addiction.

## 8.3 Limitations

The previous chapters have discussed limitations with regards to the individual studies. The following section discusses some of the more general limitations of our decisions related to methodology and study design. This overview does not attempt to be exhaustive, but focuses on the main items that should be addressed.

### Sample characteristics and measurement interval

While the Monitor Study Internet and Youth aims to achieve an even spread across a variety of demographic characteristics and regions of the Netherlands, this aim was not fully achieved in practice. This means that the overall samples under-represent some demographic aspects, such as having a low education level, living in the northern and western regions of the Netherlands, and having a non-Dutch ethnicity. Weighted analyses were avoided as we frequently used subsets of the full dataset (i.e. the online gamers), except when reporting the national prevalence estimate of game addiction in chapter 3. Although we believe that this will have no significant impact on the main findings given the large sample size and the fact that the main demographic characteristics were controlled for in regression analyses, the sample characteristics should be taken into account when comparing these results with other studies.

The Monitor Study Internet and Youth is repeated with a yearly interval. This means that longitudinal analyses, such as the one in chapter 2, use data with a relatively long interval. Whereas the use of this longitudinal convenience cohort provides some interesting findings in chapters 2 (2007-2008 cohort) and 3 (2008-2009 cohort), a one-year interval is a relatively long period because the study uses psychological state constructs (e.g. depressive mood) which tend to vary over time. More frequent measurements might have been more suited to this type of measures. Secondly, the longitudinal cohorts differ slightly from their respective main samples. Specifically, students who dropped out of the longitudinal cohort were more likely to be enrolled in a higher education program (as a result of random school drop out).

## Study design

Chapters 2 through 5 used samples derived from the Monitor Study Internet and Youth. This study has the major benefit of a large sample size and repeated measurements. However, as a result of this approach, it also suffers from several limitations. Because we aim to continually compare findings from multiple years, changing or modifying the self-report questions between the years is difficult. Consequently, the online/casual browser/offline game subdivision remained a central part of the study, even though browser games became more and more complicated due to rapid developments in browser software and one could argue for a different categorization.

The distinction between the various types of games is an example of a second limitation, i.e. it is difficult, if not impossible, to translate the complexity of online computing behavior of adolescents to straightforward and unambiguous questions. The example given in chapter 2 was that it is possible to be involved in an MSN conversation on a Smartphone during the two-minute wait for a virtual boat in World of Warcraft, while at the same time a news feed automatically refreshes on a second monitor. This problem arises in the estimates of days per week/time spent on internet activities, which were used in chapters 2 and 3. It is difficult to estimate the exact amount of time spent on activities in the view of the possibilities of multi-tasking. While this does not invalidate the present results, the results should be interpreted with this limitation in mind. Future research might benefit from employing alternative approaches, such as software-based time trackers, or more detailed breakdown of the questions, e.g. distinguishing between weekend and weekly behavior.

Thirdly, the questionnaire was used for adolescents aged between 10 and 16 years. In practice this means that, especially the younger participants, may have had some difficulty in understanding the questions. Although the problems were relatively minor because teachers were available to give advice, this demonstrates the importance of keeping the questions as simple and unambiguous as possible. Besides the matter of understanding, the age range in the sample might be associated with developmental effects. For example, in chapter 5 it was shown that being younger was associated with more negative self-esteem, which can be interpreted as a natural developmental effect (McCarthy & Hoge, 1982). These effects were controlled for (as far as possible) in the statistical analyses, but the age range in the sample needs to be taken into account when making comparisons with other studies.

## Self-report data

Chapters 2 through 5 are based on self-report data from the Monitor Study Internet and Youth, while the sixth chapter is based on clinical self-report data by therapists (and, to a lesser extent, by patients). As a result, the various biases known to affect self-report data (P. M. Podsakoff et al., 2003), e.g. self-presentation, halo effect, social desirability, and item ambiguity, are likely to play a role in the current studies. Given that this type of research is relatively new, little is known about which specific biases are native to video game use and video game addiction. Because it was shown in chapter 6 that highly involved internet users tend to under-report their behavior, under-reporting seems more likely to occur than over-reporting.

In addition, it is difficult to establish whether the self-reported game-addiction problems translate into actual clinical problems, as a formal psychiatric diagnosis cannot be established through this type of survey. Because all problems are self-reported, it is impossible to verify whether the identified extreme group is truly pathologically addicted to games, or merely very highly involved. Future research will benefit from clinically-oriented studies among gaming adolescents and from more direct measures of actual neurological and biochemical processes.

## 8.4 Implications

### Addiction to online applications: a case for subdividing internet addiction

Regardless of how we choose to call the behavior – be it addiction, compulsive behavior, high-involvement, or excessive use – it is clear that a small minority of people have trouble controlling their video game use (Gentile, 2009; Reddy, 2008; Thalemann, Wöfling, & Grüsser, 2007; Wood, 2008b). When this involves adolescents it becomes more worrying, as society expects adolescents to achieve a variety of developmental goals during adolescence. An obsessive focus on a singular activity can potentially disturb this process.

Whereas little is known about the exact nature and mechanisms involved in the gradual escalation of video game use into problematic video game use or 'video game addiction', literature on the subject is gradually expanding. In this thesis, video game addiction was broadly defined as *a loss of control over gaming, resulting in significant harm*. The term 'addiction' was not chosen to imply the existence of a new clinical diagnosis (which is by no means certain at this point), but rather to fit with the scientific debate and public understanding of the issue. Also, this wording fits the choice made by the committee currently working on the upcoming DSM-V psychiatric manual (APA, 2010). They refer to 'addiction and related disorders' when describing an entire spectrum of behavioral addictions, ranging from internet dependency to substance dependency.

Fortunately, knowledge on video game addiction is developing. An interesting finding is that most cases of video game addiction tend to involve the relatively new internet-enabled online games (Council on Science and Public Health, 2007; M. S Lee et al., 2007; Rehbein et al., 2010). Pursuing this line of thought, the current thesis found a relationship between internet addiction and video game use and went on to demonstrate the existence of a small subgroup of internet-addicted online gamers. Moreover, it was shown that

excessive gaming is a monolithic activity, i.e. heavy gamers tend to focus almost exclusively on gaming. These findings present a first argument that a subcategory of internet addiction, namely online video game addiction, should be considered in future research. Consequently, a Video game Addiction Test (VAT) was developed to facilitate identification of this group in the future.

A second argument for splitting up 'internet' addiction is the diverse nature of the activities that internet addicts undertake on the internet. An explorative qualitative study on the treatment of self-proclaimed internet addicts confirmed this among adults. For example, online erotica users suffered financial losses whereas the behavior took up relatively little time. On the other hand, those who were extremely involved in gaming or other forms of online communication tended to experience problems related to the large amount of time they spent online. Results of recent surveys confirm that the structural characteristics of games, especially the reward-and-punishment structure in the game, play a role in game addiction (King, Delfabbro, & Griffiths, 2010; Westwood & Griffiths, n.d.). Moreover, the current thesis demonstrates that the quality of friendships also plays a role in video game addiction. These social interactions, the monolithic nature of video game addiction, and the unique reward-and-punishment structure of games all indicate that online video game addiction should be considered in future research.

## **Game addiction: a new psychiatric diagnosis?**

However, this does not necessarily indicate a need for a new clinical, psychiatric diagnosis. The question remains: is a new psychiatric diagnosis for video game addiction really necessary? If we summarize the findings in the current thesis and expand on these findings, it is clear that online video games have a number of unique, highly involving features. Many of those features strongly resemble mechanisms involved in gambling, an activity strongly regulated in many countries and considered to be a serious form of behavioral addiction for some people.

A first characteristic would be (infinite) repeatability. This holds true for both games and gambling. One can endlessly play roulette and the same goes for World of Warcraft and other online games, whereas the old offline games can simply be finished. Additionally, online games feature a complex social structure which can alleviate feelings of loneliness which might otherwise prompt the player to take social action in real life. Secondly, both games and gambling feature carefully designed reward-and-punishment schedules, as discussed above. For instance, they feature intermittent, fixed, and random reinforcement of behavior. Among other factors, these features are likely to play a role in the development of behavioral addiction. A parallel line of research can be found in the more biological fields of research, where neurological and biochemical similarities are found between video gaming and drug abuse and pathological gambling (C. H. Ko et al., 2009; Koeppe et al., 1998). Moreover, this thesis demonstrated that Griffiths' central components of problematic gambling can be successfully used to measure internet addiction (CIUS) and video game addiction (VAT) on the survey level.

However, there are also important differences: the most important difference between gambling and other behaviors is the amount of **harm** involved. Any behavior that is being considered for transformation into a 'diagnosis' should result in serious harm. At this point, the comparison between gambling and gaming

becomes less clear. Whereas an addicted gambler loses both money and time, an addicted video gamer primarily loses excessive amounts of time. Of course, losing excessive amounts of time can result in significant problems as well. Whatever the case, a sizable group of Dutch adolescents reports that their online video game playing is out of control. Moreover, the existence of harmful outcomes is hard to deny for some, as cases of video game addiction are already being treated in routine health care practice (Meerkerk et al., 2009), a finding which was confirmed in the treatment study in the current thesis.

