

EÖTVÖS LORÁND UNIVERSITY
FACULTY OF EDUCATION AND PSYCHOLOGY

Orsolya Király

**ASSESSMENT AND PSYCHOLOGICAL MECHANISMS
OF PROBLEMATIC ONLINE GAMING**

Doctoral School of Psychology

Head of the School: Prof. Attila Oláh, CSc, Eötvös Loránd University

Personality and Health Psychology Program

Head of the Program: Prof. Attila Oláh, CSc, Eötvös Loránd University

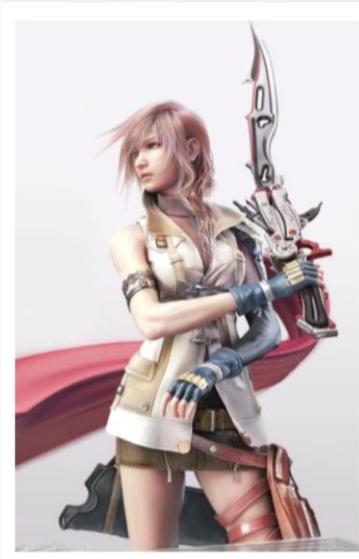
Supervisor:

Prof. Zsolt Demetrovics, DSc, Eötvös Loránd University

Committee members:

- President: Prof. Rácz József, DSc, Eötvös Loránd University
- Secretary: Dr. Habil. Ágoston Schmelowszky, PhD, associate professor, Eötvös Loránd University
- Opponents: Dr. Adrienn Ujhelyi, PhD, assistant professor, Eötvös Loránd University
Dr. Attila Körmendi, PhD, associate professor, University of Debrecen
- Members: Prof. Enikő Csilla Kiss, PhD, University of Pécs
Dr. Habil. Nguyen Luu Lan Anh, PhD, associate professor, Eötvös Loránd University
Dr. Mária Hoyer, PhD, associate professor, Semmelweis University
Dr. Zsolt Unoka, PhD, assistant professor, Semmelweis University

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LIST OF ABBREVIATIONS

AIC:	Akaike Information Criterion
BIC:	Bayesian Information Criterion
BSI:	Brief Symptom Inventory
CFI:	comparative fit index
DSM-5:	The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition
FIML:	full information maximum likelihood
GSI:	Global Severity Index
IA:	Internet addiction
IAD:	Internet addiction disorder
IGD:	Internet gaming disorder
IGDT-10:	Ten-Item Internet Gaming Disorder Test
IRC:	Internet relay chat
LMR-LRT:	Lo-Mendell-Rubin Likelihood Ratio Test
MMORPG:	massively multiplayer online role-playing games
MOFPS:	multiplayer online first-person shooter
MMORTS:	massively multiplayer online real-time strategy
MOBA:	multiplayer online battle arena
MOGQ:	Motives for Online Gaming Questionnaire
PIU:	problematic Internet use
POG:	problematic online gaming
POGQ:	Problematic Online Gaming Questionnaire
RMSEA:	root mean square error approximation
SEM:	structural equation modeling
SRMR:	standardized root mean square residuals
SSABIC:	Sample Size Adjusted BIC
TLI:	Tucker-Lewis Index

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LIST OF PUBLICATIONS DIRECTLY USED IN THE DISSERTATION

- Pápay, O.¹, Urbán, R., Griffiths, M. D., Nagygyörgy, K., Farkas, J., Elekes, Z., Felvinczi, K., & Demetrovics, Z. (2013). Psychometric properties of the Problematic Online Gaming Questionnaire Short-Form (POGQ-SF) and prevalence of problematic online gaming in a national sample of adolescents. *Cyberpsychology, Behavior, and Social Networking*, 16(5), 340-348. IF=2.410
- Király, O., Griffiths, M. D., Urbán, R., Farkas, J., Kökönyei, G., Elekes, Z., Tamás, D., Demetrovics, Z. (2014). Problematic Internet Use and Problematic Online Gaming Are Not the Same: Findings from a Large Nationally Representative Adolescent Sample. *Cyberpsychology, Behavior, and Social Networking*, 17(12), 749-754. IF=2.182
- Király, O., Nagygyörgy, K., Griffiths, M. D., & Demetrovics, Z. (2014). Problematic online gaming. In K. Rosenberg & L. Feder (Eds.), *Behavioral Addictions: Criteria, Evidence and Treatment* (pp. 61-95). New York, NY: Elsevier.
- Király, O., Urbán, R., Griffiths, M. D., Ágoston, C., Nagygyörgy, K., Kökönyei, G., & Demetrovics, Z. (2015). Psychiatric symptoms and problematic online gaming: The mediating effect of gaming motivation. *Journal of Medical Internet Research*, 17(4), e88. IF=3.428
- Király, O., Nagygyörgy, K., Koronczai, B., Griffiths, M. D., & Demetrovics, Z. (2015). Assessment of Problematic Internet Use and Online Video Gaming. In E. Aboujaoude & V. Starcevic (Eds.), *Mental Health in the Digital Age: Grave Dangers, Great Promise* (pp. 46-68). Oxford: Oxford University Press.
- Király, O., Słeczkiewicz, P., Pontes, H. M., Urbán, R., Griffiths, M. D., & Demetrovics, Z. (2015). Validation of the Ten-Item Internet Gaming Disorder Test (IGDT-10) and evaluation of the nine DSM-5 Internet Gaming Disorder criteria, *under review*.
- Király, O., Griffiths, M. D., & Demetrovics, Z. (2015). Internet gaming disorder and the DSM-5: Conceptualization, debates, and controversies. *Current Addiction Reports*, doi: 10.1007/s40429-015-0066-7.

¹ My first publications appeared under my maiden name, Orsolya Pápay.

PREFACE

It took me quite a long time and three degrees (a BA and an MA in Marketing, and an MA in Sociology) to figure out what truly interests and fascinates me in life: psychology, video games and research. Fortunately, seven years after my high-school graduation I opted for and got the chance to do a PhD in Personality and Health Psychology, having ‘video game addiction’ as my main research focus. From the very first moment I encountered this topic and the very first time I stepped over the doorstep of the Faculty of Psychology and Education, Eötvös Loránd University (Izabella building), I felt that I am finally at the right place, and I am finally doing what I have to do.

Virtual worlds have fascinated me from the moment I encountered them. It was in my early high-school years when I first had the opportunity to use computers with Internet connection in the computer lab of our school. Back then all of us was obsessed with IRC (Internet Relay Chat) which let us communicate with complete strangers from all around the world through the Internet. Later on my sister made some friends who seemed to live their lives online, and years later I met a friend of a friend who was playing an online game for months without getting bored of it and without feeling the need to do anything else. As far as I can remember these were the impulses that instantly raised my curiosity and gradually led me towards this research area: the psychology of video games, most specifically, video games involving 3D virtual worlds.

The last four years of my PhD studies were just amazing. I had the chance to read the gist of the ‘video game addiction’ literature, and also other great articles related to the psychology of video games. Moreover, I got involved in several research projects in this area, and I met several great researchers with similar research interests from all around the world.

The present dissertation is the outcome and summary of my most important papers written during my PhD years, and it concerns the assessment and psychological mechanisms of problematic online gaming.

The first part, namely the Introduction, describes the phenomenon of problematic online gaming in details. More specifically, it discussed the definition and conceptualization of the problem behavior, it presents its symptomatology, disease process and comorbidity followed by the most important considerations about assessment. The dissertation then

continues with the epidemiology and etiology sections, reporting the most important findings related to the prevalence and possible risk factors of problematic online gaming, respectively. The last part of the Introduction concerns the cultural aspects, followed by the most important practices regarding prevention and treatment.

The second part of the dissertation consists of four empirical studies related to the assessment and psychological mechanisms of problematic online gaming. The first paper presents the validation of the Problematic Online Gaming Questionnaire Short-Form (POGQ-SF) questionnaire and the prevalence of the problem behavior in a national sample of Hungarian adolescents. It was published in *Cyberpsychology, Behavior, and Social Networking* in 2013 (Pápay, O., Urbán, R., Griffiths, M. D., Nagygyörgy, K., Farkas, J., Elekes, Z., Felvinczi, K., & Demetrovics, Z. (2013). Psychometric properties of the Problematic Online Gaming Questionnaire Short-Form (POGQ-SF) and prevalence of problematic online gaming in a national sample of adolescents. *Cyberpsychology, Behavior, and Social Networking*, 16(5), 340-348). The second paper compares problematic online gaming and problematic Internet use and it was published in the same journal one year later (Király, O., Griffiths, M. D., Urbán, R., Farkas, J., Kökönyei, G., Elekes, Z., Tamás, D., Demetrovics, Z. (2014). Problematic Internet Use and Problematic Online Gaming Are Not the Same: Findings from a Large Nationally Representative Adolescent Sample. *Cyberpsychology, Behavior, and Social Networking*, 17(12), 749-754). The third study investigates the role of psychiatric distress and gaming motives in problematic online gaming and it was published in the *Journal of Medical Internet Research* in 2015 (Király, O., Urbán, R., Griffiths, M. D., Ágoston, C., Nagygyörgy, K., Kökönyei, G., & Demetrovics, Z. (2015). Psychiatric symptoms and problematic online gaming: The mediating effect of gaming motivation. *Journal of Medical Internet Research*, 17(4), e88). The last study reports the validation of another measurement tool, developed to assess Internet gaming disorder (IGD) as defined by the DSM-5. Additionally, the study aims to evaluate the nine criteria of IGD and the cut-off threshold proposed by the diagnostic manual using statistical methods. This paper has recently been submitted to Addictive Behaviors as an invited paper in an upcoming special issue on Technological Addictions (Király, O., Slezka, P., Pontes, H. M., Urbán, R., Griffiths, M. D., & Demetrovics, Z. (2015). Validation of the Ten-Item Internet Gaming Disorder Test (IGDT-10) and evaluation of the nine DSM-5 Internet Gaming Disorder criteria, *under*

review). The co-authors of the four papers have all given their approval to use these studies in my PhD dissertation.

The last part of the dissertation comprises of a general discussion in which I try to summarize the most important findings of my studies and discuss how they contribute to the field. I also point out the limitations of my work and list the possible research directions the problematic gaming field should be focusing on in the near future.

1 INTRODUCTION

1.1 Human play, video games and online games²

The activity of play has always been present in human history. It is a range of voluntary, intrinsically motivated activities associated with recreational pleasure and enjoyment. As such, play is most commonly associated with children, but adults also practice it for recreational purposes. Moreover, play has an essential role in human development both in terms of physical (e.g., hand-eye coordination) and cognitive development (e.g., concentration). Additionally, due to its social nature, the activity of play fosters the practice and improvement of social skills (Garvey, 1990). Interestingly, these developmental benefits are not limited to childhood but can be exploited even in adulthood or later stages of life (Green & Bavelier, 2006; Studenski et al., 2010).

In his well-known analysis of play, Huizinga defines play as "[...] a free activity standing quite consciously outside 'ordinary' life as being 'not serious' but at the same time absorbing the player intensely and utterly. It is an activity connected with no material interest, and no profit can be gained by it. It proceeds within its own proper boundaries of time and space according to fixed rules and in an orderly manner. It promotes the formation of social groupings that tend to surround themselves with secrecy and to stress the difference from the common world by disguise or other means." (Huizinga, 1938, p. 13). On the grounds of this definition, play constitutes a separate and independent sphere of human activity with its own goals, rules and boundaries. Outside the boundary, life proceeds according to the ordinary rules, however, within the boundary (the invisible membrane called the 'magic circle' according to Huizinga), anything can happen, physical rules don't necessarily exist anymore, time and space perception may be completely altered.

The recent technological development had an incredible impact on the options for play. The appearance and accessibility of personal computers brought along the video games, that are, "games played by electronically manipulating images produced by a computer program on a monitor or other display" (Oxford Dictionaries, 2015). Beginning with the

² This chapter is an extended version of the section entitled 'History and typology of online games' from the following book chapter: Király, O., Nagygyörgy, K., Griffiths, M. D., & Demetrovics, Z. (2014). Problematic online gaming. In K. Rosenberg & L. Feder (Eds.), *Behavioral Addictions: Criteria, Evidence and Treatment* (pp. 61-95). New York, NY: Elsevier.

90s, video games have become widely popular and accessible to such an extent that nowadays, they are one of the most widespread recreational activities irrespective of culture, age, and gender (Entertainment Software Association, 2015). Video games can be played on many different platforms, such as personal computers (PCs), video game consoles, handheld game consoles, tablets, or smartphones – all of which can be connected to the Internet. The general accessibility of the Internet was a huge step for video games, because it allowed hundreds of gamers from all around the world to play together.

Based on whether games are played through the Internet or not, video games can be divided into two main groups – online and offline video games – a distinction that can significantly influence player behavior. Offline games do not require an Internet connection, and are usually (but not always) played alone. They have a well-defined start and finish point, and the goals of the game can usually be achieved by the players themselves without external help from any other player. On the contrary, online games are played through the Internet, and are typically played simultaneously by players who can communicate with one another in real time, cooperating or competing at will. Furthermore, new areas, tasks and quests are frequently added by the game developers and/or game operators – another aspect which would not be possible without the Internet. Because of their inherent structural characteristics, these games do not usually have a predetermined end point. Subsequently, there is no real loss, and tasks can be repeated several times. Moreover, due to the regular updates (e.g., expansion packs), these games remain attractive and are able to maintain their player base for years or even decades. Some goals can be achieved alone or together with other players, while others can be completed only by players working together in highly cooperative groups. Competing with fellow players is also possible and leads to immediate social comparison (Griffiths, 2010b; M. G. Kim & Kim, 2010; Williams, Ducheneaut, Xiong, & Yee, 2006). Consequently, online games are distinguished from offline games mostly by their social nature (Charlton & Danforth, 2007; Choi & Kim, 2004; M. G. Kim & Kim, 2010) and the possibility to be updated regularly. Although in some games the aforementioned characteristics blend, most of them can clearly be specified as offline or online games. Due to these characteristics, the popularity of these game types can differ greatly. De Prato et al. (2010) indicate that 70% of gamers prefer online as opposed to offline games.

Online gamers spend more time gaming than those who play offline games, mostly because of the social nature of these games. They find online games more pleasant and satisfying than offline games and sometimes prefer playing games to real-life activities (Ng & Wiemer-Hastings, 2005). These motives may also account for the findings showing that online games trigger the appearance of problematic use more often than offline games do (Griffiths, Davies, & Chappell, 2004; Griffiths & Meredith, 2009; Rehbein, Kleimann, & Mößle, 2010). The present dissertation focuses mostly on online video games and I will refer to them simply as online games, although several different names (e.g., online video games, Internet video games, Internet games) can be found in the literature.

The first prototypical online games were the text-based virtual worlds called multi-user domains (referred to as MUDs) that appeared in the 1970s (Bartle, 2003). These were persistent³ digital worlds where several players could “be present” and interact with each other at the same time (using their own imagination instead of graphics). This new environment created so many new possibilities (e.g., real-time chat, interaction between the players, parallel activities, cooperation, competition, social comparison) that the popularity of MUDs continued to increase as the number of Internet users rose. During the same period, table-top role-playing games (RPGs) appeared in which players threw dice to determine the outcomes of moving small figures around a player-drawn map. In both types of game (MUDs and RPGs), players created characters with attributes and skills to help them fight together through dungeons filled with dangerous beasts to acquire magical items (Barnett & Coulson, 2010).

Out of these text-based virtual worlds and table-top role-playing games arose the surprisingly complex (two- and three-dimensional) graphical virtual worlds, known today as MMOGs (massively multiplayer online games), or MMOs for short. The “massively” component indicates that hundreds or even thousands of players can be present in the same virtual game world at any given moment. The “multiplayer” word refers to the fact that people play simultaneously in the same online world, not in an individual copy of it, while the word “online” indicates that the game can be played only through a platform with an Internet connection (Barnett & Coulson, 2010). The three mosaic words also hint at the degree of complexity. For the time being, MMOGs are the most complex games

³ Persistence refers here to the fact that these digital worlds not only are generated when some players enter the game but exist continually independently of the players’ actual presence.

and offer persistent virtual spaces for the hundreds of thousands of players that inhabit them. Multiplayer online games (MOGs) are arguably simpler. These are also played by groups of players together, but do not offer synchronic spaces, and the number of players is highly limited (e.g., 4-16 players). An online game (OG) simply refers to the fact that such games are played in an Internet-based environment, and the multiplayer mode is not a condition.

MMOs vary in terms of content, challenges, and setting, but all MMOs share six technical and design characteristics that collectively differentiate them from other types of games: persistence, physicality, avatar-mediated play, vertical game play, perpetuity, and social interaction (E. Chan & Vorderer, 2006). *Persistence* refers to the fact that the game world exists and changes even when a player is not actively playing (i.e., he or she is away from the keyboard), and as a result the game world may have been altered between two gaming sessions. *Physicality* means that the game models a more or less realistic world with a consistent set of physical rules, so for example a player's character will die when falling into a precipice. The player's character, or *avatar*, allows for avatar-mediated play, in which the player uses his or her character to interact with the game world and other players (see 1.1. Figure 1). *Vertical game play* and *perpetuity* refer to the fact that MMOs—unlike single-player games—cannot be completed; they can be played almost endlessly. After attaining the highest level, players may still remain in the game world and complete more challenges or just participate in the *social* activities. Even though players can play alone, social interaction, cooperation, and rivalry between the players form an essential part in an individual's game play (E. Chan & Vorderer, 2006), and provide the opportunity to make friends, overcoming physical distance and other limitations by way of a variety of specialized communication channels. There are plenty of other online game types beside MMOs, however, MMOs are particularly important from the standpoint of this dissertation because of their highly addictively nature (this topic is analyzed in details in chapter 1.10.1. [Addictive online games]).



1.1. Figure 1. A player controlled avatar in a massively multiplayer online role playing game

MMOs can be divided in three major groups and an “other” category (Nagygyörgy, Mihalik, & Demetrovics, 2012; Rice, 2006):

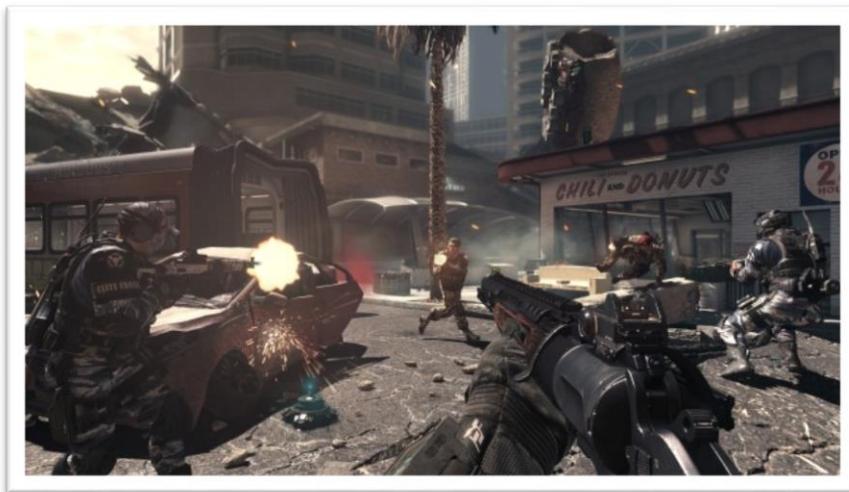
1. **Massively multiplayer online role-playing games (MMORPGs)** and their variations (see 1.1. Figure 2): As in traditional role-playing games, players control an avatar that becomes their virtual game self. Players choose a profession that determines their role and abilities. Through fulfilling different tasks or missions in the game, the avatars develop (a vertical development called “leveling up”) and acquire precious objects that lead to the differentiation in status between avatars.
2. **Massively multiplayer online first person shooters (MMOFPSs)** and their variations (see 1.1. Figure 3): These are skill-demanding action games, in which the player controls a single avatar from a first-person perspective. They mostly rely on reaction time and attention abilities and offer several ways of cooperation and competition—on an individual or group level—between the players.
3. **Massively multiplayer online real-time strategy (MMORTSs) games** and their variations (see 1.1. Figure 4): As opposed to the first two game types, here the

players typically oversee large troops and/or territories in a virtual world, engage in battles, or conclude alliances with other players. Through successful management, players establish status in the game world and gain esteem from other players.

4. **Other online games:** This category includes all the other online games, such as sport and racing games (see 1.1. Figure 5), music/rhythm games (1.1. Figure 6), flash games (1.1. Figure 7), Facebook games (1.1. Figure 8) and so on. Because this is a mixed category, all the specific and idiosyncratic characteristics cannot be outlined. Compared to the other three game types, these games attract fewer players, but at the same time the proportion of female players is much higher (Nagygyörgy et al., 2013).



1.1. Figure 2. *Multiplayer battle in the most successful MMORPG: World of Warcraft*



1.1. Figure 3. *Multiplayer battle in a popular online FPS game: Call of Duty*



1.1. Figure 4. Protoss base in one of the most popular strategy games: Starcraft 2



1.1. Figure 5. FIFA 2015: one of the most successful football games



1.1. Figure 6. Just Dance 2015: a wonderful dance game involving real body movement



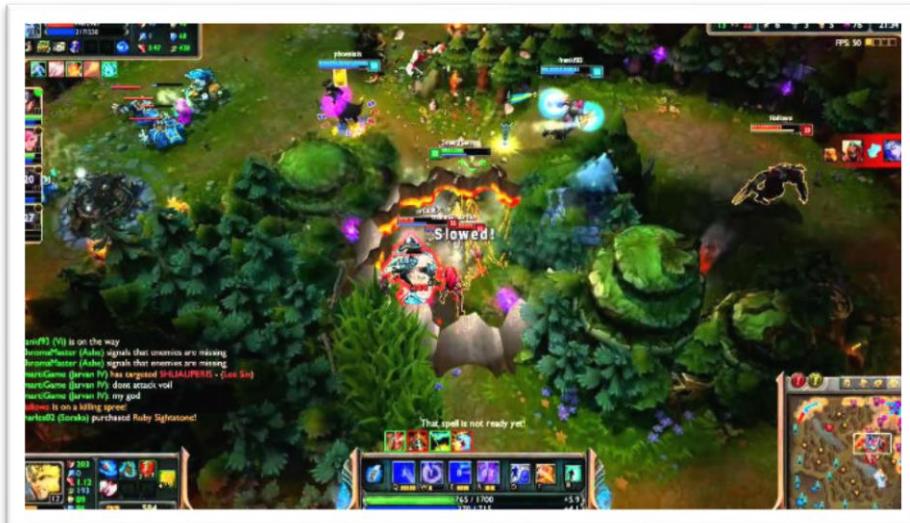
1.1. Figure 7. A point-and-click flash game where the goal is to become the ultimate douchebag



1.1. Figure 8. Royal Story, a simulation game released on Facebook

The same categories can also be applied to video games in general. More specifically, role playing games, first person shooters, and real time strategy games are large categories that apply to video games in general, whether they are online or offline, MMOs or simple games. Additionally, the so-called Multiplayer Online Battle Arena (MOBA) games have also become increasingly popular recently with millions of players around the globe (Grubb, 2015), and they might also be of particular interest from the standpoint of problematic online gaming. This gametype mixes the structural characteristics of real time strategy and role playing games. Usually two teams of five players compete with each other in discrete battles in an arena. Each player controls a single “hero” (avatar)

with special skills and abilities. Cooperative team-play and character development are emphasized (see 1.1. Figure 9).



1.1. Figure 9. *League of Legends*, one of the most successful MOBA games to date

Data from 2009 has shown that 79% of online gamers had a clear gaming preference which might suggest that specific games fulfill specific psychological needs (Nagygyörgy et al., 2013). A short section on online gaming motives is presented in chapter 1.10.2 (entitled ‘Motivational aspects’).

Lastly, another important point to be made is that video gaming clearly differs from gambling, because there is no money staked during these games in an attempt to win further money. This dissertation focuses solely on online gaming, that is, everything presented here refers to online video gaming and not gambling, unless otherwise mentioned.

1.2 Demographics of online gamers⁴

But who is playing these online video games? The stereotypical image about video game players has for long been that mostly socially withdrawn young males with unstylish looks and fragile identities play these games (Griffiths, Davies, & Chappell, 2003). However, even if this stereotype had some truths in it a few decades ago, it certainly does not have any more. Nowadays, video game playing constitutes one of the most popular

⁴ This chapter uses paragraphs from the section entitled ‘Prevalence and Demographics of the Online Gamer Population’ from the following book chapter: Király, O., Nagygyörgy, K., Griffiths, M. D., & Demetrovics, Z. (2014). Problematic online gaming. In K. Rosenberg & L. Feder (Eds.), *Behavioral Addictions: Criteria, Evidence and Treatment* (pp. 61-95). New York, NY: Elsevier.

forms of entertainment for children, adolescents and adults as well (Kardefelt-Winther, 2014b, 2014c).

According to the survey results of the Entertainment Software Association (ESA) regarding the video game playing habits of the US population, 42% of Americans play video games regularly (3 hours or more per week). The average US game player is 35 years old and 56% are male. 26% of gamers is under 18 years, 30% is between 18 and 35, 17% is between 36–49 years, and 27% is older than 50 years. The average number of years gamers have been playing video games is 13 years. Top three types of video games that the most frequent gamers play the most often are social games (31%), action games (30%), and puzzle/board game/card game/game shows (30%). Top devices most frequent gamers use to play games on are: PCs (62%), game consoles (56%), smartphones (35%), wireless devices (31%), handheld systems (21%) (Entertainment Software Association, 2015).

According to a large-scale but non-representative online survey examining online gamers in Hungary (Nagygyörgy et al., 2013) ($N = 4374$), the mean age of online gamers was 21 years, and participants were mostly male (91%) and single (66%). Their average weekly game time varied between less than 7 hours (10%) and more than 42 hours (also 10%) with most of the gamers playing 15–27 hours weekly (35%). The huge differences in mean age and gender ratios between findings from the US and Hungary may be the result of both cultural and methodological issues. In the US video gaming is a more popular leisure time activity with a much longer history, therefore people play games for more years leading to a higher mean age of players. Additionally, being a popular leisure time activity, much more women are involved in gaming in the US than in post-communistic countries such as Hungary. Moreover, the ESA survey was based on a national sample while the Hungarian study had a non-representative online gamer sample which tends to over represent dedicated online gamers playing particular types of games having a mostly male audience (Khazaal et al., 2014).

Data regarding the three main game types may provide a more nuanced view. The proportion of female gamers is the lowest in the case of first-person shooter (FPS) games (1%–2%; Jansz & Tanis, 2007; Nagygyörgy et al., 2013) and the highest between massively multiplayer online role-playing game (MMORPG) users (15%–30%; H. Cole & Griffiths, 2007; Nagygyörgy et al., 2013; Yee, 2006a). FPS users are the youngest (18–19.8 years; Jansz & Tanis, 2007; Nagygyörgy et al., 2013), while both real-time strategy

(RTS) and MMORPG players are significantly older (22 and 21–27 years, respectively; Nagygyörgy et al., 2013; Yee, 2006a). Among the three main groups, MMORPG gamers spend the most time playing (Nagygyörgy et al., 2013).

Because MMORPGs are the most researched games, there is additional information regarding such players that is still unknown in the case of other game types. For instance, half of MMORPG players work full time, 22.2% are students, and 14.8% are homemakers (89.9% of whom were female). Furthermore, 36% of the gamers are married, and 22% of them have children (Yee, 2006a; Yee, 2006d). Overall, it can be concluded that the demographic composition of MMORPG users is quite varied and probably more diverse than the composition of RTS and FPS users, although this needs further empirically testing.

1.3 Problematic online gaming

During the past two decades as the video game industry has grown to a multibillion industry preceding both Hollywood and the music industry in terms of yearly revenues (Goodkind, 2014; Mullich, 2014), the problematic (i.e., addictive-like) use of video games has become a topic of increasing research interest. Although not an official diagnosis yet, the inclusion of Internet gaming disorder (IGD) in the Section 3 of the DSM-5 called “Emerging Measures and Models” (American Psychiatric Association, 2013) signals the importance of the phenomenon and the common will to reach a consensus regarding the nature of the problem.

Nevertheless, the author and her research colleagues prefer to use the name *problematic online gaming* (POG)⁵ instead of the other names suggested and used in the literature (e.g., problem video game playing, pathological video game use or gaming, online gaming addiction, compulsive Internet use, Internet gaming addiction, Internet gaming disorder) (Griffiths, Király, Pontes, & Demetrovics, 2015). The term problematic online gaming describes the quintessence of the phenomenon (i.e., the excessive behavior leads to serious gaming-related problems), while avoiding the notion of addiction or

⁵ Although *problematic online gaming* (POG) is the preferred term throughout this dissertation, other terms might also be used for specific reasons. For instance the term *Internet gaming disorder* (IGD) is also used in Study 4 because the study describes an instrument developed to assess IGD as defined in the DSM-5 and evaluates the nine IGD criteria as proposed by the same diagnostic manual. Moreover, when I refer to findings or statements of other studies, in certain cases I use the term provided by the original study instead of the term preferred by our research team.

dependency. This later is important because the precise future definition and diagnostic criteria need to be clarified and agreed upon on the basis of DSM-5 before using the aforementioned notions.

In the following chapters I will review the most important questions regarding problematic online gaming by summarizing the main research findings of the problematic gaming literature and also the main approaches to some of these questions. More specifically, I will review the debate around the conceptualization and definition of the phenomenon, its symptomology and negative consequences, its disease process and comorbidity with psychiatric disorders, the efforts and confusion around the assessment, the epidemiological findings, the etiology and cultural aspects of the phenomenon and the practices for prevention and treatment.

1.4 Definition, conceptualization, debates and controversies⁶

1.4.1 Early conceptualizations

In the early empirical works on problematic gaming we can recognize two different conceptual approaches towards the problem behavior and most specifically to online games themselves. One group of researchers considered video games as the starting point for examining the characteristics of this specific pathology (e.g., Charlton & Danforth, 2007; Griffiths, 2005a; Griffiths & Meredith, 2009; Peters & Malesky, 2008; Porter, Starcevic, Berle, & Fenech, 2010), whereas others considered the Internet as the main platform that united different addictive Internet activities, including online games (e.g., van Rooij, Schoenmakers, Vermulst, van den Eijnden, & van de Mheen, 2011; Young, 2009). Later on, but still before the appearance of the DSM-5, some studies made an effort to integrate both approaches (e.g., Demetrovics et al., 2012; M. G. Kim & Kim, 2010). Subsequently, problematic online gaming has been viewed either as a specific type of video game addiction, as a variant of Internet addiction, or as an independent diagnosis. In the following, each of these approaches is discussed. Furthermore, despite the essential differences between these conceptualizations, all of them consider problematic online

⁶ This chapter is based on certain sections of the following book chapter: Király, O., Nagygyörgy, K., Griffiths, M. D., & Demetrovics, Z. (2014). Problematic online gaming. In K. Rosenberg & L. Feder (Eds.), *Behavioral Addictions: Criteria, Evidence and Treatment* (pp. 61-95). New York, NY: Elsevier, and the following paper: Király, O., Griffiths, M. D., & Demetrovics, Z. (2015). Internet gaming disorder and the DSM-5: Conceptualization, debates, and controversies. *Current Addiction Reports*, doi: 10.1007/s40429-015-0066-7.

gaming as a behavioral addiction. At the end of this section, problematic gaming as a behavioral addiction is discussed briefly.