Meanwhile, the national Dutch addiction care registration system (Ouwehand, Kuijpers, Wisselink, & Van Delden, 2010) reports an extremely low percentage of 0.06% addicted internet users (which includes games, chat, and erotica) for the entire addiction-care population in the Netherlands ( $n=72,554$  in 2010). This percentage may well be an underestimation, as no clear-cut categories for reporting internet and or game addiction exist in most types of registration systems. However, anecdotal reports from addiction care clinics indicate the appearance of several game-addicted adolescents per clinic per month.

These numbers may, of course, change in the future depending on the cause (or causes) of the relatively low number of patients in addiction care treatment. One explanation for the low number is that it could take some time for gamers to develop problems that are serious enough to warrant clinical attention, which means that the size of this group will probably increase over time. Secondly, it could mean that the patients are not yet finding their way to the proper care. This is a reasonable assumption, as currently there are only a few publicly advertised internet and game treatment programs. If this point is relevant, the group will grow larger in the future as more and more institutions start advertising and offering specialized care. On the other hand, it could be that the majority of the problems subsist at the subclinical level (i.e. do not result in sufficient harm) and are resolved naturally, without clinical interference. This might suggest that game addiction can better be viewed as a lifestyle or parenting problem rather than as a psychiatric issue. Unfortunately, the available data do not allow any definite conclusions to be drawn in either direction.

Future studies will probably benefit from making the connection between survey research and clinical practice. Fortunately, at least one study has now addressed this issue: Tao et al. (2010) have demonstrated that a component-based survey questionnaire (roughly comparable to the model utilized in the development of the VAT) can indeed match the professional judgment of experienced psychiatrists regarding the level of internet addiction. Some type of cross-validation of the VAT in a clinical setting is therefore recommended to improve the knowledge on clinical performance, to correct clinical identification with the instrument, and to support the development of clinical cut-off scores. Although these types of investigations fall outside the scope of this thesis, the study of Tao et al. indicates the relevance of these types of survey-based instruments.

In summary, the current state of research does not provide sufficient evidence to support the creation of a new clinical diagnosis called 'video game addiction'. Although video game addiction seems to meet all the basic criteria for an addiction, for clinical practice the numbers involved are simply too small to warrant that kind of drastic action, with all its related consequences. There are indications that video game

addiction should be seen separately from internet addiction. Nonetheless, the debate on the DSM-V (APA, 2010) should at least explore the option of defining these problems on the application level as evidence develops. A general category of internet addiction may still be warranted if a person suffers from problems related to using a variety of internet applications at the same time and generally avoids working on real-life activities due to wasting time on the internet: this idea was suggested by Davis under the heading of 'Generalized Problematic Internet Use' (2001).

## Practical implications

The current evidence seems to suggest that the online video games (if properly designed) can in fact become involving enough for people to reach a point where they continue playing in spite of serious negative consequences. Whether we choose to call this phenomenon 'game addiction' or 'high involvement', this thesis demonstrates that there is a sizable group of adolescents (1.6% of Dutch adolescents aged 13 to 16 years) who self-report to have trouble controlling their gameplay. Moreover, there is a small group of adolescents and adults who seek clinical treatment for videogame-related problems. As video games and digital technology continue to become more pervasive in our lives, this group is expected to increase in number (and perhaps severity) in the coming decades.

Health practitioners, researchers, policymakers, and even the video game industry itself can benefit from these observations and prepare for the future in several ways. Firstly, many people are interested in obtaining information on video game addiction. Providing proper information on the risks (and benefits) of video game playing should hopefully remove misconceptions and prevent undue panic. Secondly, the relatively few extreme cases and the highly involved majority would benefit from general information and, in some cases, more clarity regarding the referral paths to proper care. As neither of these are currently available, all parties involved have an opportunity to contribute to this process in order to prevent harmful outcomes.

Finally, there is a clear need for evidence-based or at least well-tested treatment protocols. In this case, clinical practice may benefit from organizing the related issues under the term 'internet addiction', in view of the current low prevalence of the specific issues such as game addiction. This is relevant since exploratory research in the current thesis indicates that treatment using a combination of Cognitive Behavioral Therapy and Motivational Interviewing seems to work equally well across various types of internet addiction.

## 8.5 Final considerations

Online video game addiction seems to be a real problem for some people. Although serious issues seem to develop in only a minority of gamers (i.e. 1.6% of the adolescents aged 13 to 16 years in the Netherlands) this in fact represents tens of thousands of adolescents. Currently, only a small minority of those adolescents actually reaches clinical addiction care. However, these numbers are likely to increase as gaming continues to develop and addiction care announces treatment possibilities. Meanwhile, industry, politicians and health care providers have an opportunity to address this new issue by developing a mix of prevention, treatment, and large-scale monitor studies.

Whether or not a new clinical diagnosis is warranted remains questionable, and we should seriously consider what goals this would achieve. Creating a new diagnosis has the advantage that it would stimulate research on the nature of the problems and serve to acknowledge the severity of the situation. On the other hand, identifying the issue as a clinical problem has the drawback that it can lead to stigmatization of gamers and reflect negatively on games as an entertainment and art form in general. Moreover, it might prevent positive utilization of games, for example as an educational tool (Van Rooij, Jansz, & Schoenmakers, 2010). However, the available evidence is not yet strong enough to allow a final decision to be made.

To some extent, video game addiction can be viewed as a conflict between two patterns of social organization. It is a clash between the subculture of online gamers and people from the previous generation who live in the 'real world'. As sociologist Henry Jenkins stated in one of his lectures (Jenkins, 2009): *'the word addiction is really a cultural category: if I stay up all night beating a video game I'm addicted, if I'm reading a book I'm congratulated.'* This type of social clash or generational conflict plays a large role in the debate on video game addiction. From this perspective, a dialogue between the two cultures would be valuable. If parents would spend more time getting to know their adolescent's online world, they might be surprised at the complexities of online gaming. However, I suspect that the next generation of parents, many of which have had the opportunity to play online games for themselves, will have different ways of dealing with video game addiction than the current generation.

As society becomes more accustomed to these new media and as research continues, both our cultural perspective on heavy gaming and the nature of the games themselves will undoubtedly continue to change.

For now at least, it seems that games are a mixed blessing. How we handle them is up to us.

Thank you for reading and: **Game responsibly!**



## References

- AMA. (2006). *American Medical Association: Warning Labels on Video Games* (No. Resolution: AMA 421 A-06). AMA.
- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders (DSM-IV TR)* (4<sup>th</sup> ed.). Washington DC: American Psychiatric Association.
- APA. (2010, February 10). Substance-Related Disorders. *American Psychiatric Association - DSM-5 Development*. Retrieved February 10, 2010, from <http://www.dsm5.org/ProposedRevisions/Pages/Substance-RelatedDisorders.aspx>. Accessed: 2010-02-10. (Archived by WebCite® at <http://www.webcitation.org/5nR8AitLs>).
- Asparouhouv, T., & Muthén, B. O. (2007). *Wald test of mean equality for potential latent class predictors in mixture modeling*. Retrieved from <http://www.statmodel.com/download/MeanTest1.pdf>. Accessed: 2010-02-16. (Archived by WebCite® at <http://www.webcitation.org/5na9F61Xo>).
- Bainbridge, W. S. (2007). The scientific research potential of virtual worlds. *Science*, 317(5837), 472-476.
- Beard, K. W., & Wolf, E. M. (2001). Modification in the proposed diagnostic criteria for Internet addiction. *CyberPsychology and Behavior*, 4(3), 377-383.
- Beidel, D., Turner, S., Young, B., Ammerman, R., Sallee, F., & Crosby, L. (2007). Psychopathology of Adolescent Social Phobia. *Journal of Psychopathology and Behavioral Assessment*, 29(1), 46-53. doi:10.1007/s10862-006-9021-1
- Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological bulletin*, 107(2), 238-246.
- Bergmark-Helmersson, K., & Bergmark, A. (2009). The diffusion of addiction to the field of MMORPGs. *Nordic Studies on Alcohol and Drugs*, 26(4), 415-426.
- Bernardi, S., & Pallanti, S. (2009). Internet addiction: a descriptive clinical study focusing on comorbidities and dissociative symptoms. *Comprehensive Psychiatry*, 50(6), 510-516. doi:10.1016/j.comppsy.2008.11.011
- Blaszczynski, A. (2008). Commentary: A Response to "Problems with the Concept of Video Game "Addiction": Some Case Study Examples". *International Journal of Mental Health and Addiction*, 6(2), 179-181.
- Blizzard Entertainment. (2008a). World Of Warcraft® Reaches New Milestone: 10 Million Subscribers. Retrieved January 21, 2008, from <http://eu.blizzard.com/en-gb/company/press/pressreleases.html?080122>. Accessed: 2010-08-17. (Archived by WebCite® at <http://www.webcitation.org/5s2wFZWcx>).
- Blizzard Entertainment. (2008b, October 28). World Of Warcraft® Surpasses 11 Million Subscribers Worldwide. Retrieved October 27, 2008, from <http://eu.blizzard.com/en-gb/company/press/pressreleases.html?081028>. Accessed: 2010-08-17. (Archived by WebCite® at <http://www.webcitation.org/5s2wJLrmG>).
- Block, J. J. (2008). Issues for DSM-V: Internet addiction. *American Journal of Psychiatry*, 165(3), 306-307.
- Bonetti, L., Campbell, M. A., & Gilmore, L. (2010). The Relationship of Loneliness and Social Anxiety with Children's and Adolescents' Online Communication. *Cyberpsychology, Behavior, and Social Networking*, 13(3), 279-285. doi:10.1089/cyber.2009.0215

- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77-101. doi:10.1191/1478088706qp063oa
- Breslin, F. C., Sobell, L. C., Sobell, M. B., & Agrawal, S. (2000). A comparison of a brief and long version of the Situational Confidence Questionnaire. *Behaviour Research and Therapy*, 38(12), 1211-1220. doi:10.1016/S0005-7967(99)00152-7
- Brewer, J. A., & Potenza, M. N. (2008). The neurobiology and genetics of impulse control disorders: Relationships to drug addictions. *Biochemical Pharmacology*, 75(1), 63-75.
- Buhrmester, D. (1990). Intimacy of Friendship, Interpersonal Competence, and Adjustment during Preadolescence and Adolescence. *Child Development*, 61(4), 1101-1111. doi:10.1111/j.1467-8624.1990.tb02844.x
- Byrne, B. M. (1998). *Structural equation modeling with LISREL, PRELIS and SIMPLIS: Basic concepts, applications, and programming*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Byun, S., Ruffini, C., Mills, J. E., Douglas, A. C., Niang, M., Stepchenkova, S., Lee, S. K., et al. (2009). Internet Addiction: Metasynthesis of 1996-2006 Quantitative Research. *CyberPsychology & Behavior*, 12(2), 203. doi:doi:10.1089/cpb.2008.0102
- Caplan, S. E. (2003). Preference for Online Social Interaction: A Theory of Problematic Internet Use and Psychosocial Well-Being. *Communication Research*, 30(6), 625-648. doi:10.1177/0093650203257842
- Caplan, S. E. (2007). Relations Among Loneliness, Social Anxiety, and Problematic Internet Use. *CyberPsychology & Behavior*, 10(2), 234-242. doi:10.1089/cpb.2006.9963
- Caplan, S. E. (2010). Theory and measurement of generalized problematic Internet use: A two-step approach. *Computers in Human Behavior*, 26(5), 1089-1097. doi:10.1016/j.chb.2010.03.012
- Chappell, D., Eatough, V., Davies, M. N. O., & Griffiths, M. D. (2006). EverQuest –It’s Just a Computer Game Right? An Interpretative Phenomenological Analysis of Online Gaming Addiction. *International Journal of Mental Health and Addiction*, 4(3), 205-216.
- Charlton, J. P., & Danforth, I. D. W. (2007). Distinguishing addiction and high engagement in the context of online game playing. *Computers in Human Behavior*, 23(3), 1531-1548.
- China Daily. (2007). The more they play, the more they lose. *People’s Daily Online*. Retrieved from [http://english.people.com.cn/200704/10/eng20070410\\_364977.html](http://english.people.com.cn/200704/10/eng20070410_364977.html)
- Chiu, S., Lee, J., & Huang, D. (2004). Video Game Addiction in Children and Teenagers in Taiwan. *CyberPsychology & Behavior*, 7(5), 571-581. doi:10.1089/cpb.2004.7.571
- Cole, H., & Griffiths, M. D. (2007). Social Interactions in Massively Multiplayer Online Role-Playing Gamers. *CyberPsychology & Behavior*, 10(4), 575-583. doi:10.1089/cpb.2007.9988
- Collins, P. (2007). Gambling and governance. In G. Smith, D. Hodgins, & R. Williams (Eds.), *Research and Measurement Issues in Gambling Studies* (pp. 617-639). New York: Elsevier.
- Collins, P., & Barr, G. (2006). *Gambling and Problem Gambling in South Africa: The National Prevalence Study 2006*. National Centre For The Study of Gambling at The University of Cape Town.
- Compas, B., Slavin, L., Wagner, B., & Vannatta, K. (1986). Relationship of life events and social support with psychological dysfunction among adolescents. *Journal of Youth and Adolescence*, 15(3), 205-221.
- Council on Science and Public Health. (2007). *Emotional and Behavioral Effects, Including Addictive Potential, of Video Games* (No. CSAPH Report 12-A-07). Retrieved from <http://www.ama-assn.org/ama/pub/upload/mm/467/csaph12a07.doc>. Accessed: 2010-02-22. (Archived by WebCite® at <http://www.webcitation.org/5njUtlurL>).

- Davis, R. A. (2001). A cognitive-behavioral model of pathological Internet use. *Computers in Human Behavior*, 17(2), 187-195.
- De Wildt, W. (2000). *Leefstijltraining 2. Handleiding voor de trainer [Lifestyle Training 2. Trainer's Manual]*. Nijmegen: Cure & Care.
- De Wildt, W. (2010). *Alcohol Dependence, Treatment effectiveness and the concept of craving [PhD thesis]*. Amsterdam: University of Amsterdam.
- Du, Y., Jiang, W., & Vance, A. (2010). Longer term effect of randomized, controlled group cognitive behavioural therapy for Internet addiction in adolescent students in Shanghai. *Australian and New Zealand Journal of Psychiatry*, 44(2), 129-134.
- Engels, R. C. M. E., Finkenauer, C., Meeus, W., & Deković, M. (2001). Parental attachment and adolescents' emotional adjustment: The associations with social skills and relational competence. *Journal of Counseling Psychology*, 48(4), 428-439.
- Erlandson, D. A., Harris, P. E. L., Skipper, B. L., & Allen, S. D. (1993). *Doing Naturalistic Inquiry: A Guide to Methods*. Newbury Park, CA: Sage Publications.
- ESA. (2008). *Essential Facts about games and violence*. Entertainment Software Association.
- Furman, W., & Buhrmester, D. (1985). Children's perceptions of the qualities of sibling relationships. *Child Development*, 56, 448-461.
- Gentile, D. A. (2009). Pathological Video-Game Use Among Youth Ages 8 to 18: A National Study. *Psychological Science*, 20(5), 594-602.
- Ghassemzadeh, L., Shahraray, M., & Moradi, A. (2008). Prevalence of Internet Addiction and Comparison of Internet Addicts and Non-Addicts in Iranian High Schools. *CyberPsychology & Behavior*, 11(6), 731-733. doi:10.1089/cpb.2007.0243
- la Greca, A. M., Dandes, S. K., Wick, P., Shaw, K., & Stone, W. L. (1988). Development of the Social Anxiety Scale for Children: Reliability and concurrent validity. *Journal of Clinical Child Psychology*, 17(1), 84-91.
- la Greca, A. M., & Stone, W. L. (1993). Social Anxiety Scale for Children-Revised: Factor structure and concurrent validity. *Journal of Clinical Child Psychology*, 22(1), 17-27.
- Greenfield, T. K., Graves, K. L., & Kaskutas, L. A. (1999). Long-term effects of alcohol warning labels: Findings from a comparison of the United States and Ontario, Canada. *Psychology and Marketing*, 16(3), 261-282.
- Gregorich, S. E. (2006). Do self-report instruments allow meaningful comparisons across diverse population groups? Testing measurement invariance using the confirmatory factor analysis framework. *Medical care*, 44(11 Suppl 3), S78-S94.
- Griffiths, M. D. (1991). Amusement machine playing in childhood and adolescence: a comparative analysis of video games and fruit machines. *Journal of Adolescence*, 14(1), 53-73.
- Griffiths, M. D. (2000). Internet Addiction - Time to be Taken Seriously? *Addiction Research & Theory*, 8(5), 413-418.
- Griffiths, M. D. (2005a). A 'components' model of addiction within a biopsychosocial framework. *Journal of Substance Use*, 10(4), 191-197.
- Griffiths, M. D. (2005b). Relationship between gambling and video-game playing: a response to Johansson and Gotestam. *Psychological Reports*, 96(3 Pt 1), 644-6.