Problematic online gaming as a subtype of problematic video game use

Griffiths (2005a) notes that although each addiction has several particular and idiosyncratic characteristics, they have more commonalities than differences that may reflect a common etiology of addictive behavior. On the grounds of his “components” model of addiction, within a biopsychosocial framework (2005a), he considers online game addiction a specific type of video game addiction that can be categorized as a nonfinancial type of pathological gambling (Griffiths, 2005b). Griffiths (2010a) developed the components of his video game addiction theory by modifying Brown’s (1991, 1993) six addiction criteria. These are (1) *salience*: This is when video gaming becomes the most important activity in the person’s life and dominates his or her thinking (i.e., preoccupations and cognitive distortions), feelings (i.e., cravings), and behavior (i.e., deterioration of socialized behavior). (2) *Mood modification*: This is the subjective experience that people report as a consequence of engaging in video game play (i.e., they experience an arousing “buzz” or a “high” or, paradoxically, a tranquilizing and/or distressing feel of “escape” or “numbing”). (3) *Tolerance*: This is the process whereby increasing amounts of video game play are required to achieve the former effects, meaning that for persons engaged in video game playing, they gradually build up the amount of time they spend online engaged in the behavior. (4) *Withdrawal symptoms*: These are the unpleasant feeling states or physical effects that occur when video gaming is discontinued or suddenly reduced, for example, the shakes, moodiness, irritability. (5) *Conflict*: This refers to the conflicts between the video game player and those around him or her (i.e., interpersonal conflict), conflicts with other activities (e.g., job, schoolwork, social life, hobbies and interests), or conflicts from within the individual him- or herself (i.e., intrapsychic conflict and/or subjective feelings of loss of control) that are concerned with spending too much time engaged in video game play. (6) *Relapse*: This is the tendency for repeated reverersions to earlier patterns of video game play to recur and for even the most extreme patterns typical at the height of excessive video game play to be quickly restored after periods of abstinence or control. Charlton and Danforth (2007, 2010) – who support the same approach – analyzed the six criteria presented here and found that tolerance, mood modification, and cognitive salience were indicators of high

engagement, while the other components – withdrawal symptoms, conflict, relapse, and behavioral salience – played a central role in the development of addiction.

Porter et al. (2010) did not differentiate either between problematic video game use and problematic online game use. They conceptualized problematic video game use as excessive use of one or more video games resulting in a preoccupation with and a loss of control over playing video games, and various negative psychosocial and/or physical consequences. Their criteria for problematic video game use did not include other features usually associated with dependence or addiction, such as tolerance and physical symptoms of withdrawal, because in their opinion there is no clear evidence that problem video game use is associated with these phenomena.

Problematic online gaming as a subtype of problematic Internet use

The most well-known representative of the approach that considers online games a specific subtype of Internet activities is Young (1998a), who developed her theoretical framework for problematic online gaming from her Internet addiction criteria, which were based on the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) criteria for pathological gambling (American Psychiatric Association, 1994). Her theory states that online game addicts gradually lose control over their game play; that is, they are unable to decrease the amount of time spent playing while immersing themselves increasingly in this particular recreational activity and eventually develop problems in their real life (Young, 2009). The earlier idea that Internet/online video game addiction can be assessed by the combination of an Internet addiction score and the amount of time spent gaming (D. H. Han, Hwang, & Renshaw, 2010; van Rooij et al., 2011) was also reflective of this approach.

Problematic online gaming as an independent diagnosis

Integrative approaches tried to take into consideration both aforementioned approaches. For instance, Kim and Kim (M. G. Kim & Kim, 2010) claimed that neither the first nor the second approach could adequately capture the unique features of online games such as MMORPGs, therefore, it was absolutely necessary to create an integrated approach. They argued that “Internet users are no more addicted to the Internet than alcoholics are addicted to bottles” (p. 389), which means that the Internet is just one channel through which people may access whatever content they want (e.g., gambling, shopping, chatting,

sex), and therefore users of the Internet may be addicted to the particular content or services that the Internet provides rather than the channel itself. On the other hand, online games differ from traditional stand-alone (offline) video games in important aspects such as the social dimension or the role-playing dimension that allow interaction with other real players. Their multidimensional Problematic Online Game Use (POGU) model reflected this integrated approach fairly well. It had been developed theoretically on the basis of several studies and theories such as those of Armstrong, Phillips, and Saling (2000), Brown (1991, 1993), Caplan (2002), Charlton and Danforth (2007), Griffiths (1998), Lee and Ahn (2002), and Young (1999b) and resulted in five underlying dimensions: euphoria, health problems, conflict, failure of self-control, and preference of virtual relationship. Demetrovics and his colleagues (including the author of this dissertation) (2012) also supported the integrative approach and stressed the need to include all types of online games in addiction models to make comparisons between genres and gamer populations possible [such as those who play online real-time strategy (RTS) games and online first-person shooter (FPS) games in addition to the widely researched MMORPG players]. According to their model, six dimensions cover the phenomenon of problematic online gaming: preoccupation, overuse, immersion, social isolation, interpersonal conflicts, and withdrawal.

Problematic gaming as a behavioral addiction

As mentioned earlier, all of these approaches view problematic gaming as a behavioral addiction. Although still a highly controversial concept, behavioral addictions are considered a specific group of mental and behavioral disorders, where the excessiveness of a behavior and not the ingestion of a psychoactive substance causes serious problems for the individual by impeding a normal everyday functioning (Demetrovics et al., 2012). The most prominent of all such behaviors is pathological gambling, which has been considered an addiction for quite a long time due to its striking similarities to chemical addictions and to the serious adverse consequences the pathology has on the problem gamblers' lives (Grant, Potenza, Weinstein, & Gorelick, 2010).

Problematic gaming is also viewed as a behavioral addiction because apparently it shares many similarities with substance use addictions and pathological gambling (Griffiths, 2005a, 2008). Games are inherently gratifying and arguably addictive (see in chapter 1.10.1, entitled 'Addictive online games') with a minority of players losing control of

their behavior and playing so excessively that their life suffers because of it (e.g., their relationships deteriorate, their performance decreases, their health is damaged). Such as heroin addicts for instance, these problem gamers cannot stop playing despite all the negative consequences they experience, and if they manage to stop by any chance, relapse occurs soon most of the time (Griffiths, 2008). Brain imaging studies suggest that online gaming might share the same neurobiological mechanism as pathological gambling and substance dependence (Kuss & Griffiths, 2012a). For instance, cue-induced gaming urge activates the same brain regions (i.e., dorsolateral prefrontal cortex, orbitofrontal cortex, parahippocampal gyrus, and thalamus) that are activated by gambling in the case of pathological gamblers and substance use in the case of substance use abusers (D. H. Han et al., 2010; Ko et al., 2009). Other results suggest that the effects of excessive online game playing on working memory may be similar to those observed in patients with substance dependence (S. M. Kim, Han, Lee, Kim, & Renshaw, 2012). Consequently, even if alternative models – that will be specified in the next section – have also been suggested, several strong arguments can be made to support the conceptualization of problematic gaming as a behavioral addiction.

1.4.2 Recent conceptualization: DSM-5

The appearance of the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders (DSM-5)* opened a whole new chapter in the conceptualization and definition of the problem behavior and also strengthened the idea of problematic online gaming as a behavioral addiction. This specific group of mental and behavioral disorders had not been present yet in DSM-IV (American Psychiatric Association, 1994) or ICD-10 (World Health Organization, 1994) but has recently been included in DSM-5 (American Psychiatric Association, 2013) as the second part of the “Substance-Related and Addictive Disorders” section. True that, at present, the sole behavior in this new category on behavioral addictions is gambling disorder. However, the Substance Use Disorder Workgroup decided to include another non-substance addiction in the ‘Emerging Measures and Models’ section of the DSM-5 (i.e., Internet gaming disorder [IGD]) after reviewing 250 related publications and concluding that, although there are no definitive conclusions, the problem deserves scientific attention due to the severity of its consequences reported in the literature (Petry et al., 2014). While many other behavioral addictions (e.g., compulsive buying, work addiction, exercise addiction, sex addiction [hypersexuality]) were also candidates for inclusion, the workgroup concluded that

research was relatively scarce in these domains and therefore, none of other non-substance addictions were included in DSM-5 (American Psychiatric Association, 2013; Petry et al., 2014).

Concerns surrounding the inclusion of IGD in DSM-5

Although there is no firm agreement as to whether IGD is a genuine addiction (Blaszczynski, 2006; Shaffer, Hall, & Vander Bilt, 2000; Wood, 2008), the inclusion of IGD appears to have been well received by most of the researchers and clinicians working in the field (Griffiths, King, & Demetrovics, 2014). Nevertheless, there are three main concerns surrounding the inclusion. The most important criticism regarding the recognition of IGD as a bona fide behavioral addiction is that once addiction becomes a diagnostic label attached to behaviors other than gambling (that has a strong association with substance addictions), the term ‘addiction’ may suffer potential depreciation because of its permissive nature (Pies, 2009; Shaffer et al., 2000; Starcevic, 2013a): “If every gratified craving from heroin to designer handbags is a symptom of ‘addiction,’ then the term explains everything and nothing” (Heller, 2008; Pies, 2009). In addition, some researchers argue that treatment models based on the theory of addiction might reduce the patients’ self-efficacy by teaching them they are not in control of their behavior making the recovery process more difficult (van Rooij & Prause, 2014). Another potential negative consequence of the inclusion is that it might lead to the premature acceptance of IGD as a behavioral addiction (Dowling, 2014; King & Delfabbro, 2014a) and to the preconception that the proposed criteria are the ‘true’ IGD criteria. This could hinder following efforts to create or test alternative explanatory models of the disorder such as the reward deficiency syndrome (Blum, Cull, Braverman, & Comings, 1996), or the compensatory Internet use (Kardefelt-Winther, 2014a) and/or to critically evaluate each proposed criterion (that is actually the main purpose of the inclusion).

Internet gaming disorder and its DSM-5 proposed criteria

The nine IGD criteria as proposed in Section 3 of DSM-5 are the following: (i) preoccupation with Internet games; (ii) withdrawal symptoms when Internet gaming is taken away; (iii) tolerance – the need to spend increasing amounts of time engaged in Internet games; (iv) unsuccessful attempts to control the participation in Internet games; (v) loss of interests in previous hobbies and entertainment as a result of, and with the exception of, Internet games; (vi) continued excessive use of Internet games despite

knowledge of psychosocial problems; (vii) deception of family members, therapists, or others regarding the amount of Internet gaming; (viii) use of Internet games to escape or relieve a negative mood; (ix) jeopardizing or losing a significant relationship, job, or educational or career opportunity because of participation in Internet games (American Psychiatric Association, 2013) (for the exact wording of each criterion see 1.4.2. Figure 1). Petry and her colleagues (2014) pointed out that these criteria were mainly derived from an earlier report that proposed diagnostic criteria for Internet addiction (IA) using clinical samples in China (Tao et al., 2010). Tao and his colleagues established their IA criteria based on their clinical experience and seven previous studies (Beard & Wolf, 2001; Griffiths, 1996b; Hollander & Stein, 2006; Ko, Yen, Chen, Chen, & Yen, 2005b; Shapira, Goldsmith, Keck Jr, Khosla, & McElroy, 2000; Young, 1998a, 1998b) that used gambling and substance use criteria from earlier versions of the DSM as their source. The DSM-5 criteria were also chosen and worded in a way to parallel the substance use and gambling disorder criteria (Petry et al., 2014).

Internet Gaming Disorder

Proposed Criteria

Persistent and recurrent use of the Internet to engage in games, often with other players, leading to clinically significant impairment or distress as indicated by five (or more) of the following in a 12-month period:

1. Preoccupation with Internet games. (The individual thinks about previous gaming activity or anticipates playing the next game; Internet gaming becomes the dominant activity in daily life.)
Note: This disorder is distinct from Internet gambling, which is included under gambling disorder.
2. Withdrawal symptoms when Internet gaming is taken away. (These symptoms are typically described as irritability, anxiety, or sadness, but there are no physical signs of pharmacological withdrawal.)
3. Tolerance—the need to spend increasing amounts of time engaged in Internet games.
4. Unsuccessful attempts to control the participation in Internet games.
5. Loss of interests in previous hobbies and entertainment as a result of, and with the exception of, Internet games.
6. Continued excessive use of Internet games despite knowledge of psychosocial problems.
7. Has deceived family members, therapists, or others regarding the amount of Internet gaming.
8. Use of Internet games to escape or relieve a negative mood (e.g., feelings of helplessness, guilt, anxiety).
9. Has jeopardized or lost a significant relationship, job, or educational or career opportunity because of participation in Internet games.

Note: Only nongambling Internet games are included in this disorder. Use of the Internet for required activities in a business or profession is not included; nor is the disorder intended to include other recreational or social Internet use. Similarly, sexual Internet sites are excluded.

Specify current severity:

Internet gaming disorder can be mild, moderate, or severe depending on the degree of disruption of normal activities. Individuals with less severe Internet gaming disorder may exhibit fewer symptoms and less disruption of their lives. Those with severe Internet gaming disorder will have more hours spent on the computer and more severe loss of relationships or career or school opportunities.

1.4.2. Figure 1. *Internet gaming disorder criteria in DSM-5.*

While it is reasonable to parallel the IGD criteria with other existing addiction criteria in an attempt to clarify whether IGD is a behavioral addiction, some researchers in the field point out that Internet gaming is a distinctive behavior with unique features that should not be neglected. For instance, Kardefelt-Winther (2014c) claims that Internet gaming – unlike gambling or substance use – is one of the most popular leisure activities among today's youth that spends great amounts of time gaming. Due to a substantial shift in the entertainment and communication practices of more recent generations, some of the IGD symptoms (e.g., preoccupation) considered as pathological earlier may be normative

today (Kardefelt-Winther, 2014a). Moreover, lots of the proposed IGD criteria have been heavily criticized.

Critiques of certain IGD criteria

King and Delfabbro (2014a) emphasized the complexity of the preoccupation criterion. In their view, preoccupation should not be assessed in terms of time but rather in terms of cognitive content. In other words, it is much more important to explore the adaptability of cognitions than the frequency of gaming-related thoughts. Tolerance and withdrawal are probably the most debated criteria because in the case of behavioral addictions there is no physiological input only what the body can produce neurochemically by the behavior alone (van Rooij & Prause, 2014), and therefore the application of symptoms related to the physical effects of behaviors is debated. Nonetheless, Ko (2014) noted that most players with IGD play so much that they could not increase their game time any further. Instead, they experience diminished levels of gaming satisfaction compared earlier playing sessions. If so, the criteria should be defined differently to adhere to the specific case of gaming. For instance, instead of the current phrasing (“Tolerance—the need to spend increasing amounts of time engaged in Internet games.”), the criterion could focus on the aforementioned decrease in satisfaction (e.g., “Tolerance—the individual experiences diminished levels of gaming satisfaction as a result of prolonged gaming activity.”).

In the case of gaming, withdrawal symptoms manifest as negative mood states (e.g., sadness) or as active symptoms (e.g., restlessness, irritability) (Petry et al., 2014). Pies (2009) points out that in addition to players' self-report, it would be really important and timely to use physiological measures such as blood pressure or pulse rate to assess withdrawal symptoms. Another important point raised (Ko et al., 2005b; Pies, 2009) is that withdrawal should not be confused with the negative emotions that arise when gaming is suddenly stopped by an external force (e.g., an angry parent). Instead, it should refer to unpleasant symptoms experienced a couple of hours (up to 1-2 days) after ceasing gaming. Emotions felt after two weeks without gaming should be considered as craving rather than withdrawal (Ko et al., 2005b). On the other hand, withdrawal proved to be one of the three core criteria of pathological video-gaming (meaning that most of the measurement instruments included this symptom) according to a comprehensive

literature review conducted by King and his colleagues (2013) prior to the publication of DSM-5 in May 2013.

The other controversial criterion is “deception of family members, therapists, or others regarding the amount of Internet gaming”. Deriving from DSM-IV pathological gambling criteria (American Psychiatric Association, 1994) it appears to be the weak link among the nine criteria symptoms. Tao and his colleagues (2010) eliminated this symptom from their diagnostic instrument (the instrument that served as a bases for the DSM-5 criteria) since its frequency of incidence among their IA patients was much lower than of other symptoms. Similarly, deception had the lowest diagnostic accuracy and frequency of incidence among adult players with IGD in another Chinese study (Ko et al., 2014).

In line with these findings, the aforementioned review by King and his colleagues (2013) reported few instruments where this criterion was included. The main argument against the suitability of this criterion for Internet gaming is that gaming usually takes place in the player’s home, therefore they would not be able to hide the activity even if they tried to (King & Delfabbro, 2013b). Moreover, the players’ conditions of accommodation and personal relationships have a great influence over this criterion. For instance, bachelors who live alone may not need to give an account of their gaming to anybody, although their behavior might still be problematic.

Although not debated as much as the other criteria, using games to escape or relieve a negative mood showed low specificity (i.e., a considerable proportion of non-disordered gamers also played to escape problems) and therefore low diagnostic accuracy in two different studies (Ko et al., 2014; Lemmens, Valkenburg, & Gentile, 2015). However, because the criterion was also experienced by the majority of disordered gamers, the two research groups did not propose its removal from the scale at this stage.

Critiques regarding the name and content of IGD

Two additional highly debated topics are worth highlighting (Griffiths & Pontes, 2014). The first is related to the name of IGD. DSM-5 states that *Internet use disorder*, *Internet addiction* or *gaming addiction* are also terms for the same construct [“Internet gaming disorder (also commonly referred to as Internet use disorder, Internet addiction, or gaming addiction) has merit as an independent disorder”] (American Psychiatric Association, 2013). It is the present author’ view – in accordance with the opinion of Griffiths and Pontes (Griffiths & Pontes, 2014) – that this confusion regarding the names is highly

problematic and has already had a negative influence over the unification of the field. While online gaming may be considered an Internet activity (Király, Nagygyörgy, Griffiths, & Demetrovics, 2014), the Internet is a medium through which many activities can be pursued (e.g., sending messages, sharing and getting information, shopping, gambling, viewing pornography, etc.). Therefore, even if we consider online gaming an Internet activity, Internet and gaming are certainly different constructs.

Moreover, empirical studies demonstrate that problematic Internet use and problematic online gaming are also different nosological entities (Montag et al., 2014; Rehbein & Mößle, 2013)⁷. In spite of the obvious difference between the two terms, online gaming addiction was often referred to as ‘Internet addiction’ making it difficult to know exactly what the respective studies measured (King et al., 2013). For instance, in a Chinese study the authors consistently referred to the patients having ‘Internet addiction disorder’ (IAD), when at one point they also mentioned that “all [the patients] were addicted to game playing” (Huang, Zhang, et al., 2010). Unfortunately this frequent blending of the two terms has made the field confusing and puzzling. This has held the unification of the field back even more. Griffiths and Pontes (2014) argue that one possible reason for using the two terms as synonyms might be that several studies used Young’s (1998a) Internet Addiction Test (IAT) to assess online gaming addiction. Another reason might be that researchers rarely are ‘gamers’ themselves, and therefore have a different approach to what games really are and/or the medium in which they are played. While ‘gamers’ may not consider online gaming (especially MMORPGs) an Internet activity, but rather as gaming *per se*; for researchers, the medium (i.e., Internet) may be more important (Király, Nagygyörgy, Koronczai, Griffiths, & Demetrovics, 2015).

The second highly debated topic refers to the content or object of IGD. DSM-5 states that “[Internet gaming disorder most often involves specific Internet games, but it could involve non-Internet computerized games as well, although these have been less researched]” (American Psychiatric Association, 2013). In other words, the disorder is called *Internet* gaming disorder, but in reality it refers to any type of video games irrespective of the medium in which it is played (e.g., console, arcade, mobile device, personal computer, etc.). While several researchers argue that online game addiction should be viewed as a sub-type of video game addiction than a subtype of Internet

⁷ Study 2 below also examines this question and reaches a similar conclusion.

addiction (Griffiths & Pontes, 2014; King & Delfabbro, 2013a; Starcevic, 2013b) (because the Internet is only a medium that provides some additional features [i.e., social interaction] to the games), it is certainly misleading and thus problematic to use a name that excludes offline games by definition while still including them. The main reason why the Substance Use Disorder Work Group voted for the name Internet gaming disorder and not video game disorder was that online games appeared to be associated with the most serious problems (e.g., Rehbein et al., 2010). However, as many researchers have noted (particularly research carried out in the pre-Internet era) offline video games can also cause problems, therefore it is the task of future research to find the best name for the problem behavior.

1.4.3 Future directions

Although the inclusion of IGD in the ‘Emerging Measures and Models’ section of DSM-5 appears to have been well received by most in the gaming studies field, reaching a consensus will take a long time if it is possible at all. On one hand, research must now focus on the rigorous examination of each diagnostic criterion, preferably through clinical studies, large-scale empirical studies, cross-cultural studies, and in-depth qualitative inquiry (in order to find out which criteria are contextually valid in the case of video games) (Kardefelt-Winther, 2014c). However, on the other hand, it must be highlighted that the behavioral addiction framework needs further testing and comparison with alternative models such as the reward deficiency syndrome (Blum et al., 1996) or the model of compensatory Internet use disorder (Kardefelt-Winther, 2014a).

1.5 Symptomology and consequences⁸

In the case of problematic online gaming, symptoms and consequences overlap to a significant extent and are therefore discussed together in this section. In the clinical understanding, problematic online gamers spend most of their time playing online games (or in many cases, one single online game) (e.g., Chappell, Eatough, Davies, & Griffiths, 2006; Griffiths, 2008; Porter et al., 2010). Although the amount of time spent on gaming is not predictive on its own (Griffiths, 2005a, 2010b), problematic gamers typically play

⁸ This chapter is an edited version of the section with the same title from the following book chapter: Király, O., Nagygyörgy, K., Griffiths, M. D., & Demetrovics, Z. (2014). Problematic online gaming. In K. Rosenberg & L. Feder (Eds.), *Behavioral Addictions: Criteria, Evidence and Treatment* (pp. 61-95). New York, NY: Elsevier.

much more than casual gamers (e.g., Gentile, 2009; Grusser, Thalemann, & Griffiths, 2007; Hussain & Griffiths, 2009). When they cannot play, they think, fantasize, and/or daydream about gaming instead of doing their usual daily activities. They may even dream about games and game playing (Griffiths, 2008; Porter et al., 2010). The activity gains a compulsive quality; namely, the player craves gaming (Ko et al., 2014), and as the feeling gets more intense and inner tension arises, the player gets restless, irritable, and moody (e.g., Chappell et al., 2006; Griffiths, 2008; Grusser et al., 2007; Ko et al., 2014).

In the most extreme cases, the increasing inner tension may turn into aggressive behavior. To decrease this unpleasant feeling, the gamer continues to play on and on (due to tolerance) in ever-increasing amounts (Griffiths, 2008; Hussain & Griffiths, 2009; Porter et al., 2010). Such individuals are typically unable to control the activity, and recognize that it causes problems in their lives (e.g., Hussain & Griffiths, 2009; Porter et al., 2010). Should they manage to quit, they typically restart the activity sometime later (i.e., relapse) with the same intensity (e.g., Chappell et al., 2006; Griffiths, 2008; Hussain & Griffiths, 2009). Problematic gamers gradually lose interest in other recreational activities and start neglecting their everyday obligations, which leads to poorer educational and/or professional performance (e.g., Chappell et al., 2006; Gentile, 2009; Griffiths, 2008; M. G. Kim & Kim, 2010; Peng & Liu, 2010). The game becomes the absolute priority that usually leads to interpersonal and intrapersonal conflicts. As a result, their real-life relationships may deteriorate and/or come to an end (e.g., Chappell et al., 2006; Griffiths, 2008; Peng & Liu, 2010; Porter et al., 2010), and these players can become lonely (M. G. Kim & Kim, 2010; Lemmens, Valkenburg, & Peter, 2011; van Rooij et al., 2011). To avoid conflicts, some players lie about their online activities and/or about the amount of time spent on gaming (Griffiths & Meredith, 2009; Young, 2009).

In addition to psychological symptoms, somatic symptoms can also be observed in the case of problematic online gamers. These extend from ignoring basic biological needs such as eating, sleeping, and personal hygiene (Griffiths & Meredith, 2009; Peng & Liu, 2010; Porter et al., 2010) to different health problems such as gaining or losing weight, dry or strained eyes, headaches, back aches, carpal tunnel syndrome, repetitive strain injuries (RSIs), and general fatigue or exhaustion (Griffiths & Meredith, 2009; Peng & Liu, 2010; Porter et al., 2010).

1.6 Disease process⁹

Case studies and interviews (Allison, von Wahlde, Shockley, & Gabbard, 2006; Chappell et al., 2006; Griffiths, 2010a; Young, 2010) note that problematic online gaming – like other addictions or problematic behaviors – evolves gradually. Young (2010) calls the development of addiction a “downward spiral.” At the initiation of the behavior, gaming is only a pleasant recreational activity, but slowly the player gets more and more involved until the activity becomes problematic. In Young’s (2009) opinion, the addiction process begins with a preoccupation with gaming. Gamers think about the game while they are offline when they should be concentrating on other things. This intensifies with time and slowly leads to a point when the game becomes the only priority that replaces all other recreational activities and everyday duties. At this time, other symptoms such as tolerance, withdrawal, and intrapersonal/interpersonal conflicts are present as well.

To date, few longitudinal studies examined the duration of problematic use. Gentile and his colleagues (2011) found that the problematic behavior existed 2 years later with the majority of children (84%) still being considered problematic gamers after the initial data collection. In the 2-year research period, only 1% of children became problematic gamers; therefore, the authors presume that problematic gaming might not be “simply a ‘phase’ that most children go through” (Gentile et al., 2011, p. e325). Similarly, a 5-year longitudinal study following German adolescents from 10 to 15 years of age, reported that problematic gaming observed in 10-year-olds led to higher problematic gaming scores five years later. Therefore, they concluded that problematic gaming was not a transient phenomenon of adolescence (Rehbein & Baier, 2013).

Regarding recovery, certain cases (Chappell et al., 2006; Young, 2010) suggest that – like other addictions – problematic online gamers reach a nadir when players become conscious of the problem itself and decide to change it. In such cases, they either seek external (e.g., professional) help or try to recover by themselves. However, given the potentially addictive nature of the problem, relapse appears to be quite frequent in these cases (Chappell et al., 2006; Young, 2010).

⁹ This chapter is an edited version of the section with the same title from the following book chapter: Király, O., Nagygyörgy, K., Griffiths, M. D., & Demetrovics, Z. (2014). Problematic online gaming. In K. Rosenberg & L. Feder (Eds.), *Behavioral Addictions: Criteria, Evidence and Treatment* (pp. 61-95). New York, NY: Elsevier.

1.7 Comorbidity¹⁰

Problematic online gamers are twice as likely to be diagnosed with some kind of attention deficit disorder (ADD or ADHD) than gamers who play recreationally (Battyany, Müller, Benker, & Wölfling, 2009; Bioulac, Arfi, & Bouvard, 2008; P. A. Chan & Rabinowitz, 2006; Ferguson, Coulson, & Barnett, 2011; Gentile et al., 2011; Doug Hyun Han et al., 2009; Hyun et al., 2015; Walther, Morgenstern, & Hanewinkel, 2012). Depression is also a comorbid clinical disorder that appears in several studies (Brunborg, Mentzoni, & Frøyland, 2014; Ferguson et al., 2011; Gentile et al., 2011; Hyun et al., 2015; Peng & Liu, 2010; Stetina, Kothgassner, Lehenbauer, & Kryspin-Exner, 2011). In the case of MMORPG players, depressive symptoms (e.g., sadness, hopelessness, crying spells, insomnia, concentration problems) are related to habitual computer game playing at night (between 10 p.m. and 6 a.m.) (Lemola et al., 2011). It has also been found that there is a non-specific association between various domains of psychopathology (assessed by the Symptom Checklist 90; SCL-90) and problem video game use (Starcevic, Berle, Porter, & Fenech, 2011). So far, it is unclear whether problematic online gaming is the reason for or the consequence of other psychiatric symptoms (Gentile, 2009). Although longitudinal data suggest that pathological gamers exhibit higher levels of depression, anxiety and social phobia during the follow-up period than normal gamers, the causal relation might be reciprocal (Gentile et al., 2011).

1.8 Assessment¹¹

Although research in the area of problematic online gaming has been carried out over a relatively brief period, a large number of assessment tools have been developed (King et al., 2013). This section provides a selective review of the most important instruments as it focuses on tools that have been used in two or more studies, of the instruments involving considerable sample sizes in their development, or the measures that have shown good psychometric properties. 1.8. Table 1 presents data regarding the initial development of

¹⁰ This chapter is an edited version of the section with the same title from the following book chapter: Király, O., Nagygyörgy, K., Griffiths, M. D., & Demetrovics, Z. (2014). Problematic online gaming. In K. Rosenberg & L. Feder (Eds.), *Behavioral Addictions: Criteria, Evidence and Treatment* (pp. 61-95). New York, NY: Elsevier.

¹¹ This chapter is based on the section entitled ‘Assessment of problematic online video game use’ from the following book chapter: Király, O., Nagygyörgy, K., Koronczai, B., Griffiths, M. D., & Demetrovics, Z. (2015). Assessment of Problematic Internet Use and Online Video Gaming. In E. Aboujaoude & V. Starcevic (Eds.), *Mental Health in the Digital Age: Grave Dangers, Great Promise* (pp. 46-68). Oxford: Oxford University Press.

the instruments. For a comprehensive and systematic review of the measures of problematic video gaming between 2000 and 2012, please see the article by King et al. (2013), which reviewed 18 instruments tested in more than 54,000 participants.