- Griffiths, M. D. (2008). Videogame Addiction: Further Thoughts and Observations. *International Journal of Mental Health and Addiction*, 6(2), 182-185.
- Griffiths, M. D., & Davies, M. N. O. (2005). Does video game addiction exist? In J. Raessens & J. Goldstein (Eds.), *Handbook of Computer Game Studies* (pp. 361-369). Cambridge, MA, USA: MA MIT Press.
- Griffiths, M. D., & Hunt, N. (1998). Dependence on computer games by adolescents. *Psychological reports*, 82(2), 475-480.
- Griffiths, M. D., & Wood, R. T. A. (2008). Responsible gaming and best practice: How can academics help? *Casino and Gaming International*, 4(1), 107-112.
- Griffiths, M. D., Wood, R. T. A., & Parke, J. (2009). Social responsibility tools in online gambling: A survey of attitudes and behavior among internet gamblers. *CyberPsychology and Behavior*, 12(4), 413-421.
- Griffiths, M. D., Wood, R. T. A., Parke, J., & Parke, A. (2007). Gaming research and best practice: Gaming industry, social responsibility and academia. *Casino and Gaming International*, 3(3), 97-103.
- Gross, E. F. (2004). Adolescent Internet use: What we expect, what teens report. *Journal of Applied Developmental Psychology*, 25(6), 633-649.
- Grüsser, S. M., Thalemann, R., & Griffiths, M. D. (2007). Excessive Computer Game Playing: Evidence for Addiction and Aggression? *CyberPsychology & Behavior*, 10(2), 290-292.
- Ha, J. H., Kim, S. Y., Bae, S. C., Bae, S., Kim, H., Sim, M., Lyoo, I. K., et al. (2007). Depression and Internet Addiction in Adolescents. *Psychopathology*, 40(6), 424-430. doi:10.1159/000107426
- Hayes, A. F., & Matthes, J. (2009). Computational procedures for probing interactions in OLS and logistic regression: SPSS and SAS implementations. *Behavior Research Methods*, 41(3), 924.
- Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, 6(1), 1-55.
- Huisman, A., van den Eijnden, R., & Garretsen, H. (2001). Internet addiction - a call for systematic research. *Journal of Substance Use*, 6, 7-10.
- Hussain, Z., & Griffiths, M. D. (2008). Gender Swapping and Socializing in Cyberspace: An Exploratory Study. *CyberPsychology & Behavior*, 11(1), 47-53.
- Hussain, Z., & Griffiths, M. D. (2009a). The Attitudes, Feelings, and Experiences of Online Gamers: A Qualitative Analysis. *CyberPsychology & Behavior*, 12(6), 747-757. doi:10.1089/cpb.2009.0059
- Hussain, Z., & Griffiths, M. D. (2009b). Excessive use of Massively Multi-Player Online Role-Playing Games: A Pilot Study. *International Journal of Mental Health and Addiction*, 11(1), 47-53. doi:10.1007/s11469-009-9202-8
- Jansz, J. (2005). The Emotional Appeal of Violent Video Games for Adolescent Males. *Communication Theory*, 15(3), 219-241.
- Jenkins, H. (2009). *FRONTLINE: digital nation: virtual worlds: internet addiction: is it really an addiction?* PBS.org. Retrieved from <http://www.pbs.org/wgbh/pages/frontline/digitalnation/virtual-worlds/internet-addiction/is-it-really-an-addiction.html?play>
- Kandel, D. B., & Davies, M. (1982). Epidemiology of depressive mood in adolescents: an empirical study. *Archives of General Psychiatry*, 39(10), 1205-1212.
- Kandel, D. B., & Davies, M. (1986). Adult Sequelae of adolescent depressive symptoms. *Archives of General Psychiatry*, 43(3), 255-262.

- Kaplan, D. (2000). *Structural Equation Modeling: Foundations and Extensions*. Thousands Oaks, CA: Sage Publications.
- Kaplan, J. (2008, September 4). MMO-Champion BlueTracker - Constructive Feedback for Server First Titles (Tigole - a.k.a. Jeffrey Kaplan). Retrieved January 9, 2009, from <http://blue.mmo-champion.com/1/9336520906-constructive-feedback-for-server-first-titles.html>
- Keepers, G. A. (1990). Pathological preoccupation with video games. *Journal of the American Academy of Child and Adolescent Psychiatry*, 29(1), 49-50.
- Kim, H. K., & Davis, K. E. (2009). Toward a comprehensive theory of problematic Internet use: Evaluating the role of self-esteem, anxiety, flow, and the self-rated importance of Internet activities. *Computers in Human Behavior*, 25(2), 490-500. doi:10.1016/j.chb.2008.11.001
- King, D., Delfabbro, P., & Griffiths, M. D. (2010). The Role of Structural Characteristics in Problematic Video Game Play: An Empirical Study. *International Journal of Mental Health and Addiction*, 1-14.
- Ko, C. H., Liu, G. C., Hsiao, S., Yen, J. Y., Yang, M. J., Lin, W. C., Yen, C. F., et al. (2009). Brain activities associated with gaming urge of online gaming addiction. *Journal of Psychiatric Research*, 43(7), 739-747. doi:10.1016/j.jpsychires.2008.09.012
- Ko, C. H., Yen, J. Y., Chen, C. C., Chen, S. H., & Yen, C. F. (2005). Gender Differences and Related Factors Affecting Online Gaming Addiction Among Taiwanese Adolescents. *The Journal of Nervous and Mental Disease*, 193(4). doi:10.1097/01.nmd.0000158373.85150.57
- Ko, C. H., Yen, J. Y., Chen, C. S., Yeh, Y. C., & Yen, C. F. (2009). Predictive Values of Psychiatric Symptoms for Internet Addiction in Adolescents: A 2-Year Prospective Study. *Arch Pediatr Adolesc Med*, 163(10), 937-943. doi:10.1001/archpediatrics.2009.159
- Koeppe, M. J., Gunn, R. N., Lawrence, A. D., Cunningham, V. J., Dagher, A., Jones, T., Brooks, D. J., et al. (1998). Evidence for striatal dopamine release during a video game. *Nature*, 393(6682), 266-267.
- Kollen, B., Van de Port, I., Lindeman, E., Twisk, J., & Kwakkel, G. (2005). Predicting Improvement in Gait After Stroke: A Longitudinal Prospective Study. *Stroke*, 36(12), 2676-2680. doi:10.1161/01.STR.0000190839.29234.50
- Kraut, R., Kiesler, S., Boneva, B., Cummings, J., Helgeson, V., & Crawford, A. (2002). Internet Paradox Revisited. *Journal of Social Issues*, 58(1), 49-74. doi:10.1111/1540-4560.00248
- La Greca, A. M., & Harrison, H. M. (2005). Adolescent Peer Relations, Friendships, and Romantic Relationships: Do They Predict Social Anxiety and Depression? *Journal of Clinical Child & Adolescent Psychology*, 34(1), 49-61. doi:10.1207/s15374424jccp3401\_5
- La Greca, A. M., & Lopez, N. (1998). Social Anxiety Among Adolescents: Linkages with Peer Relations and Friendships. *Journal of Abnormal Child Psychology*, 26(2), 83-94-94.
- Lee, M. S., Ko, Y. H., Song, H. S., Kwon, K. H., Lee, H. S., Nam, M., & Jung, I. K. (2007). Characteristics of Internet use in relation to game genre in Korean adolescents. *CyberPsychology and Behavior*, 10(2), 278-285.
- Lemmens, J. S. (2006). *Gameverslaving. Probleemgebruik herkennen, begrijpen en overwinnen*. Amsterdam: Uitgeverij SWP.
- Lemmens, J. S., Valkenburg, P. M., & Peter, J. (2009). Development and Validation of a Game Addiction Scale for Adolescents. *Media Psychology*, 12(1), 77-95.

- Lievens, E., Dumortier, J., & Ryan, P. S. (2006). The Co-Protection of Minors in New Media: A European Approach to Co-Regulation. *UC Davis Journal of Juvenile Law & Policy*, 10, 97.
- Lim, S., & Roselyn Lee, J. E. (2009). When Playing Together Feels Different: Effects of Task Types and Social Contexts on Physiological Arousal in Multiplayer Online Gaming Contexts. *CyberPsychology & Behavior*, 12(1), 59-61. doi:10.1089/cpb.2008.0054
- Lin-Liu, J. (2006). China's e-Junkies Head for Rehab. Beijing hospital ward treats Internet addicts. *Ieee Spectrum Online*. Retrieved from <http://spectrum.ieee.org/telecom/internet/chinas-ejunkies-head-for-rehab>. Accessed: 2010-02-16. (Archived by WebCite® at <http://www.webcitation.org/5na8Qi59k>).
- Longman, H., O'Connor, E., & Obst, P. (2009). The Effect of Social Support Derived from World of Warcraft on Negative Psychological Symptoms. *CyberPsychology & Behavior*, 12(5), 563-566. doi:10.1089/cpb.2009.0001
- Marlatt, G. A., & Donovan, D. M. (2005). *Relapse prevention: Maintenance strategies in the treatment of addictive behaviors*. New York: Guilford Press.
- Marsh, H., Ludtke, O., Trautwein, U., & Morin, A. (2009). Classical Latent Profile Analysis of Academic Self-Concept Dimensions: Synergy of Person- and Variable-Centered Approaches to Theoretical Models of Self-Concept. *Structural Equation Modeling: A Multidisciplinary Journal*, 16(2), 191-225. doi:10.1080/10705510902751010
- McCarthy, J. D., & Hoge, D. R. (1982). Analysis of age effects in longitudinal studies of adolescent self-esteem. *Developmental Psychology*, 18(3), 372-379. doi:doi: DOI: 10.1037/0012-1649.18.3.372
- Meerkerk, G. J., Van den Eijnden, R. J. J. M., & Garretsen, H. F. L. (2006). Predicting Compulsive Internet Use: It's All about Sex! *CyberPsychology & Behavior*, 9(1), 95-103.
- Meerkerk, G. J., Van den Eijnden, R. J. J. M., & Van Rooij, A. J. (2006). *Monitor Internet en Jongeren: Compulsief Internetgebruik onder Nederlandse Jongeren [Monitor Internet and Youth: Compulsive Internet Use Among Dutch Youth]* (Factsheet). Rotterdam: IVO. Retrieved from <http://bit.ly/auw1Nc>
- Meerkerk, G. J., Van den Eijnden, R. J. J. M., Vermulst, A. A., & Garretsen, H. F. L. (2009). The Compulsive Internet Use Scale (CIUS): Some Psychometric Properties. *CyberPsychology & Behavior*, 12(1), 1-6. doi:10.1089/cpb.2008.0181
- Meerkerk, G. J., Van Rooij, A. J., Amadmoestar, S. S., & Schoenmakers, T. M. (2009). *Nieuwe Verslavingen in Zicht. Een Inventariserend Onderzoek naar Aard en Omvang van 'Nieuwe Verslavingen' in Nederland [New Addictions in Sight! A Survey into the Nature and Prevalence of "New Addictions" in the Netherlands]* (IVO Reeks No. 63). Rotterdam: IVO. Retrieved from <http://bit.ly/98vABT>
- Meerkerk, G. J. (2007). *Pwned by the internet, Explorative research into the causes and consequences of compulsive internet use [PhD thesis]*. Rotterdam: Erasmus University Rotterdam.
- Meeroof, M., & Griffiths, M. D. (2010). Online Gaming Addiction: The Role of Sensation Seeking, Self-Control, Neuroticism, Aggression, State Anxiety, and Trait Anxiety. *Cyberpsychology, Behavior, and Social Networking*, 13(3), 313-316. doi:10.1089/cyber.2009.0229
- Miller, W. R., & Rollnick, S. (2002). *Motivational Interviewing: Preparing People for Change* (2<sup>nd</sup> ed.). New York: Guilford Press.
- Minister Klink. (2008, February 27). Antwoorden van minister Klink op kamervragen van het Kamerlid Bouwmeester over gameverslaving. (2070809970-27 februari 2008). Tweede Kamer der Staten-Generaal.

- Monti, P. M. (2002). *Treating alcohol dependence: A coping skills training guide*. New York: The Guilford Press.
- Morahan-Martin, J. (2005). Internet Abuse. Addiction? Disorder? Symptom? Alternative Explanations? *Social Science Computer Review*, 23(1), 39 -48. doi:10.1177/0894439304271533
- Munro, G., & de Wever, J. (2008). Culture clash: alcohol marketing and public health aspirations. *Drug and Alcohol Review*, 27(2), 204 - 211.
- Muthén, L. K., & Muthén, B. O. (2007). *Mplus User's Guide* (Fifth edition.). Los Angeles, CA: Muthén & Muthén.
- Ng, B., & Wiemer-Hastings, P. (2005). Addiction to the Internet and Online Gaming. *Cyberpsychology and Behavior*, 8(2), 110-114.
- NPD. (2008). Extreme Gamers Spend An Average of 45 Hours Per Week Playing Video Games. New Study Profiles Seven Gaming Segments by Key Behavioral Metrics, Usage Patterns and Purchasing Preferences. Retrieved August 10, 2008, from [http://www.npd.com/press/releases/press\\_080811.html](http://www.npd.com/press/releases/press_080811.html). Accessed: 2010-06-02. (Archived by WebCite® at <http://www.webcitation.org/5qBPzA7CK>).
- NPD. (2010). Extreme gamers spend two full days per week playing video games. Retrieved June 2, 2010, from [http://www.npd.com/press/releases/press\\_100527b.html](http://www.npd.com/press/releases/press_100527b.html). Accessed: 2010-06-02. (Archived by WebCite® at <http://www.webcitation.org/5qBPsdawk>).
- Nuttal, C. (2006). Console makers go for a slam dunk. Product Launches: Nintendo and Sony are taking very different approaches to marketing their new games consoles. *Financial Times*, 17, 10.
- Nylund, K. L., Asparouhov, T., & Muthén, B. O. (2007). Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study. *Structural Equation Modeling*, 14(4), 535-569.
- Orford, J. (2001). Addiction as excessive appetite. *Addiction*, 96(1), 15-31.
- Oudejans, S. (2009). *Routine Outcome Monitoring and Learning Organizations in Substance Abuse Treatment [PhD thesis]*. Amsterdam, The Netherlands: University of Amsterdam.
- Ouwehand, A. W., Kuijpers, W. G. T., Wisselink, D. J., & Van Delden, E. B. (2010). *Kerncijfers verslavingszorg 2009 [Core statistics addiction care 2009]* (p. 58). Houten: IVZ, Landelijk alcohol en drugs informatie systeem (LADIS).
- Pet Food Alpha. (2008, November). How Long is Too Long? *Pet Food Alpha. News, Community and more*. Retrieved June 3, 2009, from <http://petfoodalpha.com/1055/how-long-is-too-long>
- Peters, C. S., & Malesky, A. (2008). Problematic usage among highly-engaged players of massively multiplayer online role playing games. *CyberPsychology and Behavior*, 11(4), 481-484.
- Peukert, P., Sieslack, S., Barth, G., & Batra, A. (2010). [Internet- and computer game addiction: phenomenology, comorbidity, etiology, diagnostics and therapeutic implications for the addictives and their relatives]. *Psychiatrische Praxis*, 37(5), 219-224. doi:10.1055/s-0030-1248442
- Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5), 879-903.
- Potenza, M. N. (2006). Should addictive disorders include non-substance-related conditions? *Addiction*, 101(s1), 142-151.

- Rahn, K. (2006, September 15). 'No Internet Day' set for students. *Korea Times*. Retrieved from <http://www.asiamedia.ucla.edu/article.asp?parentid=52983>
- Reddy, S. (2008). A Disorder by Any Other Name: Excessive Computer Game Playing. *Virtual Mentor, American Medical Association Journal of Ethics*, 10(1), 30-34.
- Reding, V. (2007, June 26). *Self regulation applied to interactive games: success and challenges*. ISFE Expert Conference Speech, Brussels.
- Reed, J. (2008, August 4). Thailand bans Grand Theft Auto IV. *BBC News*. Retrieved from [http://news.bbc.co.uk/newsbeat/hi/technology/newsid\\_7540000/7540623.stm](http://news.bbc.co.uk/newsbeat/hi/technology/newsid_7540000/7540623.stm)
- Rehbein, F., Psych, G., Kleimann, M., Mediasci, G., & Mößle, T. (2010). Prevalence and Risk Factors of Video Game Dependency in Adolescence: Results of a German Nationwide Survey. *Cyberpsychology, Behavior, and Social Networking*, 13(3), 269-277. doi:10.1089/cyber.2009.0227
- Reuter, J., Raedler, T., Rose, M., Hand, I., Gläscher, J., & Büchel, C. (2005). Pathological gambling is linked to reduced activation of the mesolimbic reward system. *Nature Neuroscience*, 8, 147 - 148.
- Rigdon, E. E. (1996). CFI versus RMSEA: A comparison of two fit indexes for structural equation modeling. *Structural Equation Modeling: A Multidisciplinary Journal*, 3(4), 369-379.
- Rollnick, S., & Allison, J. (2004). Motivational Interviewing. In N. Heather & T. Stockwell (Eds.), *The Essential Handbook of Treatment and Prevention of Alcohol Problems* (pp. 105-116). West Sussex, England: John Wiley & Sons, Ltd.
- Room, R., Turner, N. E., & Ialomiteanu, A. (1999). Community effects of the opening of the Niagara casino. *Addiction*, 94(10), 1449-1466.
- Rosenberg, M. (1989). *Society and the Adolescent Self-Image* (revised edition.). Middletown: Wesleyan University Press.
- Russell, D., Peplau, L. A., & Cutrona, C. E. (1980). The revised UCLA Loneliness Scale: Concurrent and discriminant validity evidence. *Journal of Personality and Social Psychology*, 39(3), 472-480.
- Schermelleh-Engel, K., Moosbrugger, H., & Müller, H. (2003). Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of-fit measures. *Methods of psychological research online [now: Methodology (Gott)]*, 8(2), 23-74.
- Schwarz, G. (1978). Estimating the Dimension of a Model. *The Annals of Statistics*, 6(2), 461-464.
- Science. (2010). Psychiatry. DSM-V at a Glance. *Science*, 327(5967), 770-771. doi:10.1126/science.327.5967.770-b
- Selfhout, M. H., Branje, S. J., Delsing, M., Ter Bogt, T. F., & Meeus, W. H. (2009). Different types of Internet use, depression, and social anxiety: The role of perceived friendship quality. *Journal of Adolescence*, 32(4), 819-833. doi:10.1016/j.adolescence.2008.10.011
- Shaffer, H. J., Hall, M. N., & Bilt, J. V. (2000). "Computer Addiction": A Critical Consideration. *American Journal of Orthopsychiatry*, 70(2), 162-168.
- Sharples, T. (2009, September 27). A New Recovery Center for the Woes of Warcraft. *Time.com*. Retrieved from <http://www.time.com/time/health/article/0,8599,1925468,00.html>. Accessed: 2010-02-16. (Archived by WebCite® at <http://www.webcitation.org/5na8oy4o9>).
- Skoric, M. M., Teo, L. L., & Neo, R. L. (2009). Children and Video Games: Addiction, Engagement, and Scholastic Achievement. *CyberPsychology & Behavior*, 12(5), 567-572.