1.8. Table 1. *Measurement instruments assessing problematic online gaming*

Source	Measure	Theoretical basis	Number of items (response options)	Criteria for problematic use	Sample and assessment method	Factor structure	Psychometric properties
Young (1998b)	Internet Addiction Diagnostic Questionnaire (IADQ)	DSM-IV pathological gambling criteria	8 (Yes/No)	5 or more "Yes" responses (ad-hoc)	- 496 Internet users - 396 classified as "dependent" (39.6% male) - 100 classified as "nondependent" (64% male) - Online survey and telephone interview	Not reported	Not reported
Young (1998a)	Internet Addiction Test (IAT)	DSM-IV pathological gambling criteria	20 (5-point scale)	Score > 70 associated with significant problems (ad-hoc)	Not reported	Not reported	Not reported
Tejeiro Salguero and Moran (2002)	Problem Video Game Playing (PVP)	DSM-IV criteria for substance dependence and pathological gambling and literature on addictions	9 (Yes/No)	Not reported	- 223 high school students (53% male) - Paper-and-pencil survey	Single factor	- Cronbach's alpha = 0.69 - Item-total correlations = 0.21 - 0.54 - Concurrent validity (time spent gaming, self and parents' perception of playing excessively) - Convergent validity (Severity of Dependence Scale [SDS; Gossop et al., 1995])
Wan and Chiou (2006, 2007)	Online Games Addiction Scale for Adolescents in Taiwan (OAST)	Internet Addiction Scale for high schoolers in Taiwan (IAST; Lin & Tsai, 1999)	29 (4-point scale)	80 th percentile (ad-hoc)	- 199 high school and college students - Paper-and-pencil survey	1. Compulsive use and withdrawal 2. Tolerance 3. Related problems of family, school, and health 4. Related problems of peer interaction and finance	- Cronbach's alpha = 0.92 - Item-total correlations = 0.69 - 0.84 - Concurrent validity (addicts selected with depth-interview screening scored significantly higher than non-addicts on OAST)

							- Factor structure confirmed by confirmatory factor analysis
Charlton and Danforth (2007, 2010)	Addiction–Engagement Questionnaire (A-EQ)	General Computing Questionnaire (Charlton, 2002)	29 (2007); 24 (2010) (7-point scale)	4 or more “core” criteria associated with addiction (ad-hoc)	<ul style="list-style-type: none"> - 442 adult online gamers (85.7% male) - Online survey (Charlton & Danforth, 2007) - 388 adult online gamers (86% male) - Online survey (Charlton & Danforth, 2010) 	<ol style="list-style-type: none"> 1. Addiction 2. Engagement 	<ul style="list-style-type: none"> - Concurrent validity (time spent gaming) (Charlton and Danforth, 2007) - Cronbach’s alpha = 0.79 for addiction subscale, 0.80 for engagement subscale (Charlton and Danforth, 2010) - Convergent validity (negativity on five personality dimensions: extraversion, agreeableness, emotional stability, attractiveness, and negative valence) (Charlton and Danforth, 2010)
Gentile (2009)	Pathological-Gaming Scale (PGS)	DSM-IV pathological gambling criteria	11 (Yes/No/Sometimes)	6 or more criteria met (ad-hoc): (Yes = 1, Sometimes = 0.5, No = 0)	<ul style="list-style-type: none"> - 1,178 adolescents - National representative sample (USA) - Online survey 	Not reported	<ul style="list-style-type: none"> - Concurrent validity (time spent gaming, school performance, attention deficit disorder, health problems, self and friends’ perception of being addicted to games, being involved in physical fights, possessing a video-game system in their bedrooms) - Discriminant validity (age, frequency of using the Internet to do homework, having a TV in the bedroom, type of school attended)
Lemmens et al. (2009)	Game Addiction Scale for Adolescents (GAS-21) and its short form (GAS-7)	DSM-IV pathological gambling criteria	7 or 21 (5-point scale)	Two different approaches (ad-hoc): <ul style="list-style-type: none"> - Monothetic (Score ≥ 3 on all 7 criteria) 	Two independent samples of high school students who had played video games in the last month <ul style="list-style-type: none"> - $N_1 = 352$ (67% male) - $N_2 = 369$ (68% male) - Paper-and-pencil survey 	<ol style="list-style-type: none"> 1. Salience 2. Tolerance, 3. Mood modification 4. Relapse 5. Withdrawal 6. Conflict 7. Problems 	<ul style="list-style-type: none"> - Cronbach’s alpha for GAS-21 = 0.94 (Sample1), 0.92 (Sample2) - Cronbach’s alpha for GAS-7 = 0.86 (Sample1), 0.81 (Sample2) - Cross-validation of reliability - Concurrent validity (time spent online)

				- Polythetic (Score ≥ 3 on at least 4 criteria)			- Convergent validity (loneliness, life satisfaction, aggression, and social competence) - Factor structure confirmed by confirmatory factor analysis
Kim and Kim (2010)	Problematic Online Game Use Scale (POGU)	Five previously developed problematic Internet use and problematic online gaming questionnaires	20 (Not reported)	Not reported	<ul style="list-style-type: none"> - 1,422 high school students (Sample 1) - 199 high school students (Sample 2) - 393 high school students (Sample 3) - Paper-and-pencil survey 	<ol style="list-style-type: none"> 1. Euphoria 2. Health problem 3. Conflict 4. Failure of self-control 5. Preference of virtual relationship 	<ul style="list-style-type: none"> - Cronbach's alpha: not reported (Sample 1), 0.91 (Sample 2), 0.95 (Sample 3) - Cross-validation of reliability - Convergent validity (life satisfaction, academic self-efficacy, anxiety, and loneliness) - Factor structure confirmed by confirmatory factor analysis
Rehbein et al. (2010)	Video Game Dependency Scale (KFN-CSAS-II)	Internet Addiction Scale (ISS-20; Hahn & Jerusalem, 2001)	14 (4-point scale)	<ul style="list-style-type: none"> - Scores between 35 and 41 associated with risk of dependency (ad-hoc) - Score ≥ 42 associated with dependency (ad-hoc) 	<ul style="list-style-type: none"> - 15,168 high school students (51.3% male) - National representative sample (Germany) - Paper-and-pencil survey 	<ol style="list-style-type: none"> 1. Preoccupation /salience 2. Conflict 3. Loss of control 4. Withdrawal symptoms 5. Tolerance 	<ul style="list-style-type: none"> - Cronbach's alpha = 0.92 - Concurrent validity (time spent gaming, self-evaluation of being dependent, school achievement, school absenteeism, sleep time, sleep disturbance, participating regularly in other leisure-time activities, thoughts of committing suicide)
Müller et al. (2014)	Assessment of Internet and Computer game Addiction (AICA-S)	Scale for the Assessment of Pathological Computer-Gaming (CSV-S; Wölfling, Müller, & Beutel, 2011)	14 (5-point scale)	<ul style="list-style-type: none"> Score ≥ 7 points (3 to 4 criteria fulfilled) pointing to an addictive use (proposed on ad-hoc bases, but clinically validated in a later study) (Müller, Beutel, & Wölfling, 2014) 	<ul style="list-style-type: none"> - 2,512 adults - National representative sample (Germany) - Paper-and-pencil survey 	Unidimensional	<ul style="list-style-type: none"> - Cronbach's alpha = 0.89 - Mean inter-item correlation of $r_{ii} = 0.36$ - Discriminatory power of the items varied between 0.13 and 0.71 - Factor structure explored using principal component analysis

Demetrovic s et al. (2012)	Problematic Online Gaming Questionnaire (POGQ)	Literature review on problematic online gaming and problematic Internet use and interviews with online gamers	18 (5-point scale)	Score ≥ 66 (LPA-based: sensitivity and specificity analyses)	- 3,415 adult online gamers (90% male) - Online survey	1. Preoccupation 2. Overuse 3. Immersion 4. Social isolation 5. Interpersonal conflicts 6. Withdrawal	- Cronbach alpha = 0.91 - Factor structure confirmed by confirmatory factor analysis
van Rooij et al. (2012)	Video Game Addiction Test (VGAT)	Compulsive Internet Use Scale (CIUS; Meerkerk, Van Den Eijnden, Vermulst, & Garretsen, 2009)	14 (5-point scale)	Not reported	- 2,894 high school students who played video games (62% male) - National representative sample of Dutch secondary school students - Paper-and-pencil survey	1. Loss of control 2. Intra- and interpersonal conflict 3. Preoccupation/salience 4. Coping/mood modification 5. Withdrawal symptoms	- Cronbach's alpha = 0.93 - Concurrent validity (time spent on various game types) - Convergent validity (Game Addiction Scale [Lemmens et al., 2009], Compulsive Internet Use Scale [Meerkerk et al., 2009], depressive mood, negative self-esteem, loneliness, and social anxiety) - Factor structure confirmed by confirmatory factor analysis
Pontes et al., (2014)†	Internet Gaming Disorder Test (IGD-20 Test)	Components model (Griffiths, 2005a) & DSM-5 IGD criteria (American Psychiatric Association, 2013)	20 (5-point scale)	Score ≥ 71 (LPA-based: sensitivity and specificity analyses)	- 1,003 adult gamers (85.2% males) - Online survey	1. Salience 2. Mood modification 3. Tolerance 4. Withdrawal 5. Conflict 6. Relapse	- Cronbach's alpha = 0.88 - Concurrent validity (time spent gaming) - Convergent validity (nine IGD criteria from the DSM-5) - Factor structure confirmed by confirmatory factor analysis
Pontes et al., (2015)†	Internet Gaming Disorder Scale –	DSM-5 IGD criteria (American	9 (5-point scale)	Score ≥ 36 points (ad-hoc)	- 1,060 adult gamers (85.1% males) - Online survey	Unidimensional	- Cronbach's alpha = 0.87 - Concurrent validity (time spent gaming)

	Short-Form (IGDS9-SF)	Psychiatric Association, 2013)					- Convergent validity (IGD-20 Test) - Factor structure confirmed by confirmatory factor analysis
Lemmens et al., (2015)†	Internet Gaming Disorder Scales (IGD Scales)	DSM-5 IGD criteria (American Psychiatric Association, 2013)	27- & 9-item polytomous scales (6-point scale); 27- & 9-item dichotomous scales (Yes/No)	5 or more criteria on the 9-item dichotomous scale (ad-hoc)	- 2,444 adults and adolescents age 13-40 years from the Netherlands (approx. 50% males) - National representative sample - Online survey	- Second order factor structure for the two 27-item scales with nine first order factors: 1. Preoccupation 2. Tolerance 3. Withdrawal 4. Persistence 5. Escape 6. Problems 7. Deception 8. Displacement 9. Conflict - First order factor structure for the 9-item scales: unidimensional	- Cronbach's alpha = 0.94 (27-item pol. scale); 0.93 (27-item dich. scale); 0.95 (9-item pol. scale); 0.83 (9-item dich. scale) - Concurrent validity (time spent games) - Convergent validity (loneliness, self-esteem, prosocial behavior, and aggression); life satisfaction only correlated with the dichotomous scales - Factor structure confirmed by confirmatory factor analysis
Rehbein et al., (2015)†	Video Game Dependency Scale (CSAS)	DSM-5 IGD criteria (American Psychiatric Association, 2013)	18 (4-point scale)	5 or more criteria (one criteria is fulfilled if at least one of the two items is answered with “strongly agree”) (ad-hoc)	- 11,003 adolescents (51.1% males) - National representative sample of German nine-graders - Paper-and-pencil survey	- Both second order factor structures with nine first order factors: 1. Preoccupation 2. Withdrawal 3. Tolerance 4. Reduce/stop 5. Continue despite problems 6. Give up other activities 7. Escape adverse moods 8. Deceive/cover up 9. Risk/lose - And first order factor structure: unidimensional	- Cronbach's alpha = 0.93 - Concurrent validity (gaming time per day, self-evaluation of being “addicted to gaming”, sleeping disturbance, grade point average, times skipped school classes in past six months, any gaming related truancy in past six months) - Factor structure confirmed by confirmatory factor analysis

Note: LPA = Latent profile analysis; † Instruments developed after the appearance of the DSM-5 using the nine Internet gaming disorder (IGD) criteria proposed by the DSM-5 as their basis.

In some studies, problematic online gaming (POG) was assessed by using an instrument for problematic Internet use (PIU) and measuring time spent on online gaming (D. H. Han et al., 2010; M. S. Lee et al., 2007; Meerkerk, Van Den Eijnden, & Garretsen, 2006; Meerkerk, van den Eijnden, Franken, & Garretsen, 2010; van Rooij, Schoenmakers, van de Eijnden, & van de Mheen, 2010; van Rooij et al., 2011). The theoretical basis for this method is that the authors viewed POG as a form of PIU, which allowed its assessment by means of an instrument measuring PIU. However, this method may underestimate the number of problematic online gamers because some gamers do not consider online gaming as an Internet activity, but rather as gaming per se; for them, the content is more important than the medium in which they play. A need to assess POG and PIU separately is in line with findings of Rehbein and Mößle (2013) and Montag and colleagues (2014) that Internet addiction and video game addiction can be regarded as distinct problems.

Related to the aforementioned idea, probably the most frequently used instrument to assess POG is the Internet Addiction Test (King et al., 2013). Some studies used it without modification (e.g., Billieux et al., 2011), considering online gaming a type of Internet activity. However, this approach might distort the results, as argued above. Other researchers modified the Internet Addiction Test to measure POG by replacing the word “Internet” from its items with “online games” (C. C. Wang & Chu, 2007), “Internet gaming” (Jeong & Kim, 2011), and “WoW” (derived from the popular online game World of Warcraft) (Snodgrass, Lacy, Dengah, & Fagan, 2011; Snodgrass, Lacy, Francois Dengah, Fagan, & Most, 2011). Given the inconsistencies in the psychometric properties of the original Internet Addiction Test, cautious use is recommended, especially when assessing online gaming, which is different from the general Internet use in important respects (Rehbein & Mößle, 2013).

However, moving away from problematic Internet use and IAT towards a more general analysis of 1.8. Table 1, I am going to briefly discuss the theoretical basis of the different instruments, some general information regarding their lengths, response options, and cut-off values, the samples used in their development processes, their factor structures and their contents, and finally, their psychometric properties.

Instruments developed prior to the appearance of the DSM-5 (May 2013) were mostly constructed on a theoretical basis using (1) the DSM-IV criteria for pathological gambling or substance dependence (American Psychiatric Association, 1994); (2) the contemporary literature on addiction, including PIU and POG; and (3) the concept of behavioral

addictions (Brown, 1991, 1993; Griffiths, 1999b). In addition, as mentioned before, several tools relied on existing instruments for problematic Internet use. Empirical data derived from the interviews with online gamers were also used in certain cases (i.e., Problematic Online Gaming Questionnaire). Instruments developed after the appearance of the DSM-5, on the other hand, use the nine criteria of Internet gaming disorder proposed by the DSM-5 (American Psychiatric Association, 2013, pp. 795-798) as their starting point.

The listed questionnaires for POG are short and therefore appropriate for surveys and assessment. The number of scale items ranges from 8 to 29 and either use a dichotomous response format (Yes/No), or Likert-scales ranging from 4-point to 7-point scales. Some instruments have both long and short versions. Cut-off thresholds that differentiated problematic from normal gamers have been reported in the majority of the studies. However, most of these cutoffs are of an ad-hoc nature (i.e., they were not based on empirical analyses). The cut-off scores for only two instruments – the Internet Gaming Disorder Test (Pontes et al., 2014) and the Problematic Online Gaming Questionnaire (Demetrovics et al., 2012) – were empirically tested using latent profile analysis and sensitivity and specificity analyses. Moreover, only one instrument has a clinically validated cut-off score, namely the Assessment of Internet and Computer game Addiction (Müller, Beutel, et al., 2014), however, this instrument had initially been developed to assess general Internet addiction, and was only adapted later to assess Internet gaming disorder (Müller et al., 2015).

The studies reporting on the instruments for POG were conducted in both adolescent and adult samples. The sample sizes ranged from small ($N = 199$) to large ($N = 15,168$). Among the sixteen instruments listed in 1.8. Table 1, to the author's present knowledge, eight were used in nationally representative samples: the PGS in the United States (Gentile, 2009) and in Singapore (Gentile et al., 2011), the KFN-CSAS-II, the CSAS, and the AICA-S in Germany (Müller, Beutel, et al., 2014; Rehbein et al., 2010; Rehbein et al., 2015), VGAT and the IGD Scales in the Netherlands (Lemmens et al., 2015; van Rooij et al., 2012), and the GAS-7 in Norway (Brunborg et al., 2013). Data were collected either online or in a traditional (paper-and-pencil) manner.

The instruments show a great variability both in terms of their factor structure and the symptoms of POG that they include. Some of the scales appear to be unidimensional, with all their items measuring one construct or dimension, whereas others measure two,

four, five, six, or seven distinct dimensions. Because POG is now included in the DSM-5 Section 3 under the name of Internet gaming disorder (IGD), it is useful to compare the proposed nine criteria for IGD with items of the aforementioned instruments.

If we examine the instruments developed prior to the appearance of DSM-5, we can conclude that none of them covers all nine IGD criteria as defined in the DSM-5. However, both the 21-item version of the Game Addiction Scale for Adolescents (Lemmens et al., 2009) and the Problem Video Game Playing (Tejeiro Salguero & Moran, 2002) achieve the closest coverage. The Pathological Gaming Scale (Gentile, 2009) and the Internet Addiction Diagnostic Questionnaire (Young, 1998b) also cover the majority of the diagnostic criteria. The most poorly covered IGD criteria are loss of interests in previous hobbies and entertainment activities and continued excessive online gaming despite knowledge of psychosocial problems. In contrast, the criterion concerning interpersonal, work-related, or school-related conflicts is assessed by all the questionnaires, and items pertaining to preoccupation, withdrawal, and loss of control criteria are also included in the majority of the instruments preceding the DSM-5. Tolerance, escapism and relieving a negative mood was assessed by less instruments. Furthermore, some measures have items that do not refer to any of the criteria for IGD but relate to other aspects that may be associated with problematic gaming such as euphoria (a “buzz” or “high” that is experienced during online gaming), health-related problems, reduced sleep, and/or neglect of household chores.

Overall, none of the instruments developed prior to the appearance of the DSM-5 is recommended to test IGD because they do not fully cover the nine proposed criteria and because they have been developed on the basis of theoretical approaches different from IGD. However, there are several recently developed instruments specifically assessing the DSM-5 criteria (see the instruments marked with † in 1.8. Table 1): the IGD-20 Test (Pontes et al., 2014) which is a 20-item test that reflects the nine criteria of IGD incorporated in the theoretical framework of the components model of addiction (Griffiths, 2005a); the IGDS-SF9 (Pontes & Griffiths, 2015), a 9-item tool assessing the nine DSM-5 criteria on a 5-point Likert scale; and the Video Game Dependency Scale (CSAS) (Rehbein et al., 2015), an 18-item scale adapted from a prior instrument (KFN-CSAS-II; 7) to cover of all nine DSM-5 criteria, by two items each. In addition, Lemmens and his colleagues (2015) tested four different instruments measuring IGD: two polytomous scales (a 27-item and a 9-item version) and two dichotomous scales (also a

27-item and a 9-item version), of which the 9-item dichotomous scale appeared to be the most practical scale for diagnostic purposes.

Psychometric analyses of the instruments is also shown in 1.8. Table 1 (i.e., ‘Psychometric properties’ column). Of the instruments developed prior to the DSM-5, the Game Addiction Scale for Adolescents (Lemmens et al., 2009) and the Video Game Addiction Test (van Rooij et al., 2012) used the widest range of psychometric analyses in their development process and both show good psychometric characteristics. However, some of the other instruments also have specific advantages. The factor structure of the Problematic Online Game Use Scale (M. G. Kim & Kim, 2010) was confirmed in three different samples and showed association with POG-related variables. The Video Game Dependency Scale (Rehbein et al., 2010) was developed in a large sample; it has good internal consistency and its concurrent validity has been assessed thoroughly. The Problematic Online Gaming Questionnaire (Demetrovics et al., 2012) was developed both on a theoretical basis and empirically (i.e., through interviews with online gamers). The Addiction-Engagement Questionnaire (Charlton & Danforth, 2007) has the potential to distinguish between addiction and high engagement and also shows association with different POG-related variables. The Assessment of Internet and Computer game Addiction (Müller, Beutel, et al., 2014; Müller, Glaesmer, et al., 2014) scale has a clinically validated cut-off score, however, it was originally developed to assess general problematic Internet use.

Of the instruments developed on the basis of the DSM-5, the Internet Gaming Disorder Test (Pontes et al., 2014) has the advantage to assess IGD by integrating the nine criteria in an accepted theoretical framework, namely the ‘components model of addiction’ (Griffiths, 2005a). The Video Game Dependency Scale (Rehbein et al., 2015) and the Internet Gaming Disorder Scale (Lemmens et al., 2015) were both developed on nationally representative samples (adolescent and adolescent + adult samples, respectively) and show promising psychometric characteristics.

Summing up, it can be concluded that there is a huge variety in POG assessment tools reflecting an intense interest in this area, but also hindering consensus in the field. Most of the aforementioned instruments could be used for assessing POG, taking into account the nature of the sample, the data collection method, and the cultural setting when deciding which instrument to choose. Nevertheless, if the aim is to assess IGD as defined in DSM-5, instruments developed for this particular purpose should be favored.

1.9 Epidemiology - Prevalence¹²

At present, it is quite difficult (or if we want to be fair: impossible) to precisely estimate the prevalence of problematic online gaming due to the lack of a consensual definition and a generally accepted measurement instrument. Therefore, existent data on this matter is diverse due to the use of assessment tools with different theoretical background, different empirical development, and different cut-off values, as well as the use of different samples with different methodologies. To date, few nationally representative surveys have been conducted, and almost all of them have targeted adolescents. The prevalence rates were as follows: 1.7% in Germany (Rehbein et al., 2010); 4.1% (Mentzoni et al., 2011) and 4.2% (Brunborg et al., 2013) in Norway, respectively; 1.3% (Haagsma, Pieterse, & Peters, 2012) and 1.6% (van Rooij et al., 2011) in the Netherlands, respectively (the former value obtained from a sample comprising of both adolescents and adults); 8.5% in the United States (Gentile, 2009); and 9% in Singapore (Gentile et al., 2011).

Additionally, a cross-national European survey comprising seven countries (Müller et al., 2015) reported the following prevalence data: 0.6% in Spain, 1% in the Netherlands, 1.3% in Romania, 1.6% in Germany, 1.8% in Iceland, 2% in Poland, and 2.5% in Greece. Prevalence of IGD was usually much higher for male adolescents than for females. To the author's knowledge, only two studies to date have estimated the prevalence of IGD in nationally representative samples using the criteria proposed by the DSM-5. Rehbein and his colleagues (2015) reported a prevalence rate of 1.16% in a sample of German adolescents aged 13-18 years, while Lemmens and his colleagues (2015) used a representative sample of Dutch adolescents and adults, aged 13-40 years, reporting a prevalence rate of 5.4%.

¹² This chapter is based on a section entitled 'Assessment and prevalence' from the paper: Király, O., Griffiths, M. D., & Demetrovics, Z. (2015). Internet gaming disorder and the DSM-5: Conceptualization, debates, and controversies. *Current Addiction Reports*, doi: 10.1007/s40429-015-0066-7.

1.10 Etiology¹³

As with other addictions, problematic online gaming is the consequence of many different interacting factors. Here the main factors that contribute to the appearance and maintenance of problematic behavior according to the academic literature are presented.

1.10.1 Addictive online games

In the gambling literature, a number of authors have examined the role of structural characteristics of different gambling activities (i.e., slot machines) because they appear to be important in the acquisition, development, and maintenance of problem gambling behavior (Griffiths, 1993, 1999a; J. Parke & Griffiths, 2007). A similar exploration regarding the structural characteristics of online games has also been suggested (King, Delfabbro, & Griffiths, 2010b, 2010c). In an early study, Wood et al. (2004) found that a high degree of realism (i.e., realistic sound, graphics, and setting), a rapid absorption rate, character development, the ability to customize the game, multiplayer features, winning and losing features, and the ability to save the game at regular intervals¹⁴ were seen by most gamers as essential characteristics of video games.

King et al. (2010c) tried to enlarge and systematize Wood et al.'s (2004) list according to the gambling literature. They created a theoretical model that contained five main groups:

- *Social features* that refer to the socializing aspects of video games, such as how players can communicate with other players, and the features that create a cooperative and competitive community of players.
- *Manipulation and control features* that refer to the ways in which a player can interact with and control in-game properties using a physical control scheme.
- *Narrative and identity features* that refer to the ways in which players can take on another identity in the game (as a fictional character or a construction of the self).

¹³ This chapter is an edited version of the section with the same title from the following book chapter: Király, O., Nagygyörgy, K., Griffiths, M. D., & Demetrovics, Z. (2014). Problematic online gaming. In K. Rosenberg & L. Feder (Eds.), *Behavioral Addictions: Criteria, Evidence and Treatment* (pp. 61-95). New York, NY: Elsevier.

¹⁴ In Wood et al.'s study the possibility to save the game regularly clearly refers to the structural characteristics of offline video games. However, in the case of online games (especially MMOs), this feature is present by default because one's account preserves the current state of the player's development. When players leave the game and then re-enter it later, they are usually able to continue playing from the same point where they had logged out.

- *Reward and punishment features* that refer to the ways in which players are reinforced for skillful play (i.e., winning) and punished for losing.
- *Presentation features* that refer to the aesthetic qualities of a video game, such as how the game looks (i.e., graphics) and sounds to players.

In a follow-up empirical study, reward and punishment features, such as earning points, finding rare game items, and fast loading times, were rated by players among the most enjoyable and important aspects of video game playing. Problematic video game players reported significantly higher enjoyment of features such as managing in-game resources, earning points, getting 100% in the game, and mastering the game than non-problematic players, which are features that typically take up more playing time than other features. In addition, the problematic group identified features such as “leveling up,” earning meta-game rewards (e.g., “Achievements”), and fast loading times as having a significantly greater impact on their playing behavior than other players (King, Delfabbro, & Griffiths, 2011).

The relationship between reward and punishment features and problematic use has also been stressed in theoretical literature. For instance, this is what Shavaun Scott (2007) – a psychotherapist who is an MMORPG player herself, and the mother of two sons who introduced her to gaming – refers to when she calls the MMORPGs “the most incredibly complex Skinner boxes that anyone could ever imagine” (for further information on the topic, see Clark & Scott, 2009, pp. 84-89). Similar to the case of slot machines, online game developers apply the principle of the partial reinforcement effect (PRE) to keep players playing. PRE is a critical psychological ingredient of excessive gaming whereby the reinforcement is instant but intermittent (i.e., people keep responding in the absence of reinforcement hoping that another reward is just around the corner). Magnitude of reinforcement (e.g., a high points score for doing something in-game) is also important: large rewards lead to fast responding and greater resistance to extinction (Griffiths, 2010a). The effectiveness of operant conditioning is responsible for those situations when gamers keep playing or even increase their gaming time in spite of the fact that they do not enjoy the activity any more (Yee, 2006b). Such states may easily lead to the appearance of problematic gaming.

However, operant conditioning is only one of the numerous psychological tricks that keep people playing. Game producer companies – regardless whether they admit it or not –

employ or consult highly skilled psychologists in order to create the most attractive and addictive games they can (Scott, 2007). This is not at all surprising, since the video game industry is a huge business and a highly competitive one (Entertainment Software Association, 2015). Therefore, only the most captivating games can yield nice profits by involving a huge number of players and by keeping them playing a lot for as long as possible. Consequently, it can be argued that video games are genuinely designed to be addictive since their profitability depends on their ability to attract and retain players.

1.10.2 Motivational aspects

Another important topic is closely related to the addictive nature and structural characteristics of video games, namely the psychological needs games aim to satisfy. Online gaming involves multiple reinforcements whereby different features might be differently rewarding to different people (what could be called “the kitchen sink approach” where game designers include a diverse range of gaming rewards in the hope that at least some of them will appeal to players) (Griffiths, 2010a). The game developers’ aim is to satisfy as many different psychological needs as possible, to motivate the widely heterogeneous gamer community to play continuously. Empirical studies suggest that gaming motives play an important role in the development and maintenance of problematic online gaming (Kuss & Griffiths, 2012b, 2012c). In other words, it is not all the same what motivates a person to play, because certain motives are associated with problematic play, while others are not.

The very first theoretical model of motivational aspects was developed by Bartle (1996), who examined early text-based virtual world (MUD) players. He proposed that MUD players can be classified in one of the following four motivational types: achievers, explorers, socializers, and killers. Achievers are motivated by fulfilling game-related goals, explorers try to find out as much as they can about the virtual world, socializers love to meet and befriend other players, and killers prefer to cause distress to others.

Bartle’s theoretical model has been empirically tested by Yee (2006c) among MMORPG players. Using exploratory factor analysis, he identified 10 motivational components that belong to three main factors labeled as achievement, social, and immersion. The components belonging to the achievement factor are advancement, mechanics, and competition. Socializing, relationship, and teamwork are the subcomponents belonging to the social factor and discovery, whereas role-playing, customization, and escapism

contribute to the immersion dimension. Another important finding is that the 10 listed motivational dimensions do not suppress but complement each other depending on the gaming situation. Yee (2006c) found that escapism and advancement subcomponents were associated with problematic usage measured by a variation of Young's (1998b) diagnostic questionnaire. The escapism motivation referred to the use of the online environment to avoid thinking about real-life problems, while advancement referred to the desire to gain power, progress rapidly, and accumulate in-game symbols of wealth or status. Yee's research had been replicated on a Hungarian online MMORPG sample (Nagygyörgy et al., 2012), and a Dutch online gamer sample (Kuss, Louws, & Wiers, 2012) and yielded similar results (i.e., escapism showed the strongest association with problematic online gaming in both studies, with achievement predicting problematic MMORPG use in Nagygyörgy et al.'s study, and mechanism motive being the second strongest predictor in Kuss et al.'s study). Zanetta Dauriat and colleagues (2011) also run a similar study among French, English and Italian MMORPG players (but using a different motivational questionnaire) and found that achievement and escapism were the best predictors of problematic use. Since Yee's model has been developed solely for MMORPG players, Demetrovics and his colleagues (2011) developed an empirically based motivational measure called the Motives for Online Gaming Questionnaire (MOGQ) comprising seven factors (i.e., social, escapism, coping, fantasy, skill development, recreation, and competition) suitable for comparing different types of online games.