- Smahel, D., Blinka, L., & Ledabyl, O. (2008). Playing MMORPGs: Connections between Addiction and Identifying with a Character. *CyberPsychology & Behavior*, *11*(6), 715-718. doi:10.1089/cpb.2007.0210
- Smeaton, M., & Griffiths, M. D. (2004). Internet Gambling and Social Responsibility: An Exploratory Study. *CyberPsychology & Behavior*, *7*(1), 49-57.
- Spijkerman, R., Van den Eijnden, R. J. J. M., & Huiberts, A. (2008). Socioeconomic differences in alcohol-specific parenting practices and adolescents' drinking patterns. *European Addiction Research*, *14*(1), 26-37.
- Statistics Netherlands. (2010). CBS StatLine. Retrieved June 1, 2010, from <http://statline.cbs.nl/statweb/?LA=en>. Accessed: 2010-06-01. (Archived by WebCite® at <http://www.webcitation.org/5qA5rbLeZ>).
- Tao, R., Huang, X., Wang, J., Zhang, H., Zhang, Y., & Li, M. (2010). Proposed diagnostic criteria for internet addiction. *Addiction*, *105*(3), 556-564. doi:10.1111/j.1360-0443.2009.02828.x
- Telegraph (UK). (2009, November 3). Britain's first computer rehab clinic opens. *Telegraph.co.uk*. Retrieved from <http://www.telegraph.co.uk/technology/video-games/6485888/Britains-first-computer-rehab-clinic-opens.html>. Accessed: 2010-02-16. (Archived by WebCite® at <http://www.webcitation.org/5na8yQeEN>).
- Thalemann, R., Wöfling, K., & Grüsser, S. M. (2007). Specific cue reactivity on computer game-related cues in excessive gamers. *Behavioral Neuroscience*, *121*(3), 614-8. doi:2007-08636-018
- The Council of the European Union. (2002). Council Resolution of 1 March 2002 on the protection of consumers, in particular young people, through the labelling of certain video games and computer games according to age group. *Official Journal of the European Communities*, *C 65/2*. Retrieved from <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2002:065:0002:0002:EN:PDF>
- Turner, N. E. (2008). A Comment on "Problems with the Concept of Video Game 'Addiction': Some Case Study Examples". *International Journal of Mental Health and Addiction*, *6*(2), 186-190.
- Valkenburg, P. M., & Peter, J. (2007). Online communication and adolescent well-being: Testing the stimulation versus the displacement hypothesis. *Journal of Computer Mediated Communication*, *12*(4), 1169-1182.
- Van den Eijnden, R. J. J. M., Meerkerk, G. J., Vermulst, A. A., Spijkerman, R., & Engels, R. C. M. E. (2008). Online communication, compulsive Internet use, and psychosocial well-being among adolescents: a longitudinal study. *Developmental Psychology*, *44*(3), 655-665.
- Van den Eijnden, R. J. J. M., Spijkerman, R., Vermulst, A. A., Van Rooij, A. J., & Engels, R. C. M. E. (2010). Compulsive Internet Use Among Adolescents: Bidirectional Parent-Child Relationships. *Journal of Abnormal Child Psychology*, *38*(1), 77-89. doi:10.1007/s10802-009-9347-8
- Van den Eijnden, R. J. J. M., Van Rooij, A. J., & Meerkerk, G. J. (2007). *Excessief en Compulsief Internetgebruik. Een Kwalitatieve Analyse [Excessive and Compulsive Internetuse. A Qualitative Analysis]* (Factsheet). Rotterdam: IVO. Retrieved from <http://bit.ly/aXReFu>
- Van den Eijnden, R. J. J. M., Vermulst, A. A., Van Rooij, A. J., & Meerkerk, G. J. (2006). *Monitor Internet en Jongeren. Pesten op Internet en het psychosociale welbevinden van jongeren [Monitor Internet and Youth. Bullying on the Internet and psychosocial youth well-being]* (Factsheet). Rotterdam: IVO. Retrieved from <http://bit.ly/c25eGn>

- Van der Vorst, H., Vermulst, A. A., Meeus, W., Dekovic, M., & Engels, R. C. M. E. (2009). Identification and Prediction of Drinking Trajectories in Early and Mid-Adolescence. *Journal of Clinical Child & Adolescent Psychology*, 38(3), 329-341. doi:10.1080/15374410902851648
- Van Rooij, A. J., Jansz, J., & Schoenmakers, T. M. (2010). *Wat weten we over ... effecten van games. Een beknopt overzicht van wetenschappelijk onderzoek naar de effecten van games*. Zoetermeer: Stichting Kennisnet. Retrieved from <http://bit.ly/9sLFsa>
- Van Rooij, A. J., Meerkerk, G. J., Schoenmakers, T. M., Van den Eijnden, R. J. J. M., & Van de Mheen, D. (2008). *Monitor Internet en Jongeren. Ontwikkelingen in het internetgebruik van Nederlandse Jongeren [Monitor Internet and Youth. Developments in Internet Use among Dutch Youth]* (Factsheet). Rotterdam: IVO. Retrieved from <http://bit.ly/blr8GY>
- Van Rooij, A. J., Schoenmakers, T. M., Meerkerk, G. J., & Van de Mheen, D. (2008). *Monitor Internet en Jongeren. Videogames en Nederlandse jongeren [Monitor Internet and Youth. Video games and Dutch Youth]* (Factsheet). Rotterdam: IVO. Retrieved from <http://bit.ly/daTyd2>
- Van Rooij, A. J., Schoenmakers, T. M., Meerkerk, G. J., & Van de Mheen, D. (2009). *Introduction to video games, their publishers, and social responsibility concerning video game addiction*. Rotterdam: IVO. Retrieved from <http://bit.ly/da1uvR>
- Van Rooij, A. J., Schoenmakers, T. M., Van de Eijnden, R. J. J. M., & Van de Mheen, D. (2010). Compulsive Internet Use: The Role of Online Gaming and Other Internet Applications. *The Journal of Adolescent Health*, 47(1), 51-57. doi:10.1016/j.jadohealth.2009.12.021
- Van Rooij, A. J., Schoenmakers, T. M., Van den Eijnden, R. J. J. M., Vermulst, A. A., & Van de Mheen, D. (n.d.). Videogame Addiction Test (VAT): validity and psychometric characteristics. *[Draft]*.
- Van Rooij, A. J., Schoenmakers, T. M., Van den Eijnden, R. J. J. M., Vermulst, A. A., & Van de Mheen, D. (n.d.). Video game addiction and adolescent psychosocial wellbeing: the role of online and real-life friendship quality. *[Submitted for publication]*.
- Van Rooij, A. J., Schoenmakers, T. M., Vermulst, A. A., Van Den Eijnden, R. J. J. M., & Van De Mheen, D. (2011). Online video game addiction: identification of addicted adolescent gamers. *Addiction*, 106(1), 205-212. doi:10.1111/j.1360-0443.2010.03104.x
- Van Rooij, A. J., & Van den Eijnden, R. J. J. M. (2007). *Monitor Internet en Jongeren 2006 en 2007. Ontwikkelingen in internetgebruik en de rol van opvoeding [Monitor Internet and Youth 2006 and 2007. Developments in Internet Use and the Role of Parenting]* (IVO Reeks No. 54). Rotterdam: IVO. Retrieved from <http://bit.ly/cFUXO9>
- Vernberg, E. M., Abwender, D. A., Ewell, K. K., & Beery, S. H. (1992). Social Anxiety and Peer Relationships in Early Adolescence: A Prospective Analysis. *Journal of Clinical Child Psychology*, 21(2), 189-196.
- Wan, C., & Chiou, W. (2006). Why Are Adolescents Addicted to Online Gaming? An Interview Study in Taiwan. *CyberPsychology & Behavior*, 9(6), 762-766.
- Wang, C. C., & Wang, C. H. (2008). Helping Others in Online Games: Prosocial Behavior in Cyberspace. *CyberPsychology & Behavior*, 11(3), 344-346. doi:doi: 10.1089/cpb.2007.0045
- Warman, P. (2010a, September 10). Apple closing in on Nintendo with 40 million iOS gamers in the US. Key EU markets add another 20 million iOS gamers but gap with Nintendo is larger. *Newzoo*. Amsterdam. Retrieved from <http://www.newzoo.com/ENG/1504-Detail.html&id=60>. Accessed: 2010-10-07. (Archived by WebCite® at <http://www.webcitation.org/5t1abGV2K>).