All the aforementioned questionnaires have the structural characteristics of online games (or particularly MMORPGs) as their starting point. A different approach was applied by Ryan et al. (2006), who argued that instead of focusing on the structure and content of current games, research should target the fundamental or underlying motives and satisfactions that can initiate and sustain participation across all potential players and game types. More precisely, they argued that a true theory of motivation should not focus on behavioral classification constrained by the structure of particular games, but instead address the factors associated with enjoyment and persistence across players and genres, and how games that differ in controllability, structure, and content might appeal to basic human motivational propensities and psychological needs. Therefore, they applied the Cognitive Evaluation Theory (CET) used in the research of intrinsic motivation in the case of sports and other recreational activities which states that activities induce intrinsic

motivation depending on their capacity of satisfying the three basic human needs of autonomy, competence, and relatedness. The results support their conception that the enjoyment of video games and the desire to play again was significantly correlated with the level of autonomy, competence, and relatedness experienced in games (Przybylski, Ryan, & Rigby, 2009; Ryan et al., 2006). However, a connection between the three basic human needs and problematic online gaming has not yet been explored.

Wan and Chiou (2006) developed a different approach. Their starting point was Maslow's hierarchy of human needs. Their results showed that the psychological needs of online game players were closer to the two-factor theory that depicts satisfaction and dissatisfaction dimensions than to different one-dimensional approaches applied in other empirical studies. The lower hierarchy of human needs refers to "dissatisfactory needs" that include physical needs, safety needs, belongingness, and self-esteem. The higher hierarchy of human needs means "satisfactory needs" that comprise self-actualization and self-transcendence. Addicted players' need-gratification was similar to the feature of dissatisfactory factor. That is, the absence of playing online games is more likely to generate a sense of dissatisfaction; the addicts' compulsive use of online games appears to stem from the relief of dissatisfaction rather than the pursuit of satisfaction. In contrast, online games tend to provide non-addicted players with a sense of satisfaction rather than a sense of dissatisfaction. This result is in line with the results of Wang and Chu (2007), who differentiated harmonious and obsessive passion in online gaming and found that only obsessive passion (the state when the player is controlled by his player activity instead of controlling it himself) was related to problematic online gaming. Although players with harmonious passion enjoy and feel cheerful about gaming, players with obsessive passion feel fanatic over it and become angry or anxious when they cannot play. A case study of Griffiths (2010b) also demonstrated two excessive gamers: a healthy enthusiast who played for joy and recreation and a game addict who played to avoid his life problems and to ease the irresistible urge to play again.

1.10.3 Personality factors and psychological vulnerabilities

As mentioned before it can be argued that video games are genuinely designed to be addictive. However, no matter how addictive games are, none of them can make anybody a problematic gamer by itself. Similarly to other addictions, "it takes (at least) two to tango". Empirical research suggests (e.g., comorbidity with depressive symptoms or

general non-specific psychopathology; see previous section about comorbidity) that only gamers with psychological vulnerabilities are at risk of problematic use.

Some personality characteristics for instance seem to favor the development of problematic game use. More specifically, several studies examined the relationship between the Big Five personality traits and problematic gaming and found low emotional stability (Charlton & Danforth, 2010; Mehroof & Griffiths, 2010; Nagygyörgy et al., 2012; Peters & Malesky, 2008), low agreeableness (Charlton & Danforth, 2010; Peters & Malesky, 2008), and low extraversion (Charlton & Danforth, 2010) as being associated with the phenomenon. However, in relation to agreeableness and extraversion, the relationship does not seem to be as robust as with that of neuroticism. A possible explanation of these results could be that problematic gamers spend more time gaming to avoid real-life social situations that seem threatening because of low social abilities and/or low emotional stability. To such individuals, online environments may seem safe and be preferred to real-life situations. However, this is speculation on the author's part, and empirical research is needed to investigate such a hypothesis.

In addition to personality traits, other characteristics have also been examined. A study examining social skills found that the quality of interpersonal relationships decreased and the amount of social anxiety increased as the amount of time spent playing online games increased (Lo, Wang, & Fang, 2005). Problematic gaming has been negatively correlated with offline social self-efficacy and positively correlated with online social self-efficacy (Jeong & Kim, 2011). This echoes with research showing problematic gamers finding it easier to meet people online and having fewer friends in real life than in games (Porter et al., 2010). Inadequate self-regulation (Seay & Kraut, 2007), low self-esteem (Ko, Yen, Chen, Chen, & Yen, 2005a; Lemmens et al., 2011; Walther et al., 2012), low emotional intelligence (Herodotou, Kambouri, & Winters, 2011), above average state and trait anxiety (Kneer, Rieger, Ivory, & Ferguson, 2014; Mehroof & Griffiths, 2010), increased feeling of loneliness (Lemmens et al., 2011; Seay & Kraut, 2007; van Rooij et al., 2012), narcissistic personality (E. J. Kim, Namkoong, Ku, & Kim, 2008), and aggression (E. J. Kim et al., 2008; Mehroof & Griffiths, 2010; Müller et al., 2015; Walther et al., 2012) have also been found to be correlated with problematic online gaming. Additional studies report that problematic online gamers have lower life satisfaction (Ko et al., 2005a; E. S. Wang, Chen, Lin, & Wang, 2008) and decreased psychosocial well-being compared to other gamers (Kneer et al., 2014; Lemmens et al., 2011).

Because all the findings from these studies are correlational in nature, causal relations are unknown. Thus, Lemmens et al.'s (2011) longitudinal study worked to address this issue. Their analyses indicated that diminished social competence, lower self-esteem, and increased loneliness predicted an increase in problematic gaming six months later. Thus, lower psychosocial well-being can be considered an antecedent of problematic gaming among adolescent gamers. The analyses further indicated that loneliness was also a consequence of problematic gaming. This suggests that displacement of real-world social interaction resulting from problematic game use may deteriorate existing relationships, which could explain the increase in adolescent gamers' feelings of loneliness. Another longitudinal study published in the same year (Gentile et al., 2011) but spanning a period of two years reported that decreased social competence and impulsivity predicted initial problematic gaming symptoms and increase in the problematic behavior, which in turn predicted increased levels of depression, anxiety, and social phobia. Therefore, these results suggest that although games may be used as coping mechanisms to deal with already existing psychological problems, problematic behavior on the other hand leads to increased levels of depression, anxiety, and social phobia.

Consequently, it remains a question whether problematic online gaming is a primary or a secondary problem (or probably both), but its association with psychological vulnerabilities appears to be well-established in the academic literature. In addition to psychological problems, socio-demographic (i.e., being male, younger age) and environmental factors (e.g., influences from family, peers or school such as parental support, divorce or separation of parents, living in a single-parent family, subjective school well-being, social integration in class, school-related behavioral problems, or school phobia) may also play an important role in the development and maintenance of the problematic behavior (Haagsma et al., 2012; Rehbein & Baier, 2013; Rehbein et al., 2010; Zhou & Li, 2009). Moreover, recent studies suggest that some players might be genetically predisposed to develop problematic video game use (Griffiths, Kuss, & King, 2012). However, research in this area is still in its infancy, and numerous well-designed future studies are needed to obtain a reliable picture of the neurobiological and genetic background of behavioral addictions in general and problematic online gaming in particular.

1.11 Cultural differences

Although playing video games is a global phenomenon, and similarly, problematic online gaming is a global worry, significant cultural differences can be noticed around the world. The most remarkable and well-documented differences lie between the Western and the Eastern cultures. However, even Asian countries differ a lot from each other. Since the deep analysis of such cultural differences would need an entire dissertation, I would only like to point out a few interesting phenomena that concern specific Asian countries (i.e., China and South Korea) and differ widely from the Western culture in general.

Papers reviewing the global prevalence rates of problematic gaming often emphasize that studies from Asia report considerably higher rates than studies from other countries (e.g., King, Delfabbro, & Griffiths, 2012; Kuss, van Rooij, Shorter, Griffiths, & van de Mheen, 2013). On the one hand this should derive from methodological issues (e.g., Asian studies usually do not have representative samples while several studies from Europe has), however, on the other hand it may reflect the difference how Asian countries view the phenomenon of gaming and problematic gaming.

In their book chapter Lau, Griffiths and Kim (2011) pointed out that Internet addiction in China is not only a psychological and social problem but also a political and economic issue. The appearance and quick spreading of the Internet took China unawares, a country that tries really hard to control the mentality and behavior of its citizens. The technology of global information-flow was perceived as a great danger for the Chinese government, and therefore, they did their best to prevent Western ideology flowing into their country. They established the Great Firewall that censors the online content accessible in the country (i.e., political, religious, and pornographic). Additionally, the state pays special attention to the youth, since they are the most susceptible to novelty brought by the Internet. Moral panic concerning Internet addiction also appears in a specific cultural context. In the official Chinese communication Internet addiction is referred to as the “opium of the mind”, associating excessive Internet use with deviance, drugs, and alcohol. Moreover, the word “opium” has a special connotation in China, that is, “foreign influence” due to historical reasons related to the opium wars (Szablewicz, 2010).

The appearance of the Internet created a huge gap between generations. Academic performance is extremely important in China and due to the “one-child policy” – being in force since 1978 – parents are really demanding of their children (the one they have).

Those children who are unable to meet the high expectations of their parents are likely to escape into the online world trying to construct their personal identity and gain self-esteem (Golub & Lingley, 2008).

This social environment favored the appearance and the quick spread of Internet addiction clinics and military style boot camps all over the country. Although the patients of these clinics are for the most part adolescents, the true clients are their parents. In other words, Internet addiction is mostly considered a problem by parents and the society in general and not necessarily the adolescents themselves (Lau et al., 2011).

On the contrary, the social environment in South Korea is fairly different. Korea is a world leader in broadband penetration rates and the Korean government supports the high technological advancement and global competitiveness (Jin & Chee, 2008). In her ethnographic work Chee (2005) describes that playing video games is uniquely compelling in Korea, with a relatively large proportion of the adolescents and young adults playing regularly. For these young Koreans, their playing habit represents an entire way of life. The activities related to gaming determine their everyday routine, and also how they make choices in what and how they eat, how much they sleep, how they spend money, earn money, or even partake in courtship rituals.

As opposed to the Western practices (i.e., playing at home), Korean gamers prefer to play in the so-called “PC bangs” (PC rooms), places where they play in a shared physical space, usually a huge room with tens or even hundreds of PCs next to each other (see 1.11. Figure 1). Consequently, the PC bangs provide meeting places offline and are often considered as “third places” (Chee, 2006). Third places are social surroundings separate from the two usual social environments of home (“first place”) and the workplace (“second place”), but similarly, places of psychological comfort and support (Oldenburg, 1989). In line with this, some of the youth going regularly to such places do not primarily go for gaming but to meet and spend time with friends (Chee, 2005). Furthermore, the extreme popularity of PC bangs reflects well the collectivist nature of the Korean culture.



1.11. Figure 1. *PC bang is South Korea*

South Korea is also famous for its enthusiasm for professional gaming (Hutchins, 2006). Electronic sports, that is, the competitive play of video games (abbreviated as e-sport) is extremely popular in their culture (Jonasson & Thiborg, 2010) (see 1. 11. Figure 2). Unlike in other countries, professional gamers are regarded as celebrities without the commonly negative “nerd” association that gamers have anywhere else in the world. In fact, many Korean children aspire to be just like their popular idols, sponsored by large companies and worshiped by teenage girls (Chee, 2005).



1. 11. Figure 2. *League of Legends World Championship 2014 in South Korea*

With such an ardor around video gaming, gaming is not always a freely chosen leisure time activity. Being good at games is the norm, and those who – for some reason – are not good enough, are often isolated and bullied by their peers. The phenomenon is so universal in Korea, that it has its own name, “wang-tta”, difficult to translate in any other languages. As a consequence, there is, immense social pressure to be good at games. This is in line with the general competitiveness in Korea, the expectation to do “extremely well” in any areas (e.g., school) (Chee, 2006).

Summing up, there are serious cultural differences in the area of gaming (e.g., in the practice of gaming, in the meaning of it for the gamers themselves, for their parents, and for the society in general, in the attitude towards excessive gaming, or in the treatment approaches to problematic gaming). Consequently, cross-cultural studies are much needed to get a clear picture of these differences that is indispensable to choose the best prevention and intervention protocols for each country.

1.12 Prevention¹⁵

Articles on the topic of prevention (Griffiths, 2003b, 2008; Griffiths & Meredith, 2009) recommend that family members and/or friends initiate direct conversation with excessive or problematic players by showing true interest toward the game, the gamer, and everything the gamer likes in the virtual environment. Often this is the only topic that the player is willing to talk about or talks about with pleasure, and thus, it facilitates communication and emotional attachment with the user. Getting familiar with the games also helps toward establishing the mutually acceptable rules regarding them. If the gamer is a child or a teenager, it is highly recommended that parents or other family members choose the games together with the child using the official ratings as a guide for age appropriateness (e.g., ESRB ratings). These should be suitable for children in terms of content (e.g., violent or adult content must be avoided) while at the same time providing entertainment. Parents should encourage their children to play together with real-life friends because this helps the developing of personal relationships. This way, communication and cooperation skills learned online can be transferred more easily to real-life situations.

¹⁵ This chapter is the copy of the section with the same title from the following book chapter: Király, O., Nagygyörgy, K., Griffiths, M. D., & Demetrovics, Z. (2014). Problematic online gaming. In K. Rosenberg & L. Feder (Eds.), *Behavioral Addictions: Criteria, Evidence and Treatment* (pp. 61-95). New York, NY: Elsevier.

It is also worth determining daily and weekly game time together and in mutual agreement with players themselves, because this way it is easier to ask them to abide by it. It is also important to follow the game manufacturers' recommendations regarding monitor brightness, distance from the monitor, the taking of short and frequent breaks if gaming for a long time, not playing in the case of fatigue, etc. It is also extremely important that the gamer pursues other recreational activities (e.g., sports) in addition to gaming. If gamers play suitable games for an appropriate amount of time, playing can have several positive effects such as increasing self-esteem; improving reflexes, reaction time, memory, logical and strategic thinking, social and communication skills; and more (Griffiths, 2008, 2010a).

1.13 Treatment¹⁶

Literature on different problematic online gaming treatment methods are scarce, especially studies assessing the efficacy of different intervention types. To date, no standard clinical treatment protocol exists, and treatment techniques are usually derived from the ones applied to substance use or gambling disorders. This includes online support forums, individual, group and family psychotherapeutic interventions, pharmacotherapy, the 12-step Minnesota-model, military drill (in military style boot camps), and addiction clinics with multimodal treatment programs have been reported in the literature (Griffiths, 2008; Griffiths & Meredith, 2009; Huang, Li, & Tao, 2010; Jäger et al., 2012; Király et al., 2014; Thorens et al., 2014).

Among the psychotherapeutic treatment techniques, cognitive-behavioral therapies (CBTs) appear to be employed most often (King et al., 2012). The CBT approach posits that faulty cognitions are the sources of maladaptive behaviors and psychological problems [86]. For instance, in the case of those undergoing treatment for problematic online gaming, virtual rewards may be perceived as being significantly more valuable than real life relationships, hobbies, or a job. The goal of treatment is to induce behavioral change through identifying these faulty cognitions and replacing them with more healthy ones. Strategies to deal with everyday problems, time management, and self-regulation skills are often included too (King, Delfabbro, & Griffiths, 2010a).

¹⁶ This chapter is an edited version of the section with the same title from the following paper: Király, O., Griffiths, M. D., & Demetrovics, Z. (2015). Internet gaming disorder and the DSM-5: Conceptualization, debates, and controversies. *Current Addiction Reports*, doi: 10.1007/s40429-015-0066-7.

Pharmacological interventions are based on the assumption that problematic online gaming (like gambling disorder and substance use disorder) might share the same neurobiological mechanisms (Kuss & Griffiths, 2012a). Medications such as bupropion, escitalopram, or methylphenidate have been used to treat problematic online gaming and/or comorbid psychopathology (e.g., depression, anxiety, ADHD) (Huang, Li, et al., 2010; King & Delfabbro, 2014b). These studies have reported positive outcomes, however, the trials have several methodological shortcomings and none of them assessed the long-term efficacy of the interventions. This is indispensable in making conclusions regarding the effectiveness of pharmacological treatments.

Problematic online gaming is considered a main health issue by South-East Asian governments (e.g., China, South Korea, Singapore, Taiwan), affecting mostly the male adolescents and young adults (American Psychiatric Association, 2013; Cha, 2007). In order to treat the problem, dozens of Internet addiction treatment centers and military style boot camps have been established across these countries (Fackler, 2007; Huang, Li, et al., 2010). Unfortunately, the efficacy of the treatment programs provided in these clinics/camps are not known.

Summing-up, standardized and comprehensive methods of diagnosis (i.e., in addition to gaming frequency and problematic online gaming criteria, the context of gameplay, gaming motives, etc. should also be considered for diagnosis), standardized treatment protocols and standardized methods to assess the efficacy of these interventions are necessary (King & Delfabbro, 2014b; King et al., 2012). Not only should gaming frequency and problematic online gaming symptoms be assessed to determine post-treatment outcomes, but broader areas of benefit (e.g., the gamer's functioning in work/school-related areas, their participation in leisure time activities, the quality of their interpersonal relationships, etc.), and factors that prevent relapse should also be investigated. Due to the lack of rigor in such studies to date, none of the outlined intervention types have sufficient empirical support for treatment efficacy (King & Delfabbro, 2014b).

2 AIMS OF THE DISSERTATION

The last two decades of research in the field of problematic online gaming was fairly fruitful. Hundreds of articles have been published on the topic and as a result problematic online gaming was included in the Section 3 of the DSM-5. However, (as Section 3 also indicates), plenty of questions remain to be answered and plenty of disagreements remain to be settled until it can be decided whether problematic online gaming should be accepted as an official diagnosis or not.

Back in 2011 when I started my PhD, one of the biggest problems was that there was a huge lack in psychometrically validated measurement instruments. For this reason our research team developed the 18-item Problematic Online Gaming Questionnaire (Demetrovics et al., 2012) using thorough psychometric methods (i.e., a series of exploratory and confirmatory factor analysis on non-overlapping random subsamples originated from the initial sample) during the development process. The item pool was generated by means of a comprehensive literature review and interviews with online gamers. The target group comprised adult online gamers and data collection took place online. To further test the psychometric properties of the POGQ, the instrument was used in another survey (i.e., European School Survey Project on Alcohol and Other Drugs; ESPAD) targeting a different population (i.e., national sample of adolescents) and using a different data collection method (i.e., paper-and-pencil). In this study a shorter version (12-item) of the original scale was developed, aimed to assess the more impulsive population, and to facilitate incorporation into time limited surveys such as ESPAD. Additionally, this was the first study to explore the scale of this problem behavior in Hungary, and as such, it is an essential step in deciding whether prevention or intervention programs are necessary, and how should they be designed. Consequently, the first empirical study included in my dissertation (Study 1) had three main goals:

- (1) to validate the short form of the previously developed Problematic Online Gaming Questionnaire,
- (2) to estimate the proportion of Hungarian adolescents who play video games regularly,
- (3) and to estimate the prevalence of problematic online gaming in a national sample of Hungarian adolescents.

Another huge problem in the field is the frequent blending of problematic online gaming with problematic Internet use. The reason of this practice can be traced back to the dawn of the World Wide Web. When the Internet as a medium became available for the general public, for those not using it regularly (including some of the researchers) the medium seemed a unified entity. However, somewhat later, Griffiths (2000) has pointed out that there was an essential difference between addiction *to* the Internet (generalized Internet addiction) and addictions *on* the Internet (specific Internet addictions such as problematic online gaming, online gambling disorder, or cybersex addiction). Unfortunately, despite the efforts of Griffiths and other researchers (e.g., M. G. Kim & Kim, 2010), the practice of referring to problematic online gaming as problematic Internet use (or Internet addiction or similar terms) persisted and can still be encountered today. The biggest problem of blending these terms is making it impossible to know what the respective studies measure and making it difficult to carry out systematic reviews and meta-analyses necessary to summarize the various findings in the field. To draw further attention upon this issue, we conducted a study comparing problematic online gaming (measured by the POGQ-SF validated in Study 1) and problematic Internet use. As a consequence, the second empirical study (Study 2) aimed to

- (4) examine the interrelationship and the overlap between problematic online gaming and problematic Internet use along several relevant variables such as gender, time spent using the Internet and/or online gaming, psychological well-being, and preferred online activities.

To date, a large part of the studies conducted in the problematic online gaming field explored the psychological correlates of the behavior via correlations and regressions. These studies are indispensable in the early stage of research, however, more complex associations are also necessary to get a deeper understanding. Based on the alcohol literature where a mediator role of drinking motives between distal influences (e.g., trauma symptoms) and drinking problems was reported (Cooper, Frone, Russell, & Mudar, 1995; Kuntsche, Knibbe, Engels, & Gmel, 2007), we assumed that an indirect link existed between psychiatric distress and problematic online gaming (assessed by the POGQ) via the mediation of online gaming motives. Therefore, in Study 3 we aimed to

- (5) explore the role of psychiatric distress and gaming motives in problematic online gaming by testing a complex mediation model

- (6) to test possible moderating effects of gender and game type on the mediation model

According to the literature review presented in the Introduction, perhaps the most important question of all is how to define, conceptualize and operationalize problematic online gaming. As described earlier, there is a huge debate among scholars about the name, content and criteria of problematic gaming. The last empirical study included in my dissertation aims to contribute to this question. More specifically, it evaluates the usefulness and validity of each of the nine Internet gaming disorder criteria by testing how they perform at different severity levels of the disorder using an Item Response Theory approach. Additionally, we aimed to statistically test the possible Internet gaming disorder cut-off points (using Latent Class Analysis, sensitivity, and specificity analysis) since the one proposed by the APA was arbitrarily chosen without being tested empirically. In order to assess Internet gaming disorder and its proposed components as defined by the DSM-5, our research group developed a measurement instrument called Ten-Item Internet Gaming Disorder Test (IGDT-10). Consequently, the fourth empirical study included in the present work (Study 4) had three aims:

- (7) to validate the Ten-Item Internet Gaming Disorder Test (IGDT-10) instrument,
- (8) to evaluate the nine Internet gaming disorder criteria proposed by the DSM-5,
- (9) and to evaluate statistically the cut-off threshold (i.e., endorsing five out of nine criteria) for Internet gaming disorder proposed by the DSM-5.

The four empirical papers were introduced in the dissertation in their final (published or submitted) versions following the aforementioned order. The studies used three distinct datasets deriving from the following data collections: (1) the Hungarian data collection of the European School Survey Project on Alcohol and Other Drugs (ESPAD), carried out in 2011, aimed to assess the substance use habits of 15-16 years old adolescents; (2) an online data collection targeting adult online gamers from Hungary, carried out in 2009, aiming to explore the motivational background and psychological correlates of problematic online gaming; (3) and another online data collection targeting adolescent and adult online gamers from Hungary, carried out in 2015 as part of an international research project (coordinated by our research group) aimed to explore the motivational background of online games. The first dataset comprises a nationally representative sample of adolescents, while the other two datasets consist of large scale convenience samples (with sample sizes above 3000).

The next section comprises the empirical part of the dissertation and includes the four aforementioned studies as distinct chapters.

3 PSYCHOMETRIC PROPERTIES OF THE PROBLEMATIC ONLINE GAMING QUESTIONNAIRE SHORT-FORM (POGQ-SF) AND PREVALENCE OF PROBLEMATIC ONLINE GAMING IN A NATIONAL SAMPLE OF ADOLESCENTS (STUDY 1)¹⁷

3.1 Introduction

The growth of online video-gaming (Forbes, 2012) has led to a minority of players developing addiction-like symptoms (e.g., overuse, withdrawal, tolerance,) and negative consequences on work, education, and/or their social relationships (Griffiths, 2008; Young, 2009). Problematic use is also associated with poor self-esteem (Ko et al., 2005a; Lemmens et al., 2011) and depressive symptoms (Gentile et al., 2011; Peng & Liu, 2010). There is a lack of agreement as to the precise name and definition of the phenomenon, but general consensus that excessive online gaming can lead to a variety of physical/psychological problems (Demetrovics et al., 2012). Few studies have examined the prevalence of problematic gaming. Gentile (Gentile, 2009) reported 8.5% of American children aged 8–18 years exhibited pathological playing patterns. Rehbein and colleagues (Rehbein et al., 2010) found that 3% male and 0.3% female ninth-graders were dependent on videogames, with 5% boys and 0.5% girls at risk for developing dependence. Van Rooij and colleagues (van Rooij et al., 2011) reported 1.5% Dutch children aged 13–16 years were addicted online gamers.

In order to obtain reliable prevalence data, it is important to use psychometrically validated measurement tools (van Rooij et al., 2012). Unfortunately, there is lack of such tools, and most have been modified from other questionnaires without reliability/validity testing. This includes those based on Internet addiction (e.g., Internet Addiction Test; Young, 1998a), pathological gambling (using DSM-IV criteria), or behavioral addictions (Demetrovics & Griffiths, 2012; Griffiths, 2005a). An additional problem is that many tools focus exclusively on Massively Multiplayer Online Role Playing Games (MMORPGs) (Charlton & Danforth, 2007; M. G. Kim & Kim, 2010). In order to include

¹⁷ The present chapter is the exact copy of the following paper: Pápay, O., Urbán, R., Griffiths, M. D., Nagygyörgy, K., Farkas, J., Elekes, Z., Felvinczi, K., Demetrovics, Z. (2013). Psychometric properties of the Problematic Online Gaming Questionnaire Short-Form (POGQ-SF) and prevalence of problematic online gaming in a national sample of adolescents. *Cyberpsychology, Behavior, and Social Networking*, 16(5), 340-348.

all online gamers, an empirically-based questionnaire comprising 18 items, the Problematic Online Gaming Questionnaire (POGQ), was developed by the authors (Demetrovics et al., 2012).

Koronczai and colleagues (2011) claimed that suitable measures should meet six requirements: (1) *comprehensiveness* (i.e., examining more, possibly all, aspects of problematic online gaming); (2) *brevity* (to assess the more impulsive population as well and to facilitate incorporation into time-limited surveys); (3) reliability/validity for *different methods of data collection* (online, paper-and-pencil self-rating, face-to-face); (4) reliability/validity for *different age groups* (adolescents and adults); (5) *cross-cultural* reliability/validity; (6) validated on *clinical samples*. The measure should also serve as a basis for defining dependence cutoff scores.

The POGQ fits these first two requirements. Moreover, it is a psychometrically robust measure among large convenience samples of adult online gamers (for details of POGQ development see our earlier study; Demetrovics et al., 2012). However, there is great need for measures suitable for survey-type research in an offline data collection setting, and reliable/valid for adolescents (Kuss & Griffiths, 2012c). Therefore, the POGQ was reduced to a 12-item version and applied to an offline adolescent sample using pen-and-pencil data collection (fulfilling the third and fourth criteria above).

The aim of the present study was twofold: (a) to test the psychometric properties of the POGQ-SF, including gender invariance, on a nationally representative adolescent sample as (until recently) it had only been used on adult gamer samples, (b) to assess the prevalence of problematic online gaming in a nationwide adolescent sample, as only two nationally-representative adolescent studies in the US (Gentile, 2009) and Germany (Rehbein et al., 2010) have been published. Therefore, this study is a significant contribution to the literature.

3.2 Methods

3.2.1 Participants and procedure

In order to obtain a nationwide adolescent sample, data were collected with the European School Survey Project on Alcohol and Other Drugs (ESPAD) (Hibell et al., 2012). This international collaboration collects compulsory data on smoking, alcohol and drug use.

However, each country has the possibility to include optional questions. In 2011, Hungary included a short block to assess online gaming.

The target population of the ESPAD project is adolescents aged 16-years. To obtain a representative group sample, three different grades (8–10) were included in the Hungarian sample, each containing a proportion of the target population (Elekes, 2012). The survey applied an internationally homogenous stratified random sampling method based on region (Central/Western/Eastern Hungary), grade (8–10), and class type (Primary general, Secondary general, Secondary vocational and Vocational classes). The sampling unit was the class, and every classroom student present completed the questionnaire. Refusal rate was 15%, therefore data were weighted due to skewed non-response. To adjust for the variations among different sample groups (to match the composition of the respondents with the sampling frame), data were weighted by strata with matrix-weighting method according to the National Education Information System (KIR-STAT) (Elekes, 2012).

Students were surveyed in March 2011 (Elekes, 2012). Questions regarding online gaming were only included for the representative sample of 9th-10th graders in secondary general and secondary vocational schools (n=5,045). The present analysis was carried out on the subsample of those who had played online games in the past month (n=2,804; 55.6% of total sample). After removing cases where POGQ questions were missing, the final sample size was 2,774.

3.2.2 Measures

Major socio-demographic information (age, grade, gender, residence) and online gaming habits (e.g., type of online games played, frequency of playing, duration of typical gaming sessions) were collected. Additionally, psychological characteristics, including self-esteem (Rosenberg's Self-Esteem Scale [RSES]; Hibell et al., 2009; Rosenberg, 1965) and depressive mood (short-form [6-item] Center of Epidemiological Studies Depression-Scale [CES-D]; Radloff, 1977) were assessed. RSES is a 10-item self-report unidimensional measure of global self-esteem assessing feelings of self-worth and self-acceptance. Items were answered on a four-point scale ("strongly agree" to "strongly disagree"). Scores ranged from 10–40 with higher scores indicating higher self-esteem (Hibell et al., 2009). Cronbach's alpha was .857. CES-D is a unidimensional scale, not designed to diagnose clinical depression but to assess depressive symptom levels. Items

were answered on a four-point scale (“rarely or never” to “most of the time”). Scores ranged from 4–24 with higher scores indicating higher depressive mood level (Hibell et al., 2009). Cronbach’s alpha was .807.

Problematic online gaming was assessed using the 12-item POGQ-SF (see 9.1 Appendix A). The POGQ was originally an 18-item scale with good psychometric properties based on wide empirical content developed by the authors (Demetrovics et al., 2012). It measures six dimensions of problematic use (preoccupation, overuse, immersion, social isolation, interpersonal conflicts and withdrawal). The 12-item version of POGQ was developed by selecting two items from each factor. Item selection took into account preservation of high content validity and selection of the highest possible factor loadings. The reason for a short-form POGQ was to develop a measure that can be used in survey-type research, brief enough to assess more impulsive populations and facilitates incorporation into time-limited surveys.

3.2.3 Statistical analysis

To test the model, confirmatory factor analysis (CFA) was used with maximum-likelihood estimation with robust standard errors (MLR) in MPLUS 6.0. To evaluate goodness of fit, a *p*-value of χ^2 smaller than 0.05 for test of close fit was used. Further fit indices included Comparative Fit Index (CFI), Tucker-Lewis Fit Index (TLI), Root Mean Square Error of Approximation (RMSEA) and its 90% confidence interval (90% CI) and Standardized Root-Mean Square Residual (SRMR). For both CFI and TLI, values greater than 0.95 indicate a good fit, while values of RMSEA and SRMR should be less than 0.05 and 0.10 respectively for a well-fitting model (Byrne, 2010). In order to compare alternative nested models estimated with maximum-likelihood estimation with robust standard errors, Satorra-Bentler scaled $\Delta\chi^2$ -test (S-B $\Delta\chi^2$ -test) (Satorra & Bentler, 1994) was applied to determine the better fitting model.

Testing structural and measurement invariance between gender, a series of multigroup CFAs (Vandenberg & Lance, 2000) was carried out. Firstly, the measurement model was estimated freely in boys and girls. Secondly, four nested models with increasing constraints were estimated including one model in which factor loadings and intercepts were freely estimated (configural invariance), one model in which factor loadings were set equal (metric invariance), one model in which factor loadings and intercepts were set as equal in both groups (scalar invariance), and one model in which residual variances

were set equal (uniqueness invariance). The traditional χ^2 difference test (S-B $\Delta\chi^2$ -test) is usually used to compare two nested models but this method is sensitive to the model's complexity and large sample size (Chen, 2007; Cheung & Rensvold, 2002). Therefore the recommendations of Cheung and Rensvold (2002) and Chen (2007) for comparing two nested models were followed; cut-off values of $\Delta\text{CFI}<0.01$ and $\Delta\text{RMSEA}<0.015$ were used for testing metric, scalar and uniqueness invariance. The models were considered invariant in condition when both ΔCFI and ΔRMSEA indices were below the cut-off values.

In order to identify the gamers whose online game use was considered as problematic, latent profile analysis (LPA) was selected (carried out in MPLUS 6.0). The indicator variables were the sum score of each dimension of POGQ, as observed variables. LPA is a mixture modeling technique used to identify groups of people (categorical latent variable) that are similar in their responses to certain variables, in this case scores given for the six POGQ dimensions (continuous manifest variables) (Collins & Lanza, 2010). The analysis was performed with 2–4 classes on the weighted adolescent subsample playing online games during the last month ($n=2,774$). To determine the number of latent classes, several indices were used. Measures of parsimony of each model (e.g., Akaike Information Criteria [AIC], Bayesian Information Criteria (BIC), and Sample size adjusted Bayesian Information Criteria [SSABIC]) were used, lower values indicating more parsimonious models. The Entropy criterion was also examined, determining the accuracy of classifying people into their respective profiles, with higher values indicating better fit. Finally the Lo-Mendell-Rubin Adjusted Likelihood Ratio Test (LMRT) was used. This statistically compares the fit of the target model (e.g., 3-class model) to a model with one fewer class (e.g., 2-class model). A p -value of less than 0.05 indicates the tested model fits better than the previous one (Muthén & Muthén, 1998-2007). For CFA, the unweighted sample of the 2,774 cases was used. All other analysis was conducted on the weighted sample (described above). Missing data were treated with FIML method. Covariance coverage was above 0.98 in CFA.

To further test the validity of the POGQ, the LPA classes along a few variables (i.e., gender, time spent gaming, grade-point average, self-esteem, level of depressive symptoms) relevant to the phenomenon of problematic online gaming were compared. For these comparisons, Wald χ^2 test of mean equality for latent class predictors in mixture

modeling was used (for description of analysis, see: <http://www.statmodel.com/download/meantest2.pdf>).

3.3 Results

3.3.1 Descriptive statistics

The total sample ($n=5,045$, 51% male, mean age 16.4 years, $SD=0.87$ years) was divided into two groups. Those who played online games in the month preceding data collection were classed as ‘gamers’ (G), and those who had not played were classed as ‘non-gamers’ (NG). Over half (55.6%) of the sample’s participants were gamers ($n=2,804$). Two-thirds of gamers (65.4%) were male compared to 32.9% of non-gamers ($\chi^2=403.29$, $p<.001$). The mean age of gamers and non-gamers was 16.4 years ($SD_G=0.85$; $SD_{NG}=0.89$ years; $F=0.009$, $p=.926$).

3.3.2 Confirmatory Factor Analysis

A six-factor solution on the ‘gamer’ group ($n=2,774$) with CFA was tested. The model provided an optimal fit to the data ($\chi^2= 277.35$ $df=39$ $p<.001$; $CFI=0.972$; $TLI=0.953$; $RMSEA= 0.047$ [0.042-0.052] $Cfit>0.90$; $SRMR=0.025$) (Table 1). Alternatively, the degree of fit of a one-factor model ($\chi^2= 1549.20$ $df=54$ $p<.001$; $CFI=0.82$; $TLI=0.79$; $RMSEA= 0.100$ [0.096-0.104] $Cfit<0.001$; $SRMR=0.064$) and a model with one second-ordered factor ($\chi^2=528.30$; $df=48$, $p<.001$; $CFI=0.94$; $TLI=0.92$; $RMSEA=0.060$ [0.056-0.065]; $Cfit<0.001$; $SRMR=0.042$) were estimated. The original six-factor model yielded superior fit compared to the one-factor model (S-B $\Delta\chi^2$ -test =1137.3; $\Delta df=15$ $p<.0001$) and the second-ordered factor model (S-B $\Delta\chi^2$ -test =246.2; $\Delta df=9$ $p<.0001$). In the six-factor model the factor loadings were higher than 0.70 with their respective factor. The correlations between factors ranged between 0.82 and 0.57 (Table 1). The highest correlation was between social isolation and interpersonal conflict, and the lowest correlation was between social isolation and preoccupation. Based on the CFA analysis, the composite reliability and average variance extracted indices (Bagozzi & Yi, 1988; Forner & Larcker, 1981) were calculated. The composite reliability of each dimension was above 0.60 (3.3.2. Table 1). The average variance extracted from each scale was adequate and above 0.50 (3.3.2. Table 1). The discriminant validity coefficients with the square root of the average variance extracted were also calculated. Although discriminant validity indices were high, the correlations between factors were strong, therefore the

relatively weak discriminant validity of each dimension represented that these dimensions are closely related component of the construct of problematic online gaming.

3.3.2. Table 1. Confirmatory factor analyses of the 12 item POGQ-SF on the national sample of Hungarian adolescents

	Pre-occupation	Immer-sion	With-drawal	Over-use	Interpers. conflict	Social isolation
When you are not gaming, how often do you think about playing a game or think about how would it feel to play at that moment?	.83					
How often do you daydream about gaming?	.86					
How often do you lose track of time when gaming?		.80				
How often do you play longer than originally planned?		.71				
How often do you get restless or irritable if you are unable to play games for a few days?			.81			
How often do you feel depressed or irritable when not gaming only for these feelings to disappear when you start playing?			.83			
How often do you feel that you should reduce the amount of time you spend gaming?				.83		
How often do you unsuccessfully try to reduce the time you spend on gaming?				.85		
How often do you argue with your parents and/or your partner because of gaming?					.76	
How often do the people around you complain that you are gaming too much?					.77	
How often do you fail to meet up with a friend because you were gaming?						.78
How often do you neglect other activities because you would rather game?						.83
Factor determinacies	.93	.91	.93	.93	.93	.92
Cronbach's a	.83	.72	.80	.83	.73	.78
Mean	3.41	4.48	2.89	3.18	3.12	2.66
SD	1.77	2.16	1.58	1.75	1.64	1.81

Note: Empty cells represents the factor loadings that are fixed to 0; all other factor loadings are significant at least at $p<.001$. Chronbach's alpha of the total Problematic Online Gaming Questionnaire is .91.

Gender invariance of the six-factor model including configural, metric and scalar invariances was tested. The fit indices are reported in 3.3.2. Table 2. The first test of configural invariance measured whether POGQ-SF was best described by a six-factor structure for boys and girls. The results showed that the configural invariance model fitted the data reasonably well ($\text{RMSEA}=0.053$ $\text{Cfit}>0.135$, $\text{CFI}=0.952$). In order to confirm metric invariance, factor loadings were constrained to be equal across genders; intercepts and residual variances were freely estimated; and factor means were fixed to zero in boys and girls. The constrained model yielded acceptable model fit ($\text{RMSEA}=0.055$ $\text{Cfit}>0.050$, $\text{CFI}=0.946$). The changes in χ^2 between the configural and metric invariant model were significant (S-B $\Delta\chi^2$ -test=40.3; $\text{df}=6$, $p<.001$). However, $\Delta\text{CFI}=0.006$ and $\Delta\text{RMSEA}=0.002$ were smaller than the cut-off values. These results confirm that factor loadings were invariant across genders. To establish scalar invariance, intercepts and factor loadings were constrained to be equal across the two groups; the residual variances were freely estimated; and factor means were set to zero in one group and free in the other. The changes in χ^2 between the metric and scalar invariant model were significant (S-B $\Delta\chi^2$ -test=24.5; $\text{df}=6$, $p<.001$). However, $\Delta\text{CFI}=0.003$ and $\Delta\text{RMSEA}=0.001$ were less than the cut-off values which indicate that scalar invariance can be established across the two groups. To test uniqueness invariance intercepts, factor loadings and uniqueness (residual variances) are constrained to be equal across genders. The changes in χ^2 between the scalar and uniqueness invariant model were significant (S-B $\Delta\chi^2$ -test=236.2; $\text{df}=12$, $p<.001$). However, $\Delta\text{CFI}=0.052$ and $\Delta\text{RMSEA}=0.017$ were higher than the cut-off values which indicate that uniqueness invariance cannot be established across the two groups. However, the uniqueness invariance is not a requirement for the comparison of each group's means.

3.3.2. Table 2. Goodness-of-fit indices for models testing gender invariance

	χ^2_{boys}	χ^2_{girls}	df	CFI	TLI	RMSEA	Cfit of RMSEA	SRMR
<i>Single group analyses separately in boys and girls</i>								
1. Boys only	233.5		39	0.968	0.946	0.053	0.241	0.026
2. Girls only		113.8	39	0.959	0.931	0.044	0.829	0.037
<i>Multigroup analyses</i>								
3. Configural invariance: Factor loadings and intercepts are freely estimated, and factor means are fixed to zero.	210.9	204.3	84	0.952	0.924	0.053	0.138	0.127
4. Metric invariance: Factor loadings are fixed to be equal, intercepts are freely estimated, and factor means are fixed to zero.	216.2	244.8	90	0.946	0.921	0.055	0.063	0.175
5. Scalar invariance: Intercepts and factor loadings are constrained.	232.0	256.1	96	0.943	0.922	0.054	0.068	0.175
6. Uniqueness invariance: Intercepts, factor loadings and residual variances are constrained.	290.7	568.8	108	0.891	0.867	0.071	<0.001	0.256

3.3.3 Latent profile analysis

A latent profile analysis on the six dimensions of problematic online gaming was performed. According to the criteria listed above, the three-class solution was selected (3.3.3. Table 1). The AIC, BIC and SSABIC decreased continuously as more classes were added to the analysis. However, the scale of decrease diminished after the third latent class was added. Regarding the entropy, the two-class solution provided the greatest

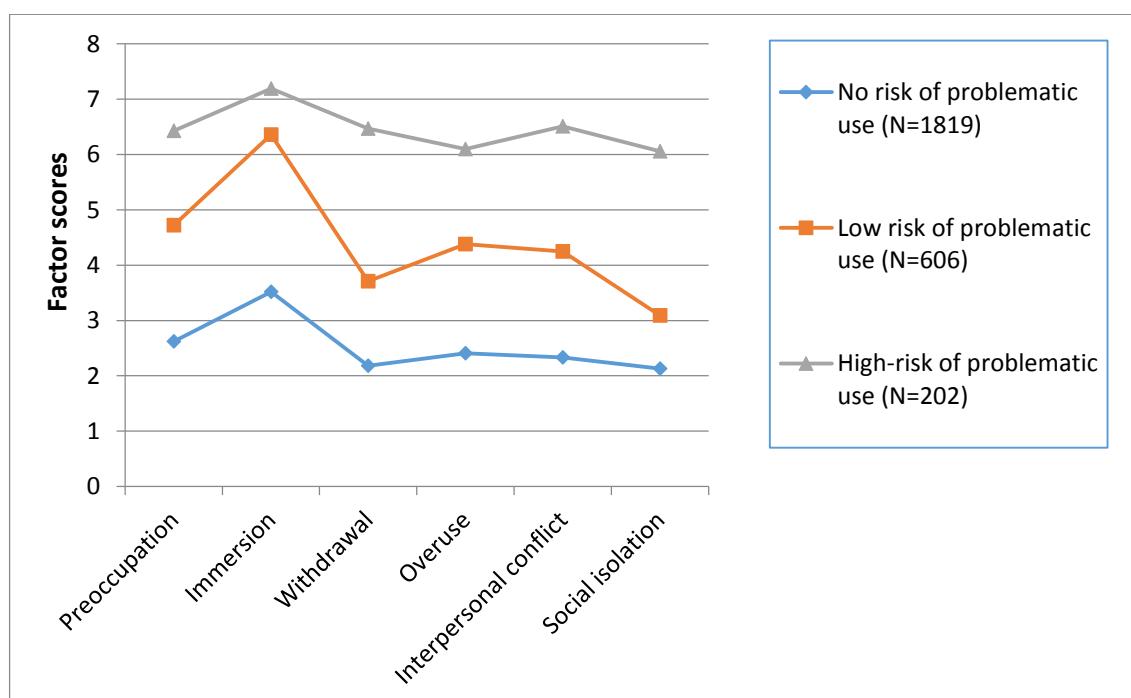
value, but the three-class solution was also adequate. The non-significant p -value of the L-M-R test clearly showed that the four-class solution should be rejected in favor of the previous one, therefore the three-class solution was accepted.

3.3.3. Table 1. Fit indices for the latent profile analysis of the POGQ-SF

Number of latent classes	AIC	BIC	SSABIC	Entropy	L-M-R test	p
2 classes	56966	57079	57019	0.944	6650	<.001
3 classes	54800	54954	54872	0.913	2141	<.001
4 classes	53905	54100	53995	0.912	797	.3423

Note: AIC: Akaike Information Criteria; BIC: Bayesian Information Criteria; SSABIC: Sample size adjusted Bayesian Information Criteria. L-M-R Test: Lo-Mendell-Rubin adjusted likelihood ratio test value; p : p -value associated with L-M-R Test.

The features of the three classes are shown in 3.3.3. Figure 1. The first class (68% of gamers; 37.8% of total sample) represents those gamers who scored below the average on the POGQ-SF factors. The second class of gamers (23.9% and 13.3% respectively) represents the low-risk of problematic use, while the third class (8.2% and 4.6% respectively) represents the high-risk for problematic online gaming population. In all three groups, especially the second, the ‘immersion’ factor showed an elevated level compared to the other five dimensions.



3.3.3. Figure 1. Latent profile analysis on the six factors of the POGQ-SF

Gamers belonging to the high-risk class were more likely to (a) be male, (b) play over five hours a day, (c) have lower grade-point average, (d) have lower self-esteem, and (e) higher level of depressive symptoms, than gamers belonging to the other two classes (3.3.3. Table 2).

3.3.3. Table 2. *Comparison of the three latent classes: testing equality for latent class predictors*

	No-risk class (N=1,883)	Low-risk class (N=652)	High-risk class (N=221)	Overall test	
				Wald χ^2	p value
Gender (Male %)	56.2 _a	83.8 _b	87.2 _b	235.5	<.001
Age (years), Mean (SE)	16.43 (0.021) _a	16.31 (0.032) _b	16.50 (0.059) _a	14.2	.001
Game time on an average day (>= 5 hours %)	8.3 _a	23.5 _b	44.9 _c	133.6	<.001
Grade point average (min 10, max 50, mean 35.5; failed <20), Mean (SE)	35.83 (0.186) _a	35.30 (0.325) _a	33.32 (0.524) _b	17.7	<.001
Self-esteem (min 10, max 40, mean 28.5); Mean (SE)	28.86 (0.126) _a	28.17 (0.215) _b	26.41 (0.393) _c	33.9	<.001
Level of depressive symptoms (min 6, max 24, mean 11.35); Mean (SE)	11.06 (0.076) _a	11.64 (0.132) _b	13.00 (0.255) _c	54.5	<.001

Notes: Different subscript letters (a, b, c) in the same row reflect significant ($p<.05$) difference between the means while same subscript letters in one row reflect non-significant difference between the means according to pair wised Wald v2 test of mean equality for latent class predictors in mixture modeling (www.statmodel.com/download/meantest2.pdf).

3.3.4 Determination of the optimal cut-off score in order to classify online gamers as problematic gamers: Sensitivity and specificity analyses.

Considering the membership in the third class (high risk for problematic online gaming) as the “gold standard”, the sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and accuracy of the POGQ-SF at all possible cut-off

points was calculated (3.3.4. Table 1). Based on this analysis, a cut-off score of 32 points is an optimal cut-off to classify online gamers as problematic gamers. At this value, sensitivity is 96%, while specificity is 97% (i.e., only 4% of true problematic gamers are not identified by the measure, while only 3% of non-problematic cases are considered problematic). In this case, PPV is 75% and NPV is 100%. This means 25% of the individuals with a positive test result are identified mistakenly, while all individuals with negative test results are identified correctly. The accuracy was 97%. Increasing the cut-off score would lead to more false negative cases, while decreasing would further increase the number of gamers mistakenly diagnosed.

3.3.4. Table 1. *Calculation of cut-off thresholds for POGQ-SF*

	True positive	True negative	False positive	False negative	Sensi- tivity (%)	Speci- ficity (%)	PPV (%)	NPV (%)	Accuracy (%)
26/27	202	2156	269	0	100	89	43	100	90
27/28	202	2208	217	0	100	91	48	100	92
28/29	202	2255	170	0	100	93	54	100	94
29/30	201	2298	127	1	100	95	61	100	95
30/31	198	2326	99	4	98	96	67	100	96
31/32	194	2361	64	8	96	97	75	100	97
32/33	187	2384	41	15	93	98	82	99	98
33/34	177	2402	23	25	88	99	89	99	98
34/35	156	2410	15	46	77	99	91	98	98
35/36	139	2417	8	63	69	100	95	97	97
36/37	109	2420	5	93	54	100	96	96	96
37/38	93	2423	2	109	46	100	98	96	96
38/39	80	2425	0	122	40	100	100	95	95
39/40	67	2425	0	135	33	100	100	95	95

Note: The bolded row in the table indicates the suggested cut-off threshold.

3.4 Discussion

Results showed that the 12-item POGQ-SF has appropriate psychometric properties according to the CFA performed on a nationally representative adolescent sample. The results support the gender invariance of POGQ-SF including configural, metric and scalar invariance. However, residual invariance cannot be confirmed. Latent profile analysis revealed 8.2% of gamers (4.6% of total sample) belong to the high-risk group. This

prevalence value is in accordance with other large sample surveys conducted (Gentile, 2009; Rehbein et al., 2010). Results showed an additional 13.3% of adolescents (23.9% of gamers) displaying symptoms of problematic online gaming above the average. Both groups (high-risk and low-risk) should be analyzed thoroughly in future studies to explore those background factors that may carry risk regarding problematic online gaming.

In this study, the “immersion” dimension showed an elevated level at all three LPA classes, especially the low-risk group. The two items of this dimension (“How often do you play longer than originally planned?” and “How often do you lose track of time when gaming?”) indicate excessive use of online games, immersion in gaming, and losing track of time. Since low-risk groups could be the focus of future prevention programs, immersion should be highlighted when developing such programs.

Gamers belonging to the high-risk class were more likely to be male, play over five hours a day, have lower grade-point average, have lower self-esteem, and higher depression score than gamers belonging to the other two classes. These results concur with findings of other studies confirming the measurement tool’s validity. Several studies claim males are at higher risk in becoming problematic online gamers (H. Cole & Griffiths, 2007; Rehbein et al., 2010) and that problematic online gamers spend greater time playing than normal gamers (Gentile, 2009; Grusser et al., 2007; Hsu, Wen, & Wu, 2009). Some studies also note that problematic gamers’ school performance is negatively affected by their gameplay (Porter et al., 2010; Young, 2009) and are characterized by lower self-esteem (Ko et al., 2005a; Lemmens et al., 2011). Furthermore, some studies have demonstrated that depression is a comorbid disorder in problematic online gaming (Gentile et al., 2011; Peng & Liu, 2010).

The present study was carried out among Hungarian adolescents, thus to test it on cross-cultural samples in the future could be an important aim. It is also a future goal to confirm the POGQ on clinical samples. The current POGQ is short, comprehensive, and assesses problematic online gaming in different age groups with different data collection methods. Therefore POGQ is an adequate tool for assessing problematic online gaming, facilitating future research, and helping legal authorities and health practitioners develop prevention and treatment programs.

4 PROBLEMATIC INTERNET USE AND PROBLEMATIC ONLINE GAMING ARE NOT THE SAME: FINDINGS FROM A LARGE NATIONALLY REPRESENTATIVE ADOLESCENT SAMPLE (STUDY 2)¹⁸

4.1 Introduction

The phenomenon of Internet addiction was first described in a number of papers by both Young (1996, 1998b) and Griffiths (1996a, 1998). The topic immediately gained more general attention and has since become a highly researched area numbering approximately 70 large-scale studies with sample sizes of over 1,000 participants (Kuss, Griffiths, Karila, & Billieux, 2014). Despite the continuing use of the term ‘Internet addiction’, researchers have pointed out the diverse nature of the activities that can now be engaged in on the Internet and have often assumed that different online activities contribute to Internet addiction in different scales (Griffiths, 1999c; Young, 1998a, 1999a).

Online applications differ considerably depending on the role the Internet plays in them. For instance, it was argued that in the case of activities like online gambling and shopping, the Internet was simply another channel in which traditional offline activities could now take place (Griffiths, 2000, 2003a). However, the Internet is an essential component in other online activities such as information browsing (e.g., ‘*Googling*’), interacting in online chat rooms and more recently, social networking (Griffiths, 2000; Kuss & Griffiths, 2011). In short, these latter activities can only take place online.

However, there are also some activities where the Internet has brought a new dimension to an offline activity. One such activity is the playing of video games. While video games (and arguably multiplayer video games) existed long before the Internet became widely used, large-scale online connectedness subsequently opened new frontiers and experiences in gaming – particularly in the case of Massively Multiplayer Online Games (MMOGs). Current MMOGs can host thousands of players simultaneously in the same virtual space and has completely changed the quality, experience, and dynamics of

¹⁸ The present chapter is the exact copy of the following paper: Király, O., Griffiths, M. D., Urbán, R., Farkas, J., Kökönyei, G., Elekes, Z., Tamás, D., Demetrovics, Z. (2014). Problematic Internet Use and Problematic Online Gaming Are Not the Same: Findings from a Large Nationally Representative Adolescent Sample. *Cyberpsychology, Behavior, and Social Networking*, 17(12), 749-754.

gaming (Griffiths et al., 2003; Williams et al., 2006). This could perhaps be one reason why problematic online gaming or online gaming addiction has become such a distinct research area. The fact that the proposed DSM-5 category of Internet use disorder was eventually replaced by Internet gaming disorder (American Psychiatric Association, 2013; Griffiths, King, et al., 2014; King & Delfabbro, 2013a) also demonstrates the importance of this particular phenomenon.

Despite the increasing number of studies conducted in these areas, relatively little is known about the relation between problematic Internet use (PIU) and problematic online gaming (POG). Beyond the theoretical considerations, it is also important on both a practical and pragmatic level to examine whether there is need for differentiation between these two phenomena. In short, are PIU and POG two distinct conceptual and nosological entities involving different populations and having different features or are they one and the same? More concretely, are the characteristics of the individuals affected by PIU and POG similar or different? Are the contributing factors similar or different?

Earlier research suggest some differences between the populations affected by the two phenomena. For instance while perhaps a larger demographical group is affected by PIU (Young, 1996) POG seems to affect mostly the younger male population (Kuss & Griffiths, 2012c; Rehbein et al., 2010). However, a critical methodological shortcoming of most of these studies is that they examined PIU and POG separately. Consequently, the aim of the present study was to examine the interrelation and the overlap between PIU and POG in terms of gender, school achievement, time spent using the Internet and/or online gaming, psychological wellbeing, and preferred online activities in a nationally representative adolescent sample.

4.2 Methods

4.2.1 Sample and procedure

Data were collected in March 2011 as part of an international project called the *European School Survey Project on Alcohol and Other Drugs (ESPAD)* (Hibell et al., 2012). This project takes place every four years since 1995 and assesses smoking habits and alcohol and drug use of adolescents aged 16 years in a growing number of participating countries. In addition to the mandatory questions, in 2011 Hungary added two brief sections to assess problematic Internet use and problematic online gaming.

To obtain a representative sample of 16-year old adolescents in the Hungarian population, an internationally homogenous stratified random sampling method was applied based on region (Central/Western/Eastern Hungary), grade (8–10), and class type (primary general, secondary general, secondary vocational, and vocational classes). The sampling unit was the class, and the questionnaire was administered to every student present at school at the time of data collection. Data needed to be weighted due to skewed nonresponse resulting from a refusal rate of 15%. To match the composition of the participants with the sampling frame, data were weighted by strata with the matrix weighting method recommended by the National Education Information System (KIR-STAT) (Elekes, 2012, unpublished data).

Questions relating to problematic Internet use and problematic online gaming were only administered to the nationally representative sample of 9th–10th graders in secondary general and secondary vocational schools ($N = 5,045$). After removing cases where answers to problematic Internet use and problematic online gaming questions were completely missing, the final sample comprised 4,875 adolescents.

4.2.2 Measures

Basic sociodemographics (i.e., gender and age) along with school performance (grade average), and information regarding Internet use and online gaming were collected. Time spent using the Internet and time spent playing online games on an average day were asked with single choice questions (less than 1 hour, 1-2h, 3-4h, 5-6h, 7-8h, more than 8 hour). In order to make the results clearer, the number of categories was reduced during the analyses by merging the two categories from the edges, respectively. The three most frequently used Internet activities were also recorded. Students could choose from six options (i.e., searching for information online, playing online games, online chatting, using social networking sites, sending emails, and downloading) and could specify up to two additional online activities.

PIU was assessed using the 6-item version of the Problematic Internet Use Questionnaire (PIUQ-6) (Demetrovics et al. 2015, unpublished manuscript). The original scale had 18 items and three subscales: obsession, neglect, and control disorder (Demetrovics, Széredi, & Rózsa, 2008). The shorter version kept the original three-factor structure measured by two items, respectively. A 5-point Likert scale (from “never” to “always/almost always”) was used to estimate how much the given statements characterized the respondents.

Scores range from 6 to 30, with higher scores indicating more problematic Internet use. A cut-off score of 15 was recommended to distinguish between problematic and non-problematic Internet users. Both instruments showed good psychometric properties (Demetrovics et al., 2008; Koronczai et al., 2011). Internal consistency of the 6-item PIUQ was .77 on the present sample.

POG was measured using the 12-item POGQ-SF (Problematic Online Gaming Questionnaire Short-Form) (Pápay et al., 2013). This instrument derives from the 18-item POGQ, a scale with good psychometric properties based on both theoretical and empirical content (Demetrovics et al., 2012). Both versions measure six underlying dimensions of problematic gaming (i.e., preoccupation, overuse, immersion, social isolation, interpersonal conflicts, and withdrawal) using a 5-point Likert scale. Scores range from 12 to 60, with higher scores indicating more problematic online gaming. A cut-off score of 32 was recommended to distinguish between problematic and non-problematic online gamers. Internal consistency of the 12-item POGQ was .93 on the present sample.

Psychological characteristics such as depressive mood (short-form [6-item] Center of Epidemiological Studies Depression-Scale [CES-D]) (Radloff, 1977) and self-esteem (Rosenberg's Self-Esteem Scale [RSES]) (Rosenberg, 1965) were also assessed. Short-form CES-D is a scale designed to assess depressive symptom levels using a 4-point Likert scale (from "rarely or never" to "most of the time"). Scores range from 4 to 24, with higher scores indicating higher depressive mood levels. Internal consistency was .82 on the present sample. RSES assesses feelings of self-worth and self-acceptance measuring in such a way global self-esteem. It has 10-items (5 reversed items) and a 4-point Likert scale (from "strongly agree" to "strongly disagree"). Scores range from 10 to 40, with higher scores indicating higher self-esteem. Internal consistency was .86 on the present sample.

4.2.3 Statistical analyses

Descriptive analyses were performed with IBM SPSS Statistics for Windows, Version 20.0 (IBM Corp, 2011). To test the interrelation between average daily Internet use and average daily online gaming (measured as categorical variables), as well as the interrelation between PIU and POG, two contingency tables were created. In order to examine the two nosological entities proposed by recent psychological literature (i.e., PIU and POG), the association of PIU and POG was compared with relevant predictive

variables using a multivariate multiple regression analysis within structural equation modeling (SEM) in MPLUS 6.0 (Muthén & Muthén, 1998-2010). Multivariate multiple regression model can estimate the associations between more than one outcome variable and more than one predictor variable, moreover in this type of analysis all regression coefficients were estimated with controlling all other predictor variables in the model. Due to deviation from normal distribution the maximum likelihood estimation with robust standard errors estimation was used. All analyses were conducted on the weighted sample. Missing data in Mplus were treated with Full Information Maximum Likelihood (FIML) method (Muthén & Muthén, 1998-2010).

4.3 Results

4.3.1 Descriptive statistics

Mean age of the sample ($N=4,875$) was 16.4 years ($SD=0.87$), and 50% were boys. Only six students (0.1%) reported not using the Internet at all in the month preceding data collection. The majority of those students that had used the Internet could be grouped into one of three groups: (i) those who had never played online games ($n=709$, 14.5%), (ii) those who had played during the month preceding data collection ($n=2,073$, 42.5%), and (iii) those who had played online games but not during the month preceding data collection ($n=1,799$, 36.9%). All the analyses were carried out on the second subsample that comprised current gamers in order to be able to make a comparison between problematic Internet use and problematic online gaming. Mean age of the current gamer subsample was the same as of the total sample. However, gender distribution was different: two-thirds (69.1%) of current gamers were boys compared to half (50.4%) of the total sample.

4.3.2 Time spent using the Internet and playing online games

In order to find out the interrelation between average daily Internet use and average daily online gaming, a contingency table was created (see 4.3.2. Table 1). The data show that while average daily Internet use was distributed fairly equally between the three time categories, online gaming substantially decreased as the time categories increased. The table also shows that while online gaming is accompanied by high amounts of Internet use, the opposite is less true. Namely those who spend a lot of time using the Internet do not necessarily spend a lot of time playing online games.