- Warman, P. (2010b, October 6). 160 million US gamers add new platforms to their menu. Online business models catch on big time. Consoles still on top. *Newzoo*. Amsterdam. Retrieved from <http://newzoo.com/ENG/1504-Detail.html&id=62>. Accessed: 2010-10-07. (Archived by WebCite® at <http://www.webcitation.org/5tlavshk7>).
- West, R., & Hardy, A. (2006). *Theory of addiction*. Wiley-Blackwell. Retrieved from <http://books.google.nl/books?id=GZwAhltuAAC>
- Westwood, D., & Griffiths, M. D. (n.d.). The Role of Structural Characteristics in Video-Game Play Motivation: A Q-Methodology Study. *CyberPsychology, Behavior, and Social Networking*, 133-136.
- Widyanto, L., & McMurran, M. (2004). The Psychometric Properties of the Internet Addiction Test. *CyberPsychology & Behavior*, 7(4), 443-450. doi:10.1089/cpb.2004.7.443
- Williams, D., Yee, N., & Caplan, S. E. (2008). Who plays, how much, and why? Debunking the stereotypical gamer profile. *Journal of Computer-Mediated Communication*, 13, 993-1018.
- Wolf, M. J. P. (2005). Genre and the Video Game. In J. Raessens & J. Goldstein (Eds.), *Handbook of Computer Game Studies* (pp. 193-204). Cambridge, MA, USA: MA MIT Press.
- Wölfing, K., & Müller, K. W. (2010). Pathologisches Glücksspiel und Computerspielabhängigkeit. *Bundesgesundheitsblatt - Gesundheitsforschung - Gesundheitsschutz*, 53(4), 306-312. doi:10.1007/s00103-010-1038-7
- Wood, R. T. A. (2008a). A response to Blaszczynski, Griffiths and Turners' comments on the paper "Problems with the Concept of Video Game 'Addiction': Some Case Study Examples" (this issue). *International Journal of Mental Health and Addiction*, 6(2), 191-193.
- Wood, R. T. A. (2008b). Problems with the Concept of Video Game "Addiction": Some Case Study Examples. *International Journal of Mental Health and Addiction*, 6(2), 169-178.
- Wood, R. T. A., & Griffiths, M. D. (2008). Why Swedish people play online poker and factors that can increase or decrease trust in poker websites: A qualitative investigation. *Journal of Gambling Issues*, (21), 80-97.
- Wood, R. T. A., Griffiths, M. D., Chappell, D., & Davies, M. N. O. (2004). The Structural Characteristics of Video Games: A Psycho-Structural Analysis. *CyberPsychology & Behavior*, 7(1), 1-10.
- Wood, R. T. A., Gupta, R., Derevensky, J. L., & Griffiths, M. D. (2004). Video Game Playing and Gambling in Adolescents: Common Risk Factors. *Journal of Child & Adolescent Substance Abuse*, 14(1), 77-100.
- Yang, C. (2006). Evaluating latent class analysis models in qualitative phenotype identification. *Computational Statistics & Data Analysis*, 50(4), 1090-1104. doi:10.1016/j.csda.2004.11.004
- Yee, N. (2006). Motivations for Play in Online Games. *CyberPsychology & Behavior*, 9(6), 772-775. doi:10.1089/cpb.2006.9.772
- Young, K. S. (1998). *Caught in the net: how to recognize the signs of Internet addiction—and a winning strategy for recovery*. New York: Wiley.
- Yug. (2008, July 10). Fallout 3 - OFLC documents. *Australian Gamer*. Retrieved from [http://www.australiangamer.com/news/1161\\_fallout\\_3\\_-\\_oflc\\_documents.html](http://www.australiangamer.com/news/1161_fallout_3_-_oflc_documents.html)



# Summary

Scientists and health care workers are increasingly aware that some gamers escalate their gaming hobby to the point of problematic use. This phenomenon is often referred to as 'game addiction' by the general public. However, the scientific field of video game addiction research is still in its infancy and no clear definitions and measurement tools are available. This lack of clarity means that researchers approach the phenomenon with a wide variety of instruments and methods. Unfortunately this makes it difficult to compare study results and make uniform advancements in this field.

On the other hand, policymakers and health care practitioners cannot always afford to wait for answers, as they are directly confronted with the consequences of the unhealthy amount of time and energy that some adolescents spend on videogames. Therefore, the current thesis approached the study of video game addiction pragmatically. It aimed to sidestep some of the main issues and provide some preliminary answers. In the absence of consensus, 'video game addiction' was broadly defined as a loss of control over gaming leading to significant harm.

## Empirical studies

In line with the pragmatic aim, the second chapter addresses the relationship between the time (days per week) spent on different internet applications including online gaming, and a measure of internet addiction, namely the *Compulsive Internet Use Scale*, in a large sample of adolescents. Of the various applications, online gaming was shown to have the strongest association with internet addiction. Moreover, changes in online gaming were most strongly associated with changes in internet addiction over time. From these findings, it was argued that a subgroup of addicted internet users might exist, which should potentially be classified as addicted gamers.

Moving forward, the third chapter provides empirical data-driven identification of the group of addicted online gamers, which was proposed in the first study. Using a cluster analysis technique (latent class analysis), the study confirms the existence of the group through an analysis of patterns in internet addiction and weekly hours of online gaming. An extreme group of online gamers was identified, which showed a disproportionately high score on internet addiction. This small group of addicted online gamers (3%) represents about 1.5% of all children aged 13-16 years in the Netherlands.

The identification of this extreme group supported efforts to develop and validate a questionnaire aimed at measuring the phenomenon of online video game addiction: this is explored in the fourth chapter. A new 14-item *Video game Addiction Test* (VAT) was created by modifying the Compulsive Internet Use Scale. The Video game Addiction Test demonstrated excellent psychometric properties. Through the VAT, video game addiction was operationally defined as an addiction-like behavioral problem which presents as: a loss of control, intra- and interpersonal conflict, preoccupation with gaming, the utilization of games for purposes of coping or mood modification, and withdrawal symptoms if the gamer is forced to quit.

However, in order to be considered a clinically significant problem, some measure of harm has to be associated with video game addiction. In order to explore this harm, chapter five employs an epidemiological approach, demonstrating a clear relationship between video game addiction and psychosocial problems. Looking at direct associations, higher quality *real-life* friendships are related to having lower scores on scales measuring psychosocial problems. However, having higher quality of *online* friendships is associated with having more psychosocial problems, namely depression, social anxiety, and negative self-esteem (but not loneliness). This can be hypothesized to mean that the social benefits of becoming involved in an online community do not fully compensate the negative consequences of heavy gaming. Moreover, the study found three instances of moderation. For those gamers with high quality of online friendships (for loneliness) and high quality of real-life friendships (for social anxiety), the relationship between game addiction and psychosocial problems was found to be weaker.

In 2009, one of the major Dutch addiction care organizations initiated a pilot program to explore the possibility of using an existing *Cognitive Behavioral Therapy and Motivational Interviewing* based treatment program ('Lifestyle Training') to treat internet addiction. The sixth chapter evaluates this pilot treatment program by providing a qualitative analysis of the experiences of the therapists with the treatment of 12 self-proclaimed internet addicts. Therapists report that the manual-based treatment program 'Lifestyle Training', which is normally used for substance dependency and pathological gambling, is well suited for the problem of internet addiction. Although all patients indicated considerable suffering due to their excessive behavior, the patient group was very diverse in terms of actual behavior (ranging from gaming to online erotica) and had a high incidence of comorbid psychological problems.

## Reflection

The current thesis was able to demonstrate a convincing relationship between internet addiction and video game use and went on to demonstrate the existence of a small subgroup of internet addicted online gamers. These findings support the argument that online video game addiction can be seen as a subcategory of internet addiction. A second argument for splitting up 'internet' addiction is the diverse nature of the activities that internet addicts undertake on the internet. The thesis also demonstrates the importance of social interactions, through a measure of friendship quality. These research findings, the monolithic nature of video game addiction, and the unique reward-and punishment structure of games all indicate that a specific subcategory of online video game addiction should be considered in future research.

Having established the existence of a small group of gamers which has trouble controlling their online video game playing, the seventh chapter reflects on the role of the video game industry. Drawing parallels with other industries (such as gambling) which are heavily regulated, the issue of social responsibility of the video game industry is explored. In our opinion, a dual approach is necessary. Firstly, consumers should be informed about the potential addiction risks that can be attributed to playing online video games. Secondly, game publishers should implement proper referral services. Providing customer care and referral services might be in the best interest of the video game industry at this point, as it may well prevent revenue-restricting governmental intervention. Therefore, taking action on the issue of social responsibility will

benefit both the consumer (who will be better informed and properly referred) and the game industry alike. Findings support the creation of a new category for game addiction, which should benefit from further research. However, creating a category on the epidemiological level does not necessarily indicate a necessity for a new clinical, psychiatric diagnosis. Is a new psychiatric diagnosis for video game addiction really necessary? The fact that care institutions are rapidly developing new forms of treatment indicates a need for treatment and considerable associated harm. However, at the moment the game addiction problem does not seem to be particularly large. While video game addiction seems to meet all the basic criteria for addiction, the size of the issue is simply too small at the moment to warrant a new clinical diagnosis. This situation, however, may of course change in the near future.

Online video game addiction seems to be a very real problem for some people. In the Netherlands, although serious issues seem to develop in only a minority of gamers, i.e. 1.6% of the adolescents aged 13 to 16 years, this still represents tens of thousands of adolescents. Currently, only a small minority of those adolescents actually reaches clinical addiction care but these numbers will probably increase as gaming continues to develop and addiction care advertises treatment possibilities. In the meantime, industry, politicians, and health care providers have an opportunity to address this new issue with an appropriate mixture of prevention, treatment, and large-scale monitor studies.



# Acknowledgments

Without funding, there would have been no studies. Therefore, I would like to start by thanking the following organizations for the providing the opportunity to realize the various studies presented in this thesis:

Netherlands Organization for Health Research & Development (ZonMw, project #31160208 and #12003097001), Volksbond Foundation Rotterdam, Kennisnet Foundation, Addiction Care North Netherlands, Novadic Kentron Addiction Care, Tactus Addiction Care, De Hoop Foundation, and Brijder Addiction Care.