4.3.2. Table 1. Contingency table showing average daily Internet use and average daily online gaming ($N = 2,057$ adolescents)

Average daily Internet use (last month)	Average daily online gaming (last month)						
	< 2 h		3-6 h		> 7 h		Total
< 2 h	596	(91.4%)	49	(7.5%)	7	(1.1%)	652 (100%)
	(42.5%)		(11.6%)		(3.0%)		(31.7%)
3-6 h	575	(67.3%)	245	(28.7%)	34	(4.0%)	854 (100%)
	(41.0%)		(57.9%)		(14.8%)		(41.5%)
> 7 h	233	(42.3%)	129	(23.4%)	189	(34.3%)	551 (100%)
	(16.6%)		(30.5%)		(82.2%)		(26.8%)
Total	1404	(68.3%)	423	(20.6%)	230	(11.2%)	2057 (100%)
	(100%)		(100%)		(100%)		(100%)

4.3.3 Problematic Internet users and problematic online gamers

To find out the scale of PIU and POG and the overlap between the two, another contingency table was created comprising four different groups: (i) neither problematic Internet users, nor problematic online gamers (80.2%), (ii) problematic Internet users but not problematic online gamers (8.8%), (iii) problematic online gamers but not problematic Internet users (4.3%), (iv) both problematic Internet users and problematic online gamers (6.7%) (4.3.3. Table 1).

4.3.3. Table 1. Contingency table showing overlaps between problematic Internet use and problematic online gaming ($N = 1,923$ adolescents)

Problematic Internet use	Problematic online gaming		
	No	Yes	Total
No	1,543 (80.2%)	82 (4.3%)	1,625 (84.5%)
Yes	169 (8.8%)	129 (6.7%)	298 (15.5%)
Total	1,712 (89.0%)	211 (11.0%)	1,923 (100%)

Note: 150 cases (7.2%) had missing values on either some PIUQ, or some POGQ questions, therefore the summarized PIU or POG scores for these cases could not be calculated.

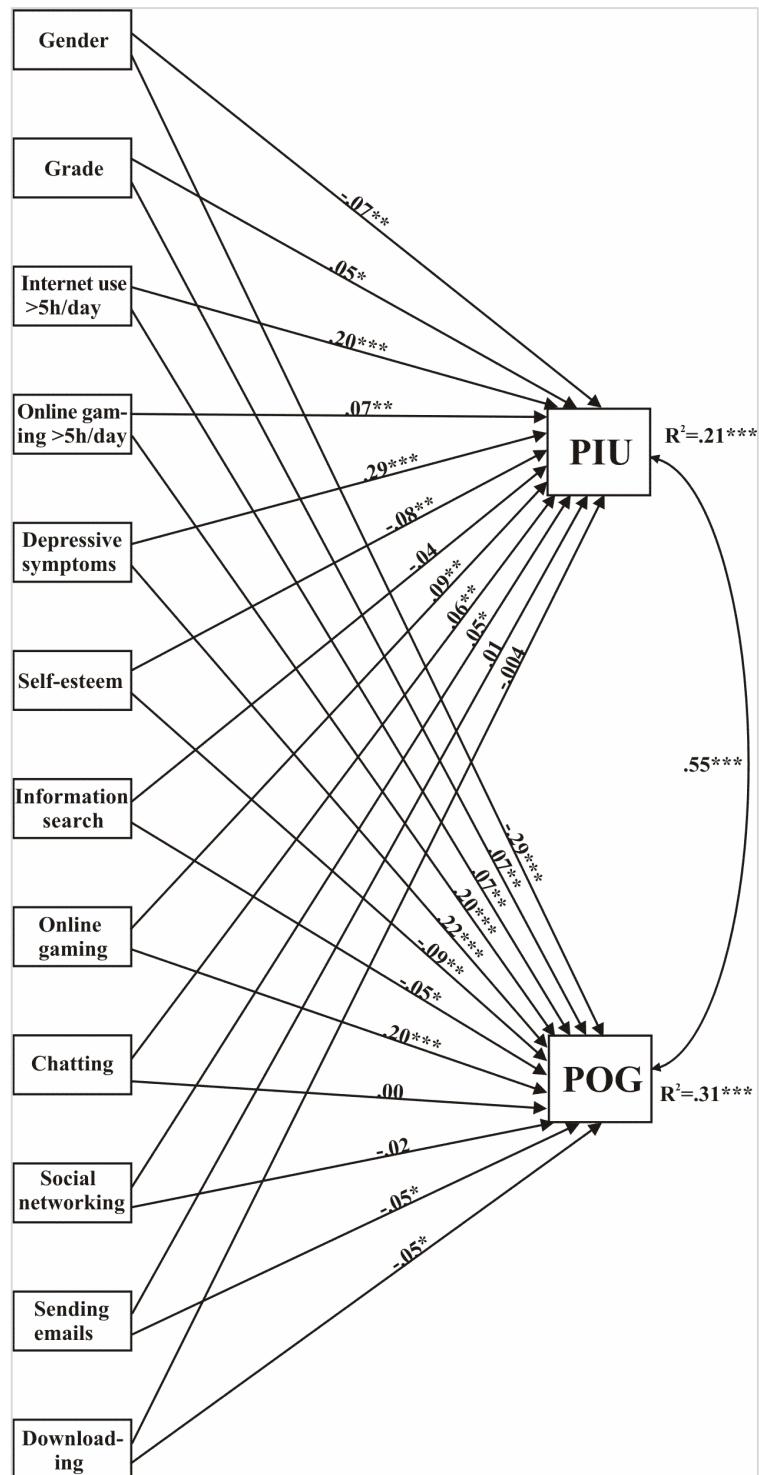
4.3.4 Multivariate multiple regression

A correlation matrix of study variables is presented in 4.3.4. Table 1. In order to compare the association of PIU and POG with relevant predictor variables, a multivariate multiple regression was carried out (see 4.3.4. Figure 1). Results demonstrated distinctive associations of some predictor variables with the two outcome variables. Being male was associated with both problem behaviors, however, the association was stronger for POG ($\beta = -.29 p < .001$) than for PIU ($\beta = -.07 p < .01$). More than five hours of Internet use on an average day had a stronger association with PIU ($\beta = .20 p < .001$) than POG ($\beta = .07 p < .01$), while online gaming for more than five hours on an average day had a closer association with POG ($\beta = .20 p < .001$) than PIU ($\beta = .07 p < .01$). Self-esteem had a very low standardized effect on both entities ($\beta = -.08 p < .01$ for PIU and $\beta = -.09 p < .01$ for POG) while depressive symptoms showed slightly stronger association with PIU ($\beta = .29 p < .001$ vs. $\beta = .22 p < .001$). In addition, school performance measured by grade point average had a very low positive effect on both problem online behaviors ($\beta = .05 p < .05$ for PIU and $\beta = .07 p < .01$ for POG). In relation to the six Internet activities that were offered to be rated as one of the three favorite online activities (i.e., searching for information, playing online games, chatting, using social network sites, sending emails, and downloading) only playing online games was considerably associated with POG ($\beta = .20 p < .001$) while playing online games, online chatting, and social networking were all associated with PIU though their effect sizes were negligible ($\beta = .09 p < .01$, $\beta = .06 p < .01$, and $\beta = .05 p < .05$, respectively).

4.3.4. Table 1. Correlation matrix comprising all study variables

	POG	Gender	Grade	Internet use >5h/day	Online gaming > 5h/day	Depressive symptoms	Self-esteem	Information search	Online gaming	Chatting	Social networking	Sending emails	Down-loading
PIU	.59**	-.01	-.04	.27**	.19**	.34**	-.23**	-.08**	.08**	.10**	.02	-.03	-.01
POG	1.00	-.32**	-.05	.20**	.35**	.20**	-.12**	-.05*	.31**	-.05*	-.12**	-.06**	-.06*
Gender		1.00	.16**	-.08**	-.24**	.25**	-.27**	-.04	-.28**	.16**	.21**	.03	-.01
Grade			1.00	-.22**	-.17**	-.13**	.06*	.05*	-.05*	-.01	.04	.01	-.03
Internet use >5h/day				1.00	.41**	.12**	-.09**	-.01	.07**	.08**	-.03	-.04*	.03
Online gaming > 5h/day					1.00	.03	-.02	-.04	.24**	-.05*	-.08**	-.01	-.10
Depressive symptoms						1.00	-.52**	-.03	-.08**	.13**	.05*	-.02	.02
Self-esteem							1.00	.03	.05*	-.05*	-.01	-.01	-.01
Information search								1.00	-.11**	-.15**	-.19**	.02	-.17**
Online gaming									1.00	-.21**	-.22**	-.02	-.18**
Chatting										1.00	.07**	-.13**	-.09**
Social networking											1.00	-.08**	-.04
Sending emails												1.00	-.06**

Notes: N=1,815–2,073 adolescents; * $p<.05$ ** $p<.01$. Gender was coded as 1 for male and 2 for female.



4.3.4. Figure 1. Multivariate multiple regression model for problematic online gaming (POG) and pathological Internet use (PIU)

Note: Error covariances among the predictor variables are not shown for the sake of clarity.

* $p < .05$ ** $p < .01$ *** $p < .001$

4.4 Discussion

The present study aimed to examine the interrelationship between PIU and POG on a nationally representative adolescent sample. The results suggested that while Internet use was a common activity among adolescents, online gaming was engaged in by a much smaller group. Moreover, ‘hard-core’ gaming (i.e., those playing online games for more than 7 hours per day) was much rarer than the prolonged use of the Internet (i.e., using the Internet for 7 hours per day). Based on these results, it is not surprising that more adolescents met the criteria for PIU than for POG while a small group of adolescents showed symptoms of both problem behaviors. These results are in line with the literature suggesting higher Internet use than online gaming (Rehbein & Mößle, 2013; van Rooij et al., 2010) and higher PIU than POG in adolescent samples (Rehbein & Mößle, 2013).

The multivariate multiple regression model also demonstrated a distinction between the two online behaviors. The most notable difference was in terms of gender and time spent on the two activities. While both PIU and POG were associated with being male, the effect size was much larger for POG. The association of PIU with time spent using the Internet was stronger than its association with playing online games, while the association of POG with time spent on online gaming was stronger than its association with time spent using the Internet. The distinction is also demonstrated by different preference for online applications. While online gaming was the only online activity mentioned as one of the frequently practiced online activities for POG, PIU was positively associated with online gaming, online chatting, and social networking. However, the very low effect size of social networking on PIU was surprising. One explanation might be that the popularity of social networking sites in Hungary began to grow exponentially following the period of this data collection. The recent increase of smart phone ownership (Forsense, 2013) might also change the findings of the upcoming *ESPAD* research in relation to activities such as social networking.

Interestingly, low self-esteem had low standardized effect sizes on both problem online behaviors. These findings are in line with some previous research (Rehbein & Mößle, 2013) but contradict some other studies (e.g., Caplan, 2002; Niemz, Griffiths, & Banyard, 2005). However, depressive symptoms were associated with both PIU and POG but affecting PIU slightly more. This again supports much of the previous literature (K. Kim et al., 2006; Yau, Potenza, & White, 2013; Yen, Ko, Yen, Chang, & Cheng, 2009).

Despite the many strengths of the study including the large sample size, the national representativeness of the sample, and the strong psychometric properties of the instruments used to assess both POG and PIU, there are some limitations to the data collected. The data were all self-report and as such are prone to various biases (e.g., social desirability, memory recall biases). In addition, all the participants were from Hungarian adolescents and the results may therefore not be generalizable to adolescents in other countries or adult samples. As mentioned above, the data were collected before the recent social networking boom and if repeated now, the study may have produced different results. The study should therefore be replicated both among adolescent and adult samples and in different countries as well.

Based on the findings of the present study, POG appears to be a conceptually different behavior than PIU. The results clearly show that the two types of problematic online behavior appear to involve different populations and are associated with different contributing factors. The data support the notion that Internet addiction disorder and Internet gaming disorder are separate nosological entities. Consequently, classifying only POG as a disorder in the current diagnostic systems might lead to ignorance towards other potentially addictive online activities such as social networking (Griffiths, Kuss, & Demetrovics, 2014) or more general problematic use of the Internet (Kuss et al., 2014).

5 THE MEDIATING EFFECT OF GAMING MOTIVATION BETWEEN PSYCHIATRIC SYMPTOMS AND PROBLEMATIC ONLINE GAMING: AN ONLINE SURVEY (STUDY 3)¹⁹

5.1 Introduction

The large-scale expansion of the video game industry and online video gaming as a leisure time activity (Gaudiosi, 2012) has led to the appearance of problematic online gaming and online gaming addiction (Kuss & Griffiths, 2012b, 2012c). Although only a minority of players appear to display addiction-like symptoms and negative consequences on other important activities (i.e., work, education) and relationships (Pápay et al., 2013), it is still essential to explore the contributing factors in the development of this behavior. The importance of the phenomenon is also demonstrated by research findings that claim that online gaming is generally the most frequent problem associated with Internet use (Thorens et al., 2014) and by the fact that problematic online gaming was recently introduced into Section 3 of the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders (DSM-5)* (American Psychiatric Association, 2013) under the name of “Internet gaming disorder.” Hopefully its inclusion will encourage further research on the topic and help unify the field (Griffiths, King, et al., 2014).

The attraction of online games appears to lie in their potential to satisfy different psychological needs that can be conceptualized as motives for gaming. In one earlier study, 7 motivational dimensions for online gaming were identified (Demetrovics et al., 2011). *Social motivation* concerns the need of gaming together with others and making friends. *Escape* refers to gaming in order to avoid real life problems and difficulties. *Competition* concerns the defeating of others, whereas *skill development* is about improving the player’s own coordination, concentration, and other skills. *Coping* involves stress, tension, or aggression reduction through gaming as well as getting into a better mood. *Fantasy* refers to trying out new identities and/or activities in virtual game worlds that are not possible in the gamers’ everyday lives. Finally, *recreation* concerns gaming for the playing of the game for fun. In fact, a recent study demonstrated that self-reported

¹⁹ The present chapter is the exact copy of the following paper: Király, O., Urbán, R., Griffiths, M. D., Ágoston, C., Nagygyörgy, K., Kökönyei, G., & Demetrovics, Z. (2015). Psychiatric symptoms and problematic online gaming: The mediating effect of gaming motivation. *Journal of Medical Internet Research*, 17(4), e88.

gaming motives were related to actual in-game behaviors and could also predict future in-game behaviors (Billieux et al., 2013).

Studies into alcohol use have shed light on the importance of motives in both drinking and problem drinking (e.g., Kuntsche, Knibbe, Gmel, & Engels, 2005). Similarly, an association between different gaming motives and problematic online gaming has been reported in the literature. Yee (2006c) found that escapism and advancement motives were the best predictors of problematic use of massively multiplayer online role-playing games (MMORPGs). Nagygyörgy and colleagues (2012) yielded similar results (i.e., escapism and achievement showed strong association with problematic MMORPG play). However, Zanetta Dauriat and colleagues (2011) found that addictive MMORPG use patterns were best predicted by achievement, escapism, and socializing motives. Kwon and colleagues (2011) suggested that adolescents become addicted to online games in an attempt to escape from self and reality based on Baumeister's (1990) escape theory.

It has also been reported that psychiatric symptoms can be related to problematic online gaming. For instance, depression, anxiety, and social anxiety are positively related to problematic gaming (Brunborg et al., 2014; Desai, Krishnan-Sarin, Cavallo, & Potenza, 2010; Mentzoni et al., 2011; Peng & Liu, 2010; Walther et al., 2012). An association has also been found between various domains of psychopathology and problem video gaming using the Symptom Checklist 90 (SCL-90) (Starcevic et al., 2011).

To date, psychiatric symptoms have been viewed as being directly related to problematic online gaming. This approach is understandable because—as in other addictions—it is highly probable that psychiatric symptoms accompany the problem behavior. However, an indirect link might also exist between the 2 entities via the mediation of specific motivations. Such findings have been reported in the alcohol and gambling literature. Drinking motives have been shown to be the most proximate factors that precede alcohol use, the gateway via which more distal influences (e.g., alcohol expectancies, anxiety sensitivity, trauma symptoms, and personality) are mediated (Cooper et al., 1995; Kaysen et al., 2007; Kuntsche et al., 2007; Stewart, Zvolensky, & Eifert, 2001; Urbán, Kökönyei, & Demetrovics, 2008). For instance, the coping motive mediates between tension-reduction expectancies and drinking problems (Cooper et al., 1995). Moreover, in the case of gambling, the motivation to escape or dissociate has been found to mediate between aversive physiological and emotional states and gambling severity (Gupta & Derevensky, 1998; Jacobs, 1986).

Gender differences may also play an important role in problematic gaming. Research has consistently shown that males are more likely to play online games (Demetrovics et al., 2012; Gentile et al., 2011; Pápay et al., 2013) and spend significantly more time gaming than female players (Gentile, 2009; Rehbein et al., 2010). The literature also suggests that male players are at higher risk of problematic gaming than female players (Gentile et al., 2011; Lemmens et al., 2011; Pápay et al., 2013; Rehbein et al., 2010). Furthermore, males and females also differ regarding their game type preference and motives to play. For instance, male gamers tend to prefer action, sports, and shooter games, whereas female gamers prefer puzzle, adventure, and quiz games (Chou & Tsai, 2007; Karakus, Inal, & Cagiltay, 2008). It has also been found that male gamers score higher on motives related to achievement and competition, whereas female gamers score higher on social motives and escapism (Demetrovics et al., 2011; Yee, 2006c). These findings are in-line with gender differences in competitiveness and social-emotional inclination. Males tend to be more competitive in various contexts, such as between-group interactions (Pemberton, Insko, & Schopler, 1996) and negotiations (Walters, Stuhlmacher, & Meyer, 1998). In contrast, females have been considered to be more interpersonally oriented (Baumeister & Sommer, 1997; Taylor et al., 2000). In addition, females are more prone to experience negative emotions and to internalize problems reflected in higher prevalence of depression (Grigoriadis & Robinson, 2007) and anxiety disorders (Pigott, 1999), and this is in-line with their higher escapism scores. It has also been argued that clinical correlates of gaming may differ by gender (Desai et al., 2010).

Given that different game types (e.g., role-playing games, first-person shooters, and real-time strategy games) vary in their basic structural characteristics and gameplay (King et al., 2010c; Nagygyörgy et al., 2013), it is reasonable to assume that psychiatric symptoms and motives related to different game types might also vary. In-line with this assumption, Stetina and colleagues (2011) found that MMORPG players showed higher tendency toward depressive symptoms and escapism than gamers playing online shooters or real-time strategy games.

Consequently, the present study had 2 aims. The first aim was to test the mediating role of online gaming motives between psychiatric symptoms and problematic use of online games. Based on the literature, it was assumed that escape, coping, and competition motives would act as mediators in the model. The second aim was to test the moderator effect of gender and game type preference in this mediation model. Based on gender

differences reported in the online gaming literature, differences in the paths related to competition, social, and escape motives have been expected between male and female players. On the other hand, no assumptions have been made regarding game type-related differences in the lack of findings in this domain.

5.2 Method

The study was approved by the Institutional Review Board of the Eötvös Loránd University, Budapest, Hungary.

5.2.1 Recruitment

All the most frequently visited Hungarian online gaming websites having more than 100 registered users were identified ($N=18$). The majority of the sites ($n=11$) were game-specific: (M)MORPG (e.g., Lineage II, World of Warcraft, Guild Wars, Diablo II, Lord of the Rings; Thrillion kincsei [The Treasures of Thrillion]); (massively) multiplayer online real-time strategy ([M]MORTS) games (e.g., Age of Empires 3, Travian, Klánháború [TribalWars], and Red Alert 3); multiplayer online first-person shooter (MOFPS) games (e.g., Call of Duty), 1 site was genre-specific (i.e., role-playing games), and 6 sites were general video gaming sites. The search was carried out by 4 experts using online search engines (i.e., Google) and additionally obtaining information from gamers from their circle of acquaintances. Subsequently, the 18 websites were invited to advertise for participants in the present study. All administrators agreed to cooperate and advertised the call for participation on their websites or included it in their online newsletter to gamers. In the call for participation in the study, gamers were asked to visit a password-protected website and complete the questionnaire.

Before filling out the questionnaire, all participants were informed about the general goals of the study (i.e., to obtain an objective and real picture of online games and the online gamer community in contrast with the simplified and rather negative picture the media disseminates) and the time needed to complete it. They were assured about confidentiality and anonymity, and their informed consent was obtained by ticking a box if they agreed to continue and participate in the study. No personal information was collected or stored and no incentives were offered. Data collection took place between April and July 2009. The advertisements were displayed for approximately 3 months, whereas the newsletters including the call for participation were sent twice. According to the voluntary nature of

participation, answering all the questions was not mandatory. The number of unique website visitors was not assessed at the time of the recruitment period, and the number of overlapping visitors between the 18 websites was also unknown; therefore, the view rate could not be calculated. In total, 7,520 gamers visited the first page of the questionnaire and 4,374 completed at least some of it. Consequently, the participation rate was 58.16%. Of these 4,374 gamers, 3,186 completed the entire survey including psychiatric symptoms, online gaming motives, and problematic online game use resulting in a completion rate of 72.84%. Consequently, all analyses were carried out on this latter subsample. Only completed questionnaires were analyzed. However, skipping answers was allowed; therefore, missing data were treated with full information maximum likelihood (FIML) method with MPlus 6.0.

5.2.2 Measures

Sociodemographic Variables

Data relating to major sociodemographics were collected including age, gender, marital status, and education.

Gaming-Related Variables

Data were collected regarding weekly game time and preferred game type. Game type preference was obtained using the results of a latent profile analysis on the amount of time spent playing different game types described in a previous study that used the same sample (which was slightly bigger than the current sample because it also included those respondents who did not complete the Brief Symptom Inventory [BSI] placed at the end of the questionnaire) (Nagygyörgy et al., 2013). The majority of the sample (2,517/3,186, 79.00%) had a clear game type preference. Almost half of the sample (1,466/3,186, 46.01%) played almost exclusively with MMORPGs, whereas an additional 872 of 3,186 gamers (27.37%) preferred MOFPSs. A small minority of the sample, 118 of 3,186 gamers (3.70%) mostly played MMORTS games. The rest of the gamers (61/3,186, 1.91%) played other online games (i.e., sport games, puzzle games) or did not have a clear game type preference (669/3,189, 21.00%). Therefore, the majority of the sample (2,338/3,186, 73.38%) could be categorized as either an MMORPG player or an MOFPS player. In the moderation analysis, only these 2 groups were focused on due to the low sample size of the remaining groups (i.e., MMORTS players and gamers playing other online game types).

Psychiatric Symptoms

These were assessed using the Hungarian version of the BSI (Derogatis, 1975; Urbán et al., 2014), a measure that assesses self-reported clinically relevant psychological symptoms. The 53-item questionnaire uses a 5-point Likert scale (from “not at all” to “extremely”). The BSI comprises 9 symptom dimensions: somatization, obsession compulsion, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism. However, in the present study, the summarized measure—the Global Severity Index (GSI)—was applied to measure the intensity of general distress. Good reliability and validity has been found across various samples (Derogatis, 1975, 1993; Urbán et al., 2014) as well as in this study (Cronbach alpha=.97).

Online Gaming Motives

These were assessed using the Motives for Online Gaming Questionnaire (MOGQ) (Demetrovics et al., 2011). This 27-item self-report measure assesses the full range of motives for online gaming. The 7 motivational dimensions assessed by MOGQ comprise social, escape, competition, skill development, coping, fantasy, and recreation. A brief description of each motivation has already been mentioned in the Introduction. In addition, a sample item for each motivation is as follows: social (e.g., “...because I can meet many different people”), escape (e.g., “...to forget about unpleasant things or offenses”), competition (e.g., “...because it is good to feel that I am better than others”), skill development (e.g., “...because it improves my skills”), coping (e.g., “...because it helps me get rid of stress”), fantasy (e.g., “...to be somebody else for a while”), and recreation (e.g., “... because it is entertaining”). The MOGQ uses a 5-point Likert scale from “never” to “almost always/always,” with higher scores indicating higher frequency of the respective motivational dimension. Internal consistencies were reported for all 7 dimensions, ranging from .79 to .90 (Demetrovics et al., 2011).

Problematic Use of Online Games

This was assessed using the Problematic Online Gaming Questionnaire (POGQ) (Demetrovics et al., 2012). The POGQ is an 18-item self-report assessment tool with good psychometric properties based on both theoretical and empirical content. It assesses 6 dimensions of problematic gaming, namely preoccupation, overuse, immersion, social isolation, interpersonal conflicts, and withdrawal. The items are measured on a 5-point Likert scale (from “never” to “always”) and a summarized score can also be calculated that shows the severity of the problematic use (with higher scores indicating more serious

problems being due to online gaming). A cut-off score of 66 points has been suggested to determine the proportion of gamers at high risk of problematic use. This cut-off score was determined empirically in the same article (Demetrovics et al., 2012). Conducting a latent profile analysis, 4 severity groups were identified and a cut-off score was calculated by using a sensitivity and specificity analysis based on the most severe group as the criterion group. The factor structure of the POGQ has been confirmed in further studies and high internal consistencies (.91) have also been reported (Demetrovics et al., 2012; Pápay et al., 2013).

5.2.3 Statistical Analyses

Structural regression analyses within structural equation modeling (SEM) were used to test the proposed mediation models. Because the scales were not normally distributed, maximum likelihood estimation robust to nonnormality (MLR) was used in all SEM analyses (Muthén & Muthén, 1998-2007). Multigroup analyses were used to test gender and game type differences. To evaluate goodness of fit of the overall models, the chi-square goodness-of-fit statistic (with a p value $<.05$), the comparative fit index (CFI), the Tucker-Lewis fit index or nonnormed fit index (TLI or NNFI), root mean square error approximation (RMSEA) and its 90% confidence interval (90% CI) and the standardized root mean square residuals (SRMR) were used. For both CFI and TLI, values greater than 0.9 were considered a good fit, whereas both the values of RMSEA and SRMR should be less than 0.08 for an acceptable degree of fit (Browne & Cudek, 1993; Kline, 2005). Descriptive analyses were performed with the SPSS 20.0 statistical software package, and all SEM analyses were performed with MPlus 6.0.

5.3 Results

5.3.1 Descriptive Statistics

The mean age of the sample ($N=3,186$) was 21.1 years (SD 5.9 years, range 14-54 years), and the majority of the sample (2,859/3,186, 89.74%) were male. As previously mentioned, 1466 of 3,186 gamers (46.01%) had a clear preference for MMORPGs and 872 of 3,186 (27.37%) for MOFPSs. Among the MMORPG players, 240 gamers (16.37%) were female, whereas among MOFPS players only 20 gamers (2.29%) were female. Information regarding weekly game time and the proportion of gamers at high risk of problematic use is presented in 5.3.1. Table 1.

5.3.1. Table 1. *Weekly game time and proportion of gamers at high risk of problematic use for the overall sample, for males and females, and for multiplayer online first-person shooter (MOFPS) and massively multiplayer online role-playing games (MMORPGs) gamer types*

Gaming related variables	Total sample, n (%) (N=3186)	Gender, n (%)		Game type preference, n (%)	
		Males (n=2,859)	Females (n=327)	MOFPS players (n=872)	MMORPG players (n=1,466)
Weekly game time					
<7 hours	382 (12.00)	328 (11.5)	54 (16.5)	125 (14.4)	137 (9.4)
7-14 hours	772 (24.25)	688 (24.1)	84 (25.7)	266 (30.5)	298 (20.4)
15-28 hours	1,102 (34.62)	1,001 (35.0)	101 (30.9)	308 (35.4)	509 (34.8)
29-42 hours	639 (20.08)	583 (20.4)	56 (17.1)	136 (15.6)	355 (24.2)
>42 hours	288 (9.05)	256 (9.0)	32 (9.8)	36 (4.1)	165 (11.3)
Gamers at high risk of problematic use^a	2.43	2.39	2.76	1.96	2.95

Note: ^a The proportion of gamers at high risk of problematic use was calculated using the established cut-off point (i.e., 66) suggested in a previous paper (Demetrovics et al., 2012). Note that only MOFPS and MMORPG gamers have been included because the MMORTS gamer group was very small and the remainder of the players could not be differentiated regarding their game type preference.

It was assumed that the parameters of the proposed model might be moderated by players' game type preference and gender. Therefore, descriptive statistics and group differences regarding the variables included in the model are presented in 5.3.1. Tables 2 and 3.

5.3.1. Table 2. Means, standard deviations (SD), and confidence intervals (CI) for multiplayer online first-person shooter (MOFPS) and massively multiplayer online role-playing games (MMORPGs) gamer types examined and for all (MOFPS and MMORPG)^a players and effects sizes (Cohen's *d*)

Psychopathology and gaming related variables ^b	All (MOFPS & MMORPG) players (n=2,338)		MOFPS players (n=872)		MMORPG players (n=1,466)		Comparison of MOFPS and MMORPG players		
	Mean (SD)	95% CI	Mean (SD)	95% CI	Mean (SD)	95% CI	t (df)	p	Cohen's <i>d</i>
Global Severity Index	0.61 (0.61)	0.59-0.64	0.57 (0.57)	0.53-0.61	0.64 (0.64)	0.61-0.67	2.82 (1986.8)	.005	0.12
POGQ Total score	36.13 (11.93)	35.65-36.62	34.99 (11.73)	34.21-35.77	36.82 (12.00)	36.20-37.44	3.59 (2326)	<.001	0.15
MOGQ									
Escape	1.93 (1.01)	1.89-1.97	1.83 (0.93)	1.76-1.88	2.00 (1.06)	1.95-2.05	4.09 (2019.5)	<.001	0.18
Coping	2.51 (1.08)	2.47-2.55	2.57 (1.12)	2.50-2.64	2.47 (1.05)	2.42-2.52	1.99 (1740.8)	.047	0.09
Fantasy	2.33 (1.13)	2.28-2.38	2.05 (1.00)	1.98-2.12	2.49 (1.17)	2.43-2.55	9.67 (2057.9)	<.001	0.40
Skill development	2.23 (1.14)	2.18-2.28	2.54 (1.21)	2.46-2.62	2.04 (1.05)	1.99-2.09	9.99 (1635.4)	<.001	0.44
Recreation	4.18 (0.87)	4.15-4.22	4.12 (0.90)	4.06-4.18	4.22 (0.85)	4.18-4.26	2.75 (1737.7)	.006	0.11
Competition	2.39 (1.19)	2.34-2.44	2.75 (1.22)	2.67-2.83	2.17 (1.11)	2.11-2.23	11.41 (1693.5)	<.001	0.50
Social	3.07 (1.20)	3.02-3.12	3.07 (1.21)	2.99-3.15	3.07 (1.19)	3.01-3.13	0.15 (2332)	.882	0.00

Note: ^a Only MOFPS and MMORPG gamers have been included because the MMORTS gamer group was very small and the rest of the players could not be differentiated regarding their game type preference. ^b POGQ: Problematic Online Gaming Questionnaire, MOGQ: Motives for Online Gaming Questionnaire.