Writing a PhD thesis is primarily a learning opportunity. As studying involves teachers, I would like to thank those who were most directly involved: my promotor prof. dr. Dike van de Mheen, copromoter dr. Tim Schoenmakers, and copromotor dr. Regina van den Eijnden. Regina was the driving force at the start of the Monitor Study Internet and Youth at the start of the project and has continued to contribute to publication of papers and this thesis. Furthermore, the writing process would not have been possible without the trust which the IVO management - consisting of Dike van de Mheen and Miranda Audenaert - chose to place in my scientific endeavors.

As for the content of the thesis, I have come to appreciate the benefits of close collaboration in the small team consisting of me, Gert-Jan Meerkerk, and Tim Schoenmakers. Your critical mindset helped to prevent many near misses in my work. Scientific inquiry is hard to learn and even harder to master, so your support is greatly appreciated. Besides these directly involved colleagues, most other colleagues at IVO have - at one point or another - contributed in thought or deed to the research process, so thanks also go out to them.

The majority of data utilized in the current study has originates from secondary schools in the Netherlands. The participating schools have been very helpful and working with schools has been a very pleasant experience. In light of the huge workload that Dutch secondary schools face, and the many demands on students' time, I appreciate the priority that the Monitor Study Internet and Youth was given and hope that the results will contribute to a better understanding of the problems that some of the students face in controlling their gaming behavior. So, thanks go out to all the schools which participated in the Monitor Study Internet and Youth:

2College Cobbenhagen, 2College Ruiven, Agnieten College (locatie Carolus Clusius), AOC-oost, Calvin College, CBS Bloemenhof, Christelijk Lyceum Delft, De Geert Grotesschool, De Klimop, De Molenhoek, De Rietlanden, De Vierambacht, De Wiltzangh, Den Akker, Grafisch Lyceum Rotterdam, Het Landje, Het Mozaïek, L.W.Beekmanschool, Lauwers College, OSG Nieuw Zuid, OBS Iemekörf, OBS De Groeneweg, OBS De Omnibus, Octopus, PCBS "Max Havelaar", Pius X College, Porta Mosana, Prisma College - De Rotonde, Prisma College - Van Cooth, RKBS J.F.Kennedy, Sint-Janslyceum, Trevianum, Van Heemstra, and Vechtdal College.

After individually folding 6000 envelopes in 2006, I came to appreciate the benefits of involving students in the various aspects of the study. I have had the good fortune of working with (i.e. leaving some of the grunt work in the capable hands of) a variety of interns. Each of them delivered excellent performance during data collection, and ultimately, wrote interesting theses. So, thanks go out to: Ingrid Nan and Bianca de Ruijter (2007); Floor Bevaart (2008); Leonard Vanbrabant and Lieneke Spel (2009); and Martijn Altenburg (2010).

With regards to the more clinically oriented pilot-treatment study for which data collection took place at various Brijder Addiction Care clinics, I'd like to thank the various treating therapists, as well as the anonymous patients who agreed to participate in the study.

Working at IVO has the major benefit that the organization maintains strong ties with various addiction and health care institutions. As such, I have had the privilege of introducing the scientific findings and debate on video game and internet addiction to a wider audience on multiple occasions. Video game addiction is a subject which people seem to be very opinionated about, and my writing and thinking has benefitted greatly from feedback at those types of gathering. Thanks for listening to my presentations, and thanks for sharing!

At least five dedicated professionals in the field have directly contributed to studies. Firstly, professor Mark Griffiths, who singlehandedly wrote half the literature on video game addiction, was kind enough to share his thoughts at a conference and contribute to the editorial on social responsibility. Secondly, our residential qualitative analysis expert Cas Barendregt provided his valuable expertise on the treatment study. Thirdly, Mieke Zinn was kind enough to contribute her extensive therapeutic experience to the treatment study. Finally, I have had the great pleasure of analyzing data for a variety of papers with Ad Vermulst. Ad has a talent for explaining the really, really complicated in the simplest way possible without compromising on the depth of insight. Thanks for your contributions!

I'm blessed with a variety of interesting friends on a variety of continents, and their continuing criticism, personal game addiction (merely rumors of course!), and honest feedback have kept me on my feet and determined to complete the thesis. Fortunately the list is too long to present here, but you can always take a look at my Facebook page if you have managed to arrive in the 21<sup>st</sup> century. Thanks guys!

Of course, my family has suffered most seriously under my increasingly scientific attitude towards just about anything. So mom, dad, Luuk, and Claire: thanks for sitting through the many stories and thanks for free meals!

Finally, I'd like to thank my girlfriend Yvette for her support and all the meals she kindly promised, and sometimes actually even managed, to cook during my final writing struggles. "You're a late riser and I'm a morning person, but we can always meet up in the afternoon", you said once and we have not stopped having great afternoons ever since.



# Curriculum Vitae

Antonius J. van Rooij, known as Tony in less formal surroundings, is a researcher and PhD student at the IVO Addiction Research Institute. He holds a master's degree in both Business Administration (M.Sc. in B.A., Management of Change, 2004), and Psychology (M.Sc. in Clinical and Health Psychology, 2006).

In his spare time, Tony is a dedicated gamer and fixer-of-broken-computers, and has extensive experience with playing video games - including a position as class leader in a competitive World of Warcraft guild.

Since 2005 he has been involved in the execution and management of the large scale, repeating survey 'Monitor study Internet and Youth', which was deemed worthy of receiving government funding through ZonMW for the 2009 (4<sup>th</sup>) and 2010 (5<sup>th</sup>) measurements. This funding enabled more scientifically oriented output and is largely responsible for the current thesis. Besides this main project, he has worked on several smaller scale projects in the period of 2006 through 2010, mostly in the area of other 'new' behavioral addictions.

Supported by the IVO internet and gaming team - which includes Tim Schoenmakers, Ph.D., Gert-Jan Meerkerk, Ph.D. and our former IVO colleague Regina van den Eijnden, Ph.D. - Tony's work has resulted in a wide variety of Dutch research publications and factsheets, a growing number of international peer reviewed publications, and regular public presentations at health-care conferences, in addiction care clinics, and at secondary schools.

Up-to-date information on publications and contact information for Tony can be found through [www.ajvanrooij.com](http://www.ajvanrooij.com) (English), while the IVO research team can be found through navigation to the internet section at [www.ivo.nl](http://www.ivo.nl) (Dutch).

## List of academic publications

### THESIS CHAPTER

- 5 Van Rooij, A. J., Schoenmakers, T. M., Van den Eijnden, R. J. J. M., Vermulst, A. A., & Van de Mheen, D. (n.d.). **Video game addiction and adolescent psychosocial wellbeing: the role of online and real-life friendship quality.** [*Submitted for publication*].
- 4 Van Rooij, A. J., Schoenmakers, T. M., Van den Eijnden, R. J. J. M., Vermulst, A. A., & Van de Mheen, D. (n.d.). **Videogame Addiction Test (VAT): validity and psychometric characteristics.** [*Submitted for publication*].
- 3 Van Rooij, A. J., Schoenmakers, T. M., Vermulst, A. A., Van Den Eijnden, R. J. J. M., & Van De Mheen, D. (2011). **Online video game addiction: identification of addicted adolescent gamers.** *Addiction*, *106*(1), 205-212. doi:10.1111/j.1360-0443.2010.03104.x  
Van den Eijnden, R. J. J. M., Spijkerman, R., Vermulst, A. A., Van Rooij, A. J., & Engels, R. C. M. E. (2010). **Compulsive Internet Use Among Adolescents: Bidirectional Parent-Child Relationships.** *Journal of Abnormal Child Psychology*, *38*(1), 77-89. doi:10.1007/s10802-009-9347-8
- 7 Van Rooij, A. J., Meerkerk, G. J., Schoenmakers, T. M., Griffiths, M. D., & van de Mheen, D. (2010). **Video game addiction and social responsibility.** *Addiction Research & Theory*, *18*(5), 489-493. doi:10.3109/16066350903168579
- 2 Van Rooij, A. J., Schoenmakers, T. M., Van de Eijnden, R. J. J. M., & Van de Mheen, D. (2010). **Compulsive Internet Use: The Role of Online Gaming and Other Internet Applications.** *The Journal of Adolescent Health*, *47*(1), 51-57. doi:10.1016/j.jadohealth.2009.12.021
- 6 Van Rooij, A. J., Zinn, M. F., Schoenmakers, T. M., & Van de Mheen, D. (2010). **Treating internet addiction with cognitive-behavioral therapy: A thematic analysis of the experiences of therapists.** *International Journal of Mental Health and Addiction*. doi:10.1007/s11469-010-9295-0  
Van Rooij, A. J. (2009). **Videogameverslaving - een verkenning** [Videogame addiction - an exploration]. *Tijdschrift voor Gezondheidswetenschappen*, *87*(3 [Nederlands Congres Volksgezondheid]), 24.  
Van Rooij, A. J., & Snoek, A. (2009). **Gameverslaving, fabel of feit** [Game addiction, fable or fact]. *TSG: tijdschrift voor gezondheidswetenschappen*, *87*(5), 210-211. doi:10.1007/BF03082241  
Van Rooij, A. J. (2007). (Bespreking van:) **Gameverslaving - Probleemgebruik herkennen, begrijpen en overwinnen** [Book review: Game addiction - Recognizing, understanding, and beating problem use]. *Maandblad Geestelijke volksgezondheid*, *62*(5), 451-452.