5.3.1. Table 3. Means, standard deviations (SD), and confidence intervals (CI) for both genders and for the total sample and effects sizes (Cohen's *d*)

Psychopathology and gaming related variables ^a	Total sample (N=3,186)		Males (n=2,859)		Females (n=327)		Gender comparison		
	Mean (SD)	95% CI	Mean (SD)	95% CI	Mean (SD)	95% CI	t (df)	p	Cohen's <i>d</i>
Global Severity Index	0.62 (0.62)	0.60-0.64	0.60 (0.61)	0.58-0.62	0.77 (0.69)	0.70-0.85	4.05 (387.4)	<.001	0.26
POGQ Total Score	35.89 (11.85)	35.48-36.30	35.86 (11.83)	35.43-36.30	36.12 (12.31)	35.78-37.46	0.37 (3171)	.714	0.02
MOGQ									
Escape	1.91 (0.99)	1.88-1.94	1.87 (0.97)	1.84-1.90	2.28 (1.14)	2.16-2.40	6.22 (380.2)	<.001	0.39
Coping	2.50 (1.07)	2.46-2.54	2.50 (1.08)	2.46-2.54	2.56 (0.99)	2.45-2.67	1.05 (3177)	.295	0.06
Fantasy	2.33 (1.12)	2.29-2.37	2.28 (1.10)	2.24-2.32	2.77 (1.23)	2.64-2.90	6.80 (386.5)	<.001	0.42
Skill development	2.25 (1.14)	2.21-2.29	2.26 (1.15)	2.22-2.30	2.17 (1.00)	2.06-2.28	1.54 (430.9)	.125	0.08
Recreation	4.18 (0.88)	4.15-4.21	4.16 (0.88)	4.13-4.19	4.29 (0.82)	4.20-4.38	2.61 (416.5)	.009	0.15
Competition	2.41 (1.18)	2.37-2.45	2.47 (1.18)	2.43-2.51	1.80 (0.93)	1.70-1.90	12.06 (456.4)	<.001	0.63
Social	3.04 (1.20)	3.00-3.08	3.01 (1.20)	2.97-3.05	3.32 (1.18)	3.19-3.45	4.42 (3177)	<.001	0.26

Note: ^a POGQ: Problematic Online Gaming Questionnaire; MOGQ: Motives for Online Gaming Questionnaire.

Results demonstrated that MOFPS players reported significantly higher scores on competition, skill development, and coping motives, whereas MMORPG players scored significantly higher on fantasy, escape, problematic online gaming, the GSI, and recreation.

Results also demonstrated that female gamers scored significantly higher on fantasy, escape, social, and recreation motives as well as on the GSI of psychiatric symptoms, whereas male gamers reported significantly higher scores only on competition motive. The zero-order correlations between the components of the mediation model along with internal consistencies (Cronbach alpha) for all scales and subscales are presented in 5.3.1.

Table 4.

5.3.1. Table 4. *Zero-order correlations and Cronbach alphas (N=3186)*

Psychopathology and gaming related variables	2	3	4	5	6	7	8	9	Cron bach's α
1. Global Severity Index	.55	.51	.29	.36	.11	-.01	.20	.09	.97
2. POGQ Total Score		.51	.39	.40	.19	.15	.37	.26	.91
3. MOGQ Escape			.60	.61	.24	.18	.27	.29	.87
4. MOGQ Coping				.50	.41	.41	.38	.42	.84
5. MOGQ Fantasy					.30	.29	.28	.34	.83
6. MOGQ Skill development						.23	.38	.45	.89
7. MOGQ Recreation							.23	.35	.78
8. MOGQ Competition								.32	.90
9. MOGQ Social									.91

Note: All correlation coefficients were significant at least $p<.001$ according to Bonferroni correction except for GSI-MOGQ recreation ($p=.61$). POGQ: Problematic Online Gaming Questionnaire; MOGQ: Motives for Online Gaming Questionnaire.

Because both the BSI and the POGQ are multidimensional scales, a comprehensive correlation matrix is also provided as an appendix containing all subscales of the BSI, the MOGQ, and the POGQ (see 9.2 Appendix B).

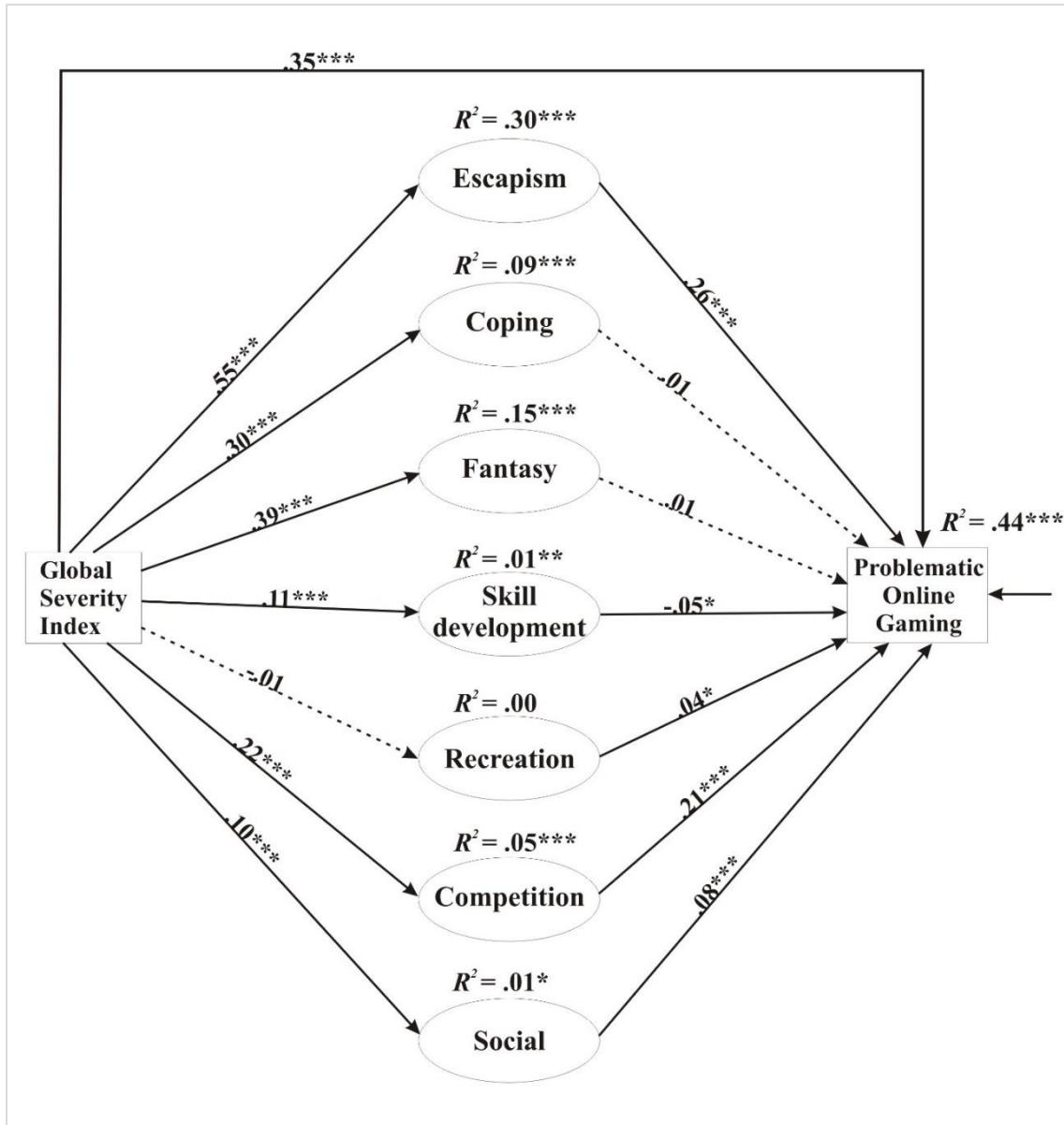
5.3.2 Mediation Analysis

It was hypothesized that general psychiatric distress has both a direct and indirect effect (via the mediating effect of the 7 online gaming motives) on problematic online gaming. Psychiatric distress was measured by the GSI and introduced in the model as a continuous observed variable. Problematic online gaming was measured by the summarized score of the POGQ and also introduced in the model as a continuous observed variable. Gaming motives were measured by the 7 factors of the MOGQ and introduced in the model as continuous latent variables. The proposed mediation models were tested with structural equation modeling. Because significant gender and gamer type differences were found in many of the variables included in the model, 3 different models were tested: (1) an overall model, (2) a separate multigroup analysis for the 2 gamer types, and (3) another multigroup analysis for males and females. The third model was carried out on the MMORPG gamer subsample because this group was the only one that had enough female players for comparison.

5.3.3 The Overall Model

The overall model had an adequate fit to the data ($\chi^2_{343}= 3217.8, p<.001$; CFI=0.935; TLI=0.923; RMSEA=0.051, 90% C.I. [0.050-0.053]; Cfit>0.90; SRMR=0.046). According to the results (see 5.3.3. Figure 1), psychiatric symptoms had a significant direct effect on problematic online gaming (standardized effect=.35, $p<.001$) as well as on all the gaming motives apart from recreation (standardized effects ranging from .10 to .55, $p<.001$). Psychiatric symptoms were significantly and strongly associated with escape, coping, and fantasy, and significantly but weakly associated with skill development, competition, and social motives. In relation to the association between gaming motives and problematic use, only escape and competition motives had a considerable effect size (standardized effect=.26 and .21, respectively), whereas social motives, skill development, and recreation motives had significant but low effect sizes. In relation to the indirect effect between psychiatric symptoms and problematic gaming, 4 paths were statistically significant: (1) psychiatric symptoms → escape → problematic gaming (standardized effect=.139, $p<.001$); (2) psychiatric symptoms → competition → problematic gaming (standardized effect=.046, $p<.001$); (3) psychiatric symptoms → social motives → problematic gaming (standardized effect=.008, $p=.001$); and (4) psychiatric symptoms → skill development → problematic gaming (standardized effect=

.006, $p=.02$). However, the latter 2 pathways had a negligible effect size. The mediation pathways added up a total standardized indirect effect size of .194 ($p<.001$). The proportion of the mediated effect in the total effect was 35%. Therefore, higher levels of psychiatric symptoms were associated with higher escape and competition motives that were associated with higher level of problematic use. All other indirect pathways were nonsignificant ($p>.05$) or had a negligible effect size (i.e., less than .01). The full model explained 44% of the total variance of problematic online gaming.



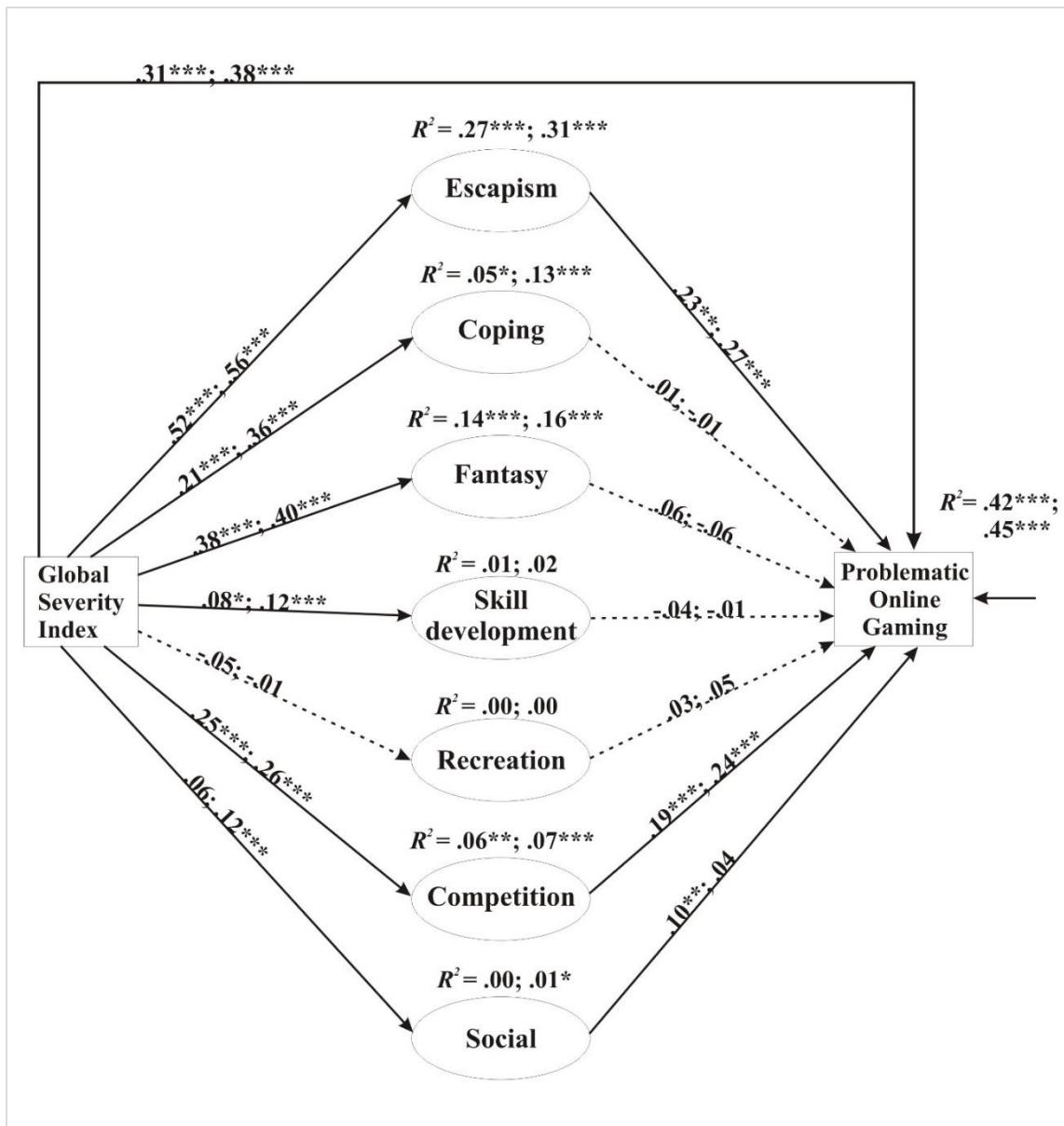
5.3.3. Figure 1. *The overall mediation model with standardized path coefficients and the explained variance of the endogenous variables (R^2) (N=3,186)*

Note: All 7 mediator variables are latent variables. For clarity, indicator variables associated with them have not been depicted in this figure but were published in an earlier paper (Demetrovics et al., 2011). Also for clarity, the covariances between the

errors of all mediator variables have not been depicted in the figure. Simple arrows: significant path coefficients, dotted arrows: nonsignificant path coefficients. * $p<.05$; ** $p<.01$; *** $p<.001$.

5.3.4 Gamer Type Comparison

The model comparing MOFPS and MMORPG players also had an adequate fit to the data ($\chi^2_{726}=3120.7$; MOFPS: $\chi^2_{726}=1343.6$; MMORPG: $\chi^2_{726}=1777.0$ $p<.001$; CFI=0.926; TLI=0.918; RMSEA=0.053, 90% C.I. [0.051-0.055]; Cfit>0.90; SRMR=0.051). Overall, the results (see 5.3.4. Figure 1) were fairly similar to the first model (Figure 1). The psychiatric symptoms had a significant direct effect on problematic online gaming in both groups and the psychiatric symptoms → escape → problematic online gaming and the psychiatric symptoms → competition → problematic online gaming indirect pathways were significant and had a considerable effect size in both groups. In the case of MOFPS players, the standardized effect size of the direct pathway was .314 ($p<.001$), whereas the standardized effect size of the mediation pathway was .194 ($p<.001$) that amounted to 38.2% of the total effect size. The mediation pathway via escape had a standardized effect size of .119 ($p=.001$) and the one via competition had an effect size of .048 ($p<.001$). Neither of the other indirect pathways was significant. The full model explained 42% of the total variance of problematic online gaming. In the case of MMORPG players, the standardized effect size of the direct pathway was .376 ($p<.001$), whereas the standardized effect size of the mediation pathway was .191 ($p<.001$) that amounted to 33.7% of the total effect size. The mediation pathway via escape had a standardized effect size of .152 ($p<.001$) and the one via competition had an effect size of .063 ($p<.001$). The full model explained 45% of the total variance of problematic online gaming. Neither of the other indirect pathways was significant. The comparison of the 2 player types according to the Wald test showed no significant differences in the model.

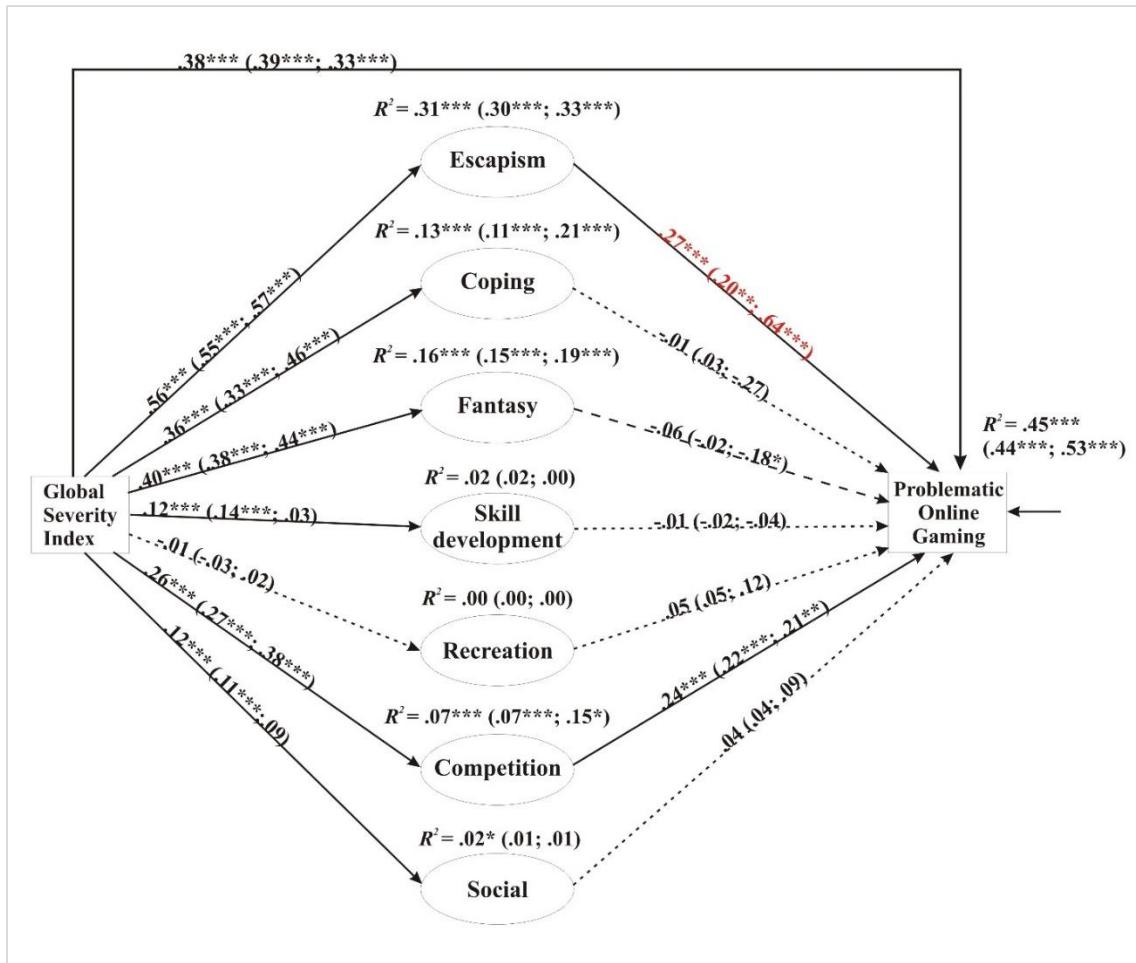


5.3.4. Figure 1. The mediation model and standardized path coefficients. Results of multigroup analysis and path coefficients across the 2 gamer types, multiplayer online first-person shooter (MOFPS) and massively multiplayer online role-playing games (MMORPGs), and the explained variance of the endogenous variables (R^2) (MOFPS: $n=872$; MMORPG: $n=1,466$)

Note: The first (left) values describe MOFPS players, whereas the second (right) values describe MMORPG players. All 7 mediator variables are latent variables. For clarity, indicator variables associated with them have not been depicted but were published in an earlier paper (Demetrovics et al., 2011). Also for clarity, the covariances between the errors of all mediator variables have not been depicted in the figure. Simple arrows: significant path coefficients; dotted arrows: nonsignificant path coefficients. * $p<.05$; ** $p<.01$; *** $p<.001$.

5.3.5 Gender Comparison Between Massively Multiplayer Online Role-Playing Game Players

Given that the proportion and sample size of female players were only considerable among MMORPG players, the third model was carried out only on this group (see 5.3.5. Figure 1). The model fitted the data properly ($\chi^2_{726}=2232.0$; males: $\chi^2_{726}=1531.3$; females: $\chi^2_{726}=700.7$; $p<.001$; CFI=0.929; TLI=0.920; RMSEA=0.053, 90% C.I. [0.051-0.056]; Cfit>0.90; SRMR=0.049). In relation to MMORPG players (Figure 3), the results were also similar to the results of the overall model (Figure 1). Psychiatric symptoms again had a direct effect on problematic online gaming with a standardized effect size of .38 ($p<.001$). Again, only the mediation pathways via escape and competition were significant with standardized effect sizes of .153 ($p<.001$) and .063 ($p<.001$), respectively. The standardized effect size of the indirect link between psychiatric symptoms and problematic online gaming was .191 ($p<.001$) that amounted to 33.7% of the total effect size. The full model explained 45% of the total variance of problematic online gaming.



5.3.5. Figure 1. The mediation model and standardized path coefficients. Results of multigroup analysis and path coefficients across both genders (males/females) and the explained variance of the endogenous variables (R^2) (males: $n=1,226$; females: $n=240$)

Note: The first values (left of the brackets) describe all MMORPG players. The first (left) values in the brackets describe male MMORPG players, whereas the second (right) values describe female MMORPG players. Color red indicates a significant difference between male and female players according to the Wald test. All 7 mediator variables are latent variables. For clarity, indicator variables associated with them have not been depicted in this figure but were published in an earlier paper (Demetrovics et al., 2011). Also for clarity, the covariances between the errors of all mediator variables have not been depicted in the figure. Simple arrows: significant path coefficients; dotted arrows: nonsignificant path coefficients. * $p<.05$; ** $p<.01$; *** $p<.001$.

Results relating to gender differences showed a significant difference in the escape → problematic online gaming direct link between male and female MMORPG players. The standardized direct effect size of this link was .20 ($p=.001$) for men and .64 ($p<.001$) for women. The group difference between males and females was significant (Wald test=6.11, $p=.01$). As a result, the psychiatric symptoms → escape → problematic online gaming mediator pathway for female players had a much higher standardized effect size

(standardized effect=.368, $p<.001$) than the one for male players (standardized effect=.111, $p=.001$). This also led to a stronger indirect link between psychiatric symptoms and problematic gaming for female players (standardized effect=.253, $p<.001$) than for male players (standardized effect=.175, $p<.001$). The total explained variance of problematic online gaming by the model was also slightly higher for female players (53%) than for males (44%).

5.4 Discussion

5.4.1 Principal Results and Comparison with Prior Work

The results of the present study suggest that psychiatric symptoms are both directly and indirectly (via Escape and Competition motives) positively associated with problematic online gaming. The mediator effect of gaming motives amounts to approximately 35% of the total effect. To the authors' knowledge, this is the first study to statistically unravel the complex association between psychiatric symptoms, online gaming motivations, and problematic use using a SEM framework. The results relating to the associations between motives and problematic use are similar to previous findings in the psychological gaming literature. For instance, Yee (2006c) and Billieux and colleagues (2013) found that escapism was the best predictor of problematic use in the case of MMORPG players followed by advancement motivation (i.e., the desire to progress rapidly in the game—"level up"—and become powerful).

Although advancement and competition motives are not the same, they are related to each other via a common connection to achievement and performance. Progressing rapidly and gaining power eventually become a way to be competitive, a way to complete goals successfully, and a way to defeat others. However, the advancement motive was developed in studies focusing on MMORPGs where 'leveling up' is of a particular importance due to the persistence of the virtual world. On the other hand, the Competition motive used in the present study is related to online games in general including games such as multiplayer online first-person shooter games or strategy games, in addition to MMORPGs. Other studies (Nagygyörgy et al., 2012; Zanetta Dauriat et al., 2011) have also reported a strong association between escapism and problematic gaming as well as achievement and problematic use. Achievement is the higher order factor in Yee's (2006c) motivational model comprising 3 subdimensions (i.e., advancement, mechanics, and competition), whereas in the study by Zanetta Dauriat (2011), the motive with the

same name refers to the need for being competitive, to obtain fame and recognition, and to be member of a top guild. Furthermore, our results relating to the association between psychiatric symptoms and motives are also in-line with previous findings. For instance, Hagström and Kaldo (2014) reported that among all online gaming motives, escapism showed the strongest relationship with psychological distress.

In addition to confirming previous findings in the gaming literature, as predicted the present study showed that the same 2 motives (escape and competition) mediated between psychiatric symptoms and problematic gaming. Playing games to escape everyday difficulties appears to be a motivating behavior that can ease psychiatric distress, and thus extends self-medication theory (Khantzian, 1985) to online gaming. This theory states that substance use is a coping strategy through which users try to compensate their psychiatric distress and attain emotional stability. This compensatory behavior then contributes to the development and maintenance of the problem behavior. The findings outlined in the present study also strengthen the inclusion of escapism as an individual criterion for Internet gaming disorder in *DSM-5* (American Psychiatric Association, 2013).

The second mediator variable in the present study was competition. Despite the fact that competition is usually considered a healthy and adaptive behavior, our findings suggest that in some cases it can also be a pathological factor. This has also been reported in the literature on problem gambling in which problem gamblers have been shown to be more competitive than nonproblem gamblers (A. Parke, Griffiths, & Irving, 2004). Gamers whose psychiatric distress level is high might use online gaming as a source for achievement through defeating other players and winning in general. If games are the only sources that maintain and boost their self-confidence and self-efficacy, and thus become a replacement for real life competition and achievement, the activity appears to increase the risk of developing a problematic behavior. However, this reasoning needs further confirmation.

In contrast to prestudy expectations, coping did not mediate between psychiatric distress and problematic gaming. Earlier motivational research yielded the surprising finding that although highly correlated (.60), coping and escape are distinct motives (Demetrovics et al., 2011), and the present study strengthened the argument that these 2 motives have different mechanisms of action. The results of the present study suggest that in contrast to playing to escape everyday problems, gaming can also be used as an adaptive coping

strategy for stress release or tension reduction without necessarily leading to problematic use. A possible explanation might be that different underlying mechanisms lie behind the 2 strategies. Avoiding real life problems (i.e., escape) only alleviates the perceived stress for a short time, retaining or further multiplying the original problem (i.e., stress source). On the other hand, channeling everyday stress, tension, or aggression into gaming (i.e., coping) can be an active coping mechanism where at least some extent of the perceived stress is dissipated while playing. However, this is speculative and requires further research.

The recreational use of online games was neither related to psychiatric symptoms nor to problematic use of games. This suggests that playing online games can be a healthy form of entertainment if it is used moderately and balanced with other leisure time activities (i.e., sports). This result also serves as counterweight for media scaremongering that often exaggerates the potential dangers of video games (Griffiths, 2010b).

This model in the present study was found to be invariant across game type preference (i.e., MOFPS or MMORPG), but varied significantly between males and females in the case of MMORPG players. As expected, females were characterized by a stronger link between escape and problematic online gaming and also had higher escape scores than males. This latter result is in-line with Yee's findings (2006a) that examined the motivational background of MMORPG players and also found that female players scored higher on the escape motive than male players. However, the present study suggests that this higher inclination for escape motivation among females is linked to a higher risk of problematic use. In contrast to the other prestudy assumptions, no gender differences were found regarding competition and social motives.

In addition, it is important to point out that the proportion of female players in the present sample is much lower than the proportion of women that play video games in the general population (i.e., approximately 40%; Mentzoni et al., 2011; Pápay et al., 2013). This is most likely due to the online data collection method in which participation is voluntary. In online gamer samples, the proportion of female players is usually quite low (i.e., approximately 10%-20%; Griffiths et al., 2003; Yee, 2006a). The reason might be that the so-called "hard-core" gamers are more interested in participating in such research studies and that the proportion of hard-core female players is lower than the proportion of hard-core male players. Therefore, it is important to acknowledge that these findings apply more to those female gamers who play seriously (in a hard-core or "masculine"

gamer manner) than to the average female (casual) gamers in the general population (Griffiths & Lewis, 2011; McLean & Griffiths, 2013).

5.4.2 Limitations

Despite the advantage of a large sample size, the self-selected and self-reported nature of the Hungarian-only data needs to be taken into consideration when generalizing the results (especially because recent research has shown that self-selection of MMORPG players affects the sample's representativeness; Khazaal et al., 2014). Consequently, there is a clear need for future observational and clinical studies to confirm the findings of the present study in other nationalities of gamers. The cross-sectional study design should be also borne in mind when applying the findings because causation and directionality of findings cannot be confirmed. Consequently, future studies should also use longitudinal or experimental design to establish causal relations regarding the proposed model. Furthermore, it is theoretically feasible to construct alternative models that act in the opposite direction (i.e., problematic online gaming leading to psychiatric distress) and/or that both models may not be mutually exclusive (that for some people psychiatric distress leads to problematic online gaming and vice versa for others). Such possibilities should also be empirically tested in future studies.

5.4.3 Implications for Prevention and Treatment

The present study has some direct implications for prevention and treatment. There is little reason for parents, educators, and health professionals to be concerned or worried about the recreational use of online games. Neither should they necessarily be concerned about playing as a way to cope with day-to-day stress or tension. However, playing excessively as a way to avoid real life problems or to defeat other players should receive attention because such motivations may lead to negative (addiction-like) real-life consequences. Therefore, exploring gaming motivations both on the individual and group level are likely to be helpful in the preparation of prevention and treatment programs concerning problematic gaming.

6 VALIDATION OF THE TEN-ITEM INTERNET GAMING DISORDER TEST (IGDT-10) AND EVALUATION OF THE NINE DSM-5 INTERNET GAMING DISORDER CRITERIA (STUDY 4)²⁰

6.1 Introduction

The assessment of problematic gaming (or gaming addiction) has been subject of controversy since it has gained scientific attention (Griffiths et al., 2015; King et al., 2013; Kuss & Griffiths, 2012c). Over 20 instruments have been developed to assess problematic gaming but few have been properly validated and the lack of consensual definition led to inconsistencies in the assessment criteria (see King et al., 2013; Király, Nagygyörgy, et al., 2015; Pontes & Griffiths, 2014). The inclusion of Internet gaming disorder (IGD) in Section 3 of the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (American Psychiatric Association, 2013), led to an upsurge of new psychometric tools designed to assess problematic gaming according to the nine DSM-5 IGD criteria (e.g., Lemmens et al., 2015; Pontes & Griffiths, 2015; Pontes et al., 2014; Rehbein et al., 2015). Additionally, the concept of IGD has stirred debate among scholars in terms of the validity of each nine IGD criteria and how to better operationally define such criteria in light of knowledge on problematic gaming accumulated over three decades (Király, Griffiths, & Demetrovics, 2015; van Rooij & Prause, 2014).

To date, most of the newly developed IGD assessment measures have two main shortcomings. Firstly, some of the new measures are arguably lengthy, thus not optimal for large-scale surveys using questionnaires that comprise several scales necessary to test complex associations regarding IGD. Secondly, some of the new instruments (including short ones) either do not specifically reflect the nine IGD criteria, or use convoluted wording that might be difficult for gamers to understand and answer. Given this, the first aim of this study is to develop and validate psychometrically, a new brief instrument to assess IGD using definitions suggested in the DSM-5, while also adopting a simple, clear, and more consistent item-wording that adequately reflects the IGD concept.

²⁰ The present chapter is the exact copy of the submitted version of the following paper: Király, O., Slezcka, P., Pontes, H. M., Urbán, R., Griffiths, M. D., & Demetrovics, Z. (2015). Validation of the Ten-Item Internet Gaming Disorder Test (IGDT-10) and evaluation of the nine DSM-5 Internet Gaming Disorder criteria, *under review*.

Furthermore, a few recently published studies (Ko et al., 2014; Lemmens et al., 2015; Rehbein et al., 2015) examining the usefulness and validity of all nine IGD criteria provided interesting and yet conflicting results. For instance, Rehbein and colleagues (2015) found that the criteria “give up other activities,” “tolerance” and “withdrawal” were of key importance for identifying IGD, while Lemmens and colleagues (2015) found “escape” did not add to diagnostic accuracy due to lack of specificity. As a second aim, the present authors contribute to this debate by further investigating the nine IGD criteria as proposed by the DSM-5 and examining how each IGD criterion performs at different severity levels using an Item Response Theory (IRT) approach.

Moreover, little is known empirically about the validity of the proposed cut-off threshold for IGD (i.e., endorsing five or more criteria out of the nine) in the DSM-5 as it was conservatively chosen by the APA, because low thresholds might inflate diagnoses and result in classifying individuals who have not suffered significant clinical impairment (Petry et al., 2014). To the authors’ knowledge, only one study (i.e., Ko et al., 2014) has examined the diagnostic validity of the nine IGD criteria and tested the proposed cut-off threshold for IGD. The study concluded that endorsing five or more of the nine IGD criteria was the best cut-off threshold to differentiate gamers with IGD from healthy gamers. A final aim is to contribute to this question by empirically testing the suggested IGD cut-off points with Latent Class Analysis (LCA), sensitivity, and specificity analysis in a large heterogeneous sample of online gamers.

6.2 Materials and methods

The study was approved by the Institutional Review Board of the Eötvös Loránd University, Budapest, Hungary.

6.2.1 Participants and procedure

Data collection took place online with the cooperation of a popular Hungarian gaming magazine (i.e., *GameStar*). The magazine’s *Facebook* page had approximately 65,000 followers during data collection and an associated online website. A participation call was posted online via the magazine’s website and *Facebook* page three times during August to September 2014. Prior to starting the survey, all participants were informed about the goals of the study. They were assured about anonymity and confidentiality, and their informed consent was obtained by ticking into a box if they agreed to continue and

participate in the study (14-17 years old children had to tick another box too for parental permission). A shopping voucher of 90,000 HUF (approx. 300€) was drawn between participants that fully completed the survey. A total of 7,757 gamers started the survey. After excluding cases with severe incompleteness or inconsistencies, 4,887 gamers remained, corresponding to a response rate of 63.0%.

6.2.2 Measures

Ten-Item Internet Gaming Disorder Test-10 (IGDT-10) comprises 10 items and assesses levels of IGD. The instrument was developed theoretically, based on the nine DSM-5 criteria, and also taking into consideration Petry et al.'s (2014) recommendations. During instrument development, the authors sought to operationalize IGD throughout the nine criteria suggested in the DSM-5 in a brief and simple way by adopting a clear wording for each item. The IGD criterion referring to "*jeopardy or losing a significant relationship, job, or educational or career opportunity because of participation in Internet games*" was operationalized via two items given its complexity. Response options for the ten items were "never", "sometimes", and "often" instead of "yes" and "no". The 3-point Likert scale was preferred in order to facilitate the responses given by participants as it makes the decision easier and more realistic. However, during scoring the IGDT-10 items were recoded into a "yes" (1) and "no" (0) format in order to resemble the dichotomous structure of IGD in DSM-5. Since IGD criteria in the DSM-5 suggest that behaviors or problems are frequently repeated or continuously present, only "often" answers were recoded as "yes". Given that question 9 and 10 are related to the same criterion, they are combined in the scoring, that is, answering "Often" on either Item 9 or Item 10 (or both items) scores only 1 point (see 9.3 Appendix C). Consequently, the composite score of IGDT-10 ranges from 0 to 9, higher scores indicating more severe cases of IGD. Cronbach's alpha of the scale was .68.

Problematic Online Gaming Questionnaire (POGQ; Demetrovics et al., 2012). The POGQ is a standardized tool with good validity and reliability indices. It comprises 18 items used to assess problematic online gaming via six factors (i.e., preoccupation, immersion, overuse, social isolation, interpersonal conflicts, and withdrawal). Items were rated on a 5-point Likert scale (from "never" to "almost always/always") with higher scores meaning higher risk of problematic play. Cronbach's alpha for this instrument in

the present sample was .90. This instrument was used to ascertain the validity of the IGDT-10.

Brief Symptom Inventory (BSI; Derogatis, 1975) comprises 53 items and assessed psychiatric distress. This instrument assesses nine self-reported clinically relevant psychological symptoms: somatization, obsession-compulsion, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism. Answers were given on a 5-point Likert scale from “not at all” to “extremely”. In the present study, a summarized index (i.e., The Global Severity Index [GSI]) assessed the intensity of general distress where higher scores indicated higher levels of general distress. Cronbach’s alpha for this measure in the present sample was .96.

Weekly gaming time was measured as an ordinal variable with six response options: “None”; “Less than 7 hours weekly”; “7-14 hours weekly”; “15-28 hours weekly”; “29-42 hours weekly”; and “More than 42 hours weekly”, and it was linearized for the analysis (first and last values were retained with a score of 0 and 42, while intervals were recoded with their mid-points).

6.2.3 Statistical analysis

Validation of the IGDT-10

To test dimensionality and construct validity of the IGDT-10, confirmatory factor analysis (CFA) was used with robust weighted least square (WLSMV) estimation method in *Mplus* 7.3 (Muthén & Muthén, 1998-2012). To evaluate model fit, multiple indices were used, including the chi-square (χ^2) value, the comparative fit index (CFI), the Tucker–Lewis Fit index (TLI), the root mean square error of approximation (RMSEA), its 90% confidence interval (90% CI), and p value smaller than .05 for test of close fit. The chi-square test should be non-significant ($p>.05$) for good fitting models. However, this index is sensitive to large sample sizes, therefore goodness of fit was examined using the other indices. Hu and Bentler (1999) suggested an RMSEA value less than 0.06 and CFI and TLI values above 0.95 for good model fit. To further verify the construct validity of the IGDT-10 a pattern of covariates was tested with a fully saturated structural regression model in *Mplus* 7.3, having IGDT-10 and POGQ as endogenous variables, and psychiatric distress and gaming time as exogenous variables. All composite scores (i.e., IGDT-10, POGQ, and psychiatric distress) were entered in the model as latent variables

with single indicators in order to control for measurement error (D. A. Cole & Preacher, 2014).

Evaluating the nine DSM criteria using Item Response Theory

IRT is a theoretical framework and complementary to Classical Test Theory (CTT). Both approaches share the assumption that measurement involves placing of an individual on the continuum of the underlying latent variable, in this case the severity of IGD. The IRT has nevertheless some important advantages over the CTT. The IRT models place individuals and items²¹ on the same latent variable. Thus, item properties remain invariant with respect to the analyzed sample (e.g., Reeve & Fayers, 2005).

A two-parameter logistic Item Response Theory model (2PL-IRT model) was computed using *Mplus* 7.3. The 2PL-IRT describes measurement performance of each criterion with two parameters. The threshold parameter (b parameter) is related to severity of a criterion and its higher value indicates that the criterion is fulfilled only in more severe stages of the disorder. The discrimination parameter (a parameter) refers to the accuracy of the criterion in distinguishing between respondents below and above the aforementioned threshold (b). Based on the two parameters, an information function can be estimated. It describes how informative (in terms of measurement) criteria on different levels of disorder severity are.

The fit indices for the Item Response Theory (IRT) were equivalent to those obtained in CFA analysis. Additionally, the assumptions of the 2PL-IRT model were verified. The question in regard to unidimensionality was subject to CFA analysis. Monotonicity assumption was verified based on the evaluation of the ratio of respondents endorsing each criterion, nine groups fulfilling different number of criteria. Residual correlation matrix and model indices were analysed to identify associations between the criteria after controlling for the underlying latent factor.

Evaluating IGD's suggested cut-off value

In order to test the cut-off value suggested in the DSM-5 (i.e., endorsement of five or more of nine IGD criteria) a latent class analysis (LCA) was carried out in *Mplus* 7.3 to identify problematic gamers. LCA is a mixture modeling technique used to identify groups of people (categorical latent variables) who give similar responses to specific

²¹The terms *item* and *criterion* are used interchangeably in the description of statistical analyses.

variables (Collins & Lanza, 2010), in this case the responses given by gamers to the IGDT-10 criteria (dichotomous manifest variables). The group with the highest likelihood of meeting the nine criteria was used as the gold standard to determine the optimal cut-off value that separated this group from the remaining sample. The sensitivity, specificity, positive, negative predictive value, and diagnostic accuracy of each cut-off threshold were calculated and compared to identify the best-fitting value and compare it to the one suggested for IGD in DSM-5.

The LCA analysis was carried out with one to five classes. To determine the number of latent classes, multiple indices were used: measures of parsimony (i.e., Akaike Information Criteria [AIC], Bayesian Information Criteria [BIC], and Sample-size adjusted Bayesian Information Criteria [SSABIC]) with lower values indicating more parsimonious models, the Entropy criterion that determines the accuracy of classifying people into their respective classes (higher values indicating better fit), and the Lo-Mendell-Rubin Adjusted Likelihood Ratio Test (LMR-LRT) that statistically compares the fit of the tested model (e.g., four-class model) to a model with one class less (e.g., three-class model). A significant *p* value in LMR-LRT indicates the tested model fits better than the previous one (Muthén & Muthén, 1998-2012). Missing data were treated with Full Information Maximum Likelihood (FIML) method in Mplus. Descriptive statistics, prevalence, and criteria endorsement analyses were carried out using SPSS version 22 (IBM Corp., 2013).

6.3 Results

6.3.1 Descriptive statistics

After deleting cases with severe incompleteness or inconsistencies, the sample comprised 4,887 online gamers (mean age 22.2 years [SD = 6.4], age range 14-64 years, 92.5% male), most of whom played for more than 15 hours weekly. The mean number of completed years in education was 12.4 years (SD=3.2), and most were single and still studying in education (see 6.3.1. Table 1).

6.3.1. Table 1. Demographics and weekly gaming time of sample participants (total sample, participants without IGD, and participants with IGD)

Demographics	Total sample (N=4,700-4,881)	Participants without IGD (n=4432-4611)	Participants with IGD (n=135-138)
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Gender (Males)	4517 (92.5%)	4268 (92.6%)	124 (89.9%)
Age, years; Mean (SD)	22.2 (6.4)	22.2 (6.3)	21.4 (6.1)
Education, number of completed years; Mean (SD)	12.4 (3.2)	12.4 (3.2)	11.8 (3.5)
Marital status			
Single	2825 (60.1%)	2648 (59.7%)	93 (68.9%)
In a relationship, but living separately	1073 (22.8%)	1017 (22.9%)	30 (22.2%)
Living in a partnership	551 (11.7%)	527 (11.9%)	10 (7.4%)
Married	226 (4.8%)	215 (4.9%)	2 (1.5%)
Divorced	25 (.5%)	25 (.6%)	0 (0.0%)
Studying currently	2965 (60.9%)	2802 (61.0%)	88 (63.8%)
Working status			
Not working	2368 (48.8%)	2236 (48.8%)	79 (57.2%)
Having a full-time job	1598 (32.9%)	1506 (32.9%)	36 (26.1%)
Having a half-time job	118 (2.4%)	114 (2.5%)	3 (2.2%)
Having a part-time job	218 (4.5%)	202 (4.4%)	7 (5.1%)
Working on ad-hoc basis	550 (11.3%)	521 (11.4%)	13 (9.4%)
Weekly gaming time			
None	57 (1.2%)	56 (1.2%)	0 (0.0%)
Less than 7 hours weekly	829 (17.0%)	805 (17.5%)	4 (2.9%)
7-14 hours weekly	1214 (24.9%)	1162 (25.2%)	16 (11.6%)
15-28 hours weekly	1503 (30.8%)	1418 (30.8%)	48 (34.8%)
29-42 hours weekly	866 (17.8%)	809 (17.6%)	26 (18.8%)
More than 42 hours weekly	409 (8.4%)	355 (7.7%)	44 (31.9%)

Note: Sample sizes for these analyses varied due to cases with missing values

6.3.2 Validation of the IGDT-10

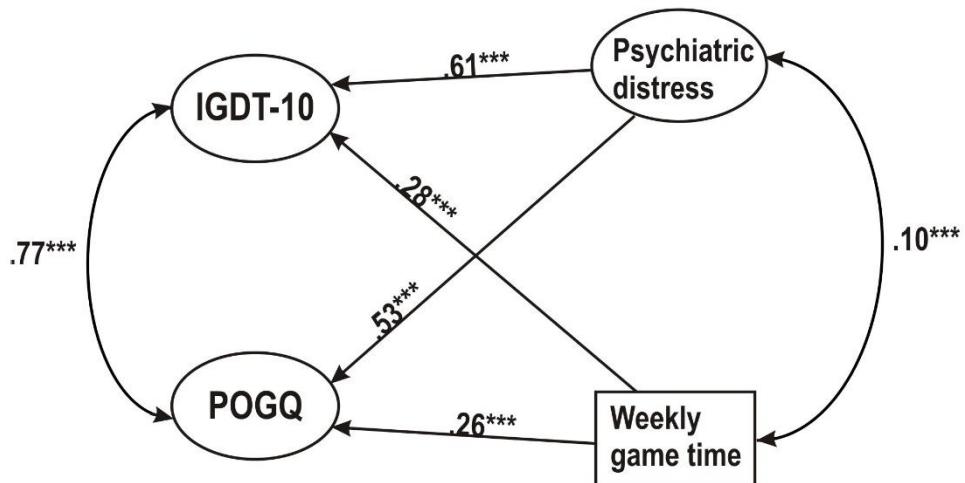
A one-factor solution of the nine IGD items was tested with CFA. The model provided a good fit to the data ($\chi^2=194.4$ df=27 $p<.0001$; CFI=0.971; TLI=0.962; RMSEA=0.036 [0.031-0.040] Cfit>0.90 pclose=1.000; N=4,887). Factor loadings of all nine indicators

of the IGDT-10 were above the conventional threshold of .50 (see 6.3.2. Table 1). The pattern of covariates of IGDT-10 was tested with a structural regression model (see 6.3.2. Figure 1). The two instruments measuring problematic online gaming (i.e., IGDT-10 and POGQ) were strongly correlated ($r=.77$, $p<.001$). Additionally, their associations with psychiatric distress and gaming time were comparable, IGDT-10 having slightly higher associations with both explanatory variables.

6.3.2. Table 1. Endorsement of the nine IGD criteria, factor loadings, and item response theory parameters of the criteria

	Endorsement in the total sample (N=4,856-4,883)	Endorsement among the disordered group (≥ 5 DSM criteria) (n=138)	Factor loading (one- factor model)	Discrimination parameter a Estimate (SE) (N=4,887)	Severity parameter b Estimate (SE) (N=4,887)		
Criterion	N	%	N	%			
1. Preoccupation	982	20.1	106	76.8	.55	0.66 (0.04)	1.51 (0.07)
2. Withdrawal	154	3.2	55	39.9	.73	1.07 (0.09)	2.54 (0.12)
3. Tolerance	226	4.6	77	55.8	.72	1.04 (0.08)	2.33 (0.10)
4. Loss of control	324	6.6	73	52.9	.66	0.89 (0.06)	2.26 (0.10)
5. Giving up other activities	215	4.4	76	55.1	.74	1.10 (0.08)	2.30 (0.10)
6. Continuation	754	15.5	128	92.8	.80	1.35 (0.08)	1.27 (0.04)
7. Deception	238	4.9	70	50.7	.70	0.98 (0.07)	2.36 (0.10)
8. Escape	631	13.0	105	76.1	.61	0.78 (0.05)	1.83 (0.08)
9. Negative consequences	516	10.6	112	81.2	.74	1.10 (0.07)	1.69 (0.06)
Subjects endorsing ≥ 5 IGD criteria	138	2.9					
Total endorsed criteria					$M = .83$	$(SD = 1.36)$	

Note: Sample sizes for analyses related to “Endorsement in the total sample” varied due to cases with missing values.



6.3.2. Figure 1. Structural regression model to test construct validity of IGDT-10.

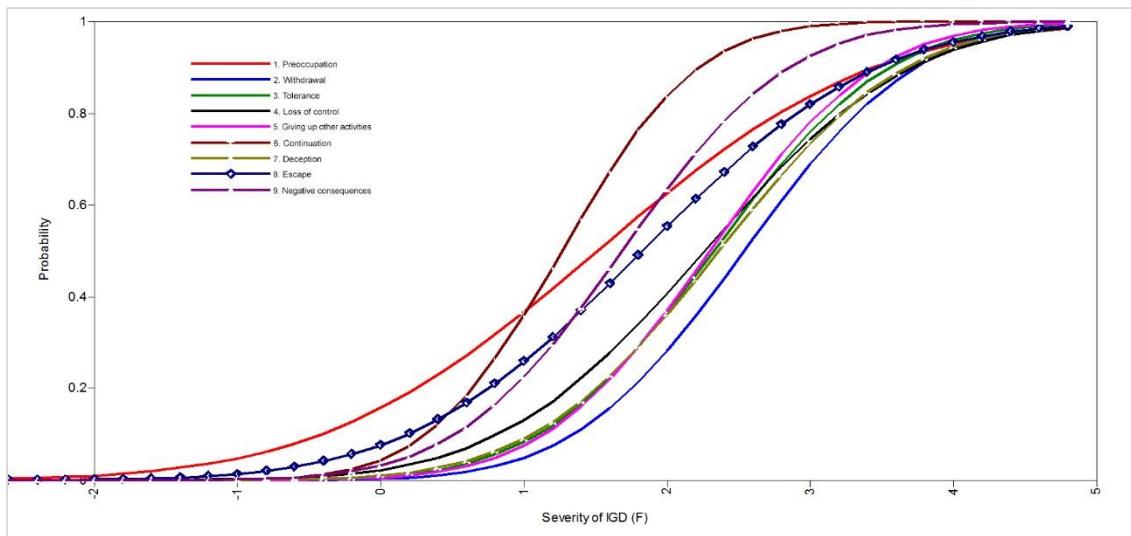
Note: IGDT-10: Ten-Item Internet Gaming Disorder Test; POGQ: Problematic Online Gaming Questionnaire; values on the simple arrows are standardized regression coefficients; double-headed arrows indicate correlations between the two variables; *** $p<.001$

6.3.3 IGD prevalence and criteria endorsement

Based on five criteria endorsement suggested in DSM-5 as the cut-off threshold for classifying disordered gamers, IGD prevalence rate in the present sample was 2.9% ($n=138$). Basic demographic characteristics and weekly gaming time of the participants with and without IGD are outlined in 6.3.1. Table 1. The endorsement of each IGD criterion in the total sample and among disordered gamers is in 6.3.2. Table 1. “Preoccupation” was the most frequently endorsed criterion (20.1%) among all gamers, while “continuation” was the most commonly endorsed criterion among disordered gamers (92.8%).

6.3.4 Evaluating the nine DSM criteria using IRT

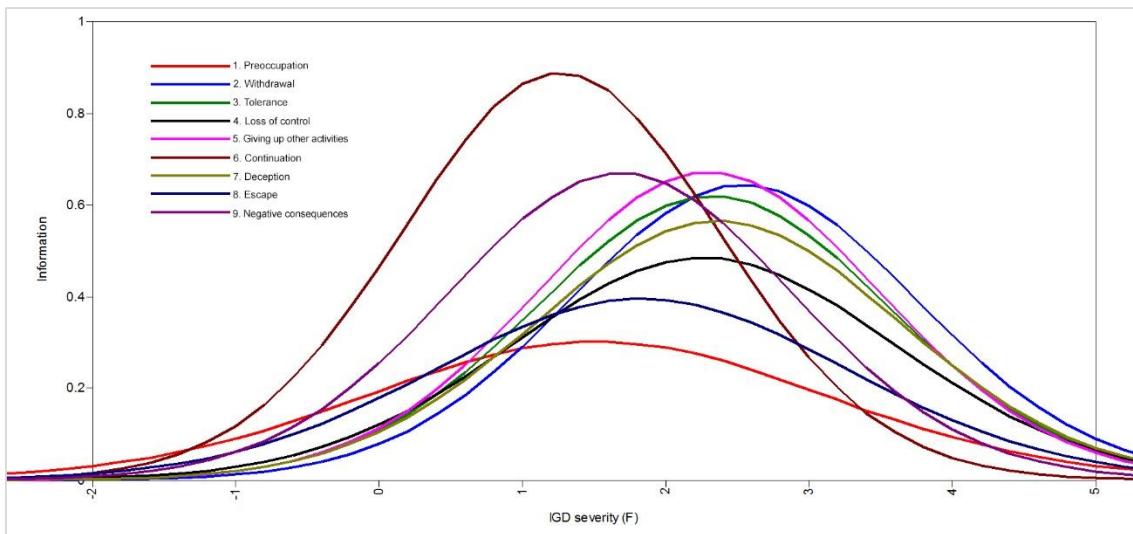
All assumptions of the 2PL-IRT model were verified. The probability of endorsing each criterion increased with the number of criteria fulfilled, indicating monotonicity. After controlling for the underlying latent factor, no significant correlations between the criteria were found. Fit indices for the IRT model were the same as for the CFA, and therefore acceptable. The Item Characteristic Curves are presented in 6.3.2. Table 1 and graphically displayed in 6.3.4. Figure 1.



6.3.4. Figure 1. Criterion response curves for the IGD criteria

Generally (see 6.3.4. Figure 1), a specific criteria endorsement pattern was identified in the responses. The probability (Y-axis) of fulfilling each criterion differed depending on the severity of IGD (X-axis). The criteria “continuation”, “preoccupation”, “negative consequences” and “escape” were associated with lower IGD severity. “Tolerance”, “loss of control”, “giving up other activities” and “deception” criteria were associated with more severe levels, and had similar threshold (b) parameters. Highest severity ($b = 2.54$) was noted for “withdrawal” criterion, indicating that withdrawal is associated with most severe IGD symptoms.

Regarding criterion discrimination accuracy (a parameter), some differences were found in performance of various criteria. While most had similar discriminatory power, “preoccupation” and “escape” criteria showed significantly lower values, indicating worse accuracy. Based on threshold and discrimination parameters, Item (criteria) Information Curves were estimated. These indicators (see 6.3.4. Figure 2) describe how much information each criterion delivers for estimation of IGD severity. Due to different threshold parameters, each criterion delivered different amounts of information on various IGD severity stages. In general, criteria with higher discriminatory power delivered more information.



6.3.4. Figure 2. Criterion information curves for the IGD criteria

When compared to other criteria, “preoccupation” and “escape” provided the least information. Conversely, “continuation”, followed by “negative consequences” and “giving up other activities” provided the most information. The “continuation” criterion provided considerably more information on less severe IGD levels, suggesting it accurately measures the severity of IGD problems already among individuals with low severity of IGD.

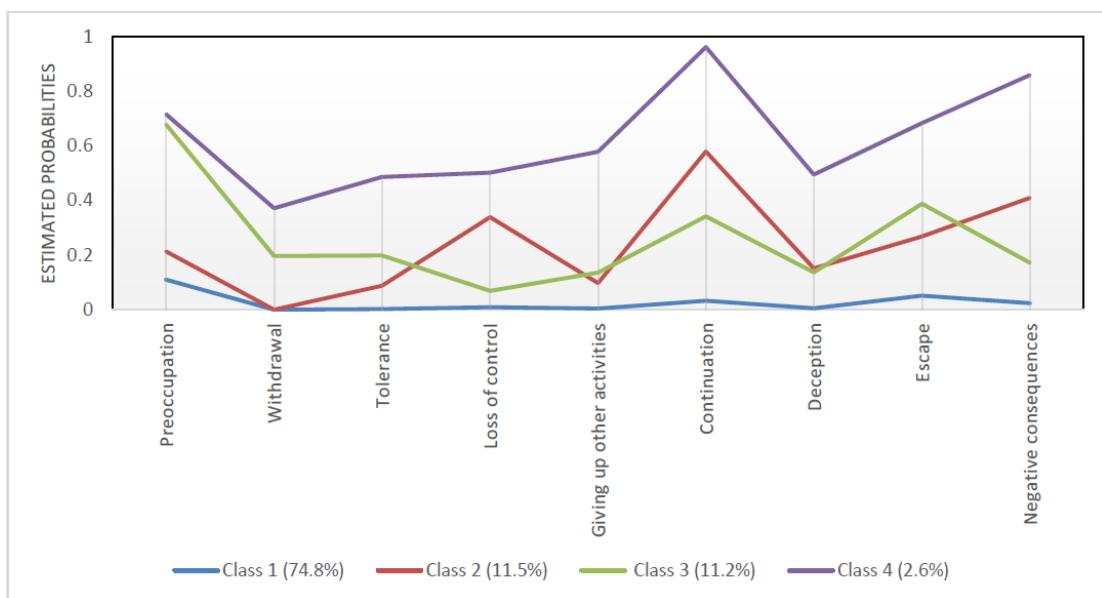
6.3.5 Evaluating the suggested cut-off value

An LCA analysis with two to five latent classes was performed on the IGDT-10 criteria to test the cut-off value suggested in the DSM-5. Fit indices and test values are presented in 6.3.5. Table 1. According to the criteria listed in the ‘Statistical analyses’ section, the four-class solution was selected. Estimated probabilities of the four latent classes are presented in 6.3.5. Figure 1. The fourth class (i.e., 2.6%, N=4,887) represents gamers with the highest estimated probabilities of endorsing all nine IGD criteria, and therefore considered the disordered group. “Continuation” and “negative consequences” criteria had the highest estimated probabilities of being endorsed by these gamers.

6.3.5. Table 1. Fit indices for the Latent Class Analysis (LCA) of the IGDT-10 ($N=4,887$)

Nr. of classes	Log-likelihood	Replicat ed log-likelihood	Nr. of free param eters	AIC	BIC	SSABIC	Entrop y	LMR	<i>p</i> -LRT test
2	-11251.887	Yes	19	22542	22665	22609	0.796	2842	<.0001
3	-11159.881	Yes	29	22378	22566	22474	0.774	182	<.0001
4	-11098.715	Yes	39	22275	22529	22405	0.764	121	<.0001
5	-11083.844	No	49	22266	22584	22428	0.782	29	.2115

Note: AIC = Akaike Information Criterion, BIC = Bayesian Information Criterion, SSABIC = Sample Size Adjusted BIC, LMR-LRT = Lo-Mendell-Rubin Likelihood Ratio Test.



6.3.5. Figure 1. Latent class analysis on the nine IGD criteria of the IGDT-10

To test whether the cut-off value suggested by the DSM-5 (i.e., five or more criteria) fitted the data empirically, the fourth LCA group was used as the gold standard to determine the optimal cut-off threshold to distinguish gamers of this group from the remaining sample (6.3.5. Table 2). Based on sensitivity, specificity, positive and negative predictive value, and diagnostic accuracy of each cut-off score, the empirical data

supported DSM-5's suggestion for IGD cut-off threshold (i.e., endorsement of five or more criteria).

6.3.5. Table 2. *Calculation of cut-off thresholds for IGD-10 using the highest LCA group as a gold standard (N=4,751)*

Cut-off values	True positive	True negative	False positive	False negative	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)
2	111	3774	866	0	100	81	11	100	82
3	111	4226	414	0	100	91	21	100	91
4	111	4476	164	0	100	96	40	100	97
5	106	4608	32	5	95	99	77	100	99
6	65	4639	1	46	59	100	98	99	99
7	30	4640	0	81	27	100	100	98	98
8	13	4640	0	98	12	100	100	98	98
9	3	4640	0	108	3	100	100	98	98

Note: Only those cases were included in the analysis where the nine binary IGD items had no missing values.

6.4 Discussion

The primary aim of this study was to develop and validate a new psychometric tool to assess IGD that overcomes the shortcomings present in extant IGD instruments. Furthermore, this study also contributed to ongoing debate regards the usefulness and validity of each of the nine IGD criteria, and investigated the cut-off threshold suggested in DSM-5. As for validity and reliability of the IGDT-10, CFA demonstrated a one-factor structure. This suggests IGD can be assessed using a first-order latent variable reflecting the nine criteria via multiple indicators. The structural regression model testing the pattern of covariates showed high correlation with POGQ, an instrument measuring the same construct, and comparable associations of the two instruments with explanatory variables. Moderate associations with psychiatric distress and weak to moderate associations with gaming time were found in line with the literature (Brunborg et al., 2014; Hsu et al., 2009; Király, Urbán, et al., 2015; Starcevic et al., 2011; Zanetta Dauriat et al., 2011) and therefore demonstrate construct validity of the instrument. Internal consistency was satisfactory, however, not too high, which may be related to the limited number of binary variables analyzed.

The results of IRT analysis demonstrated the criteria “continuation”, “preoccupation”, “negative consequences”, and “escape” were endorsed more frequently in less severe IGD stages and “tolerance”, “loss of control”, “giving up other activities”, and “deception” were only reported in more severe cases. Based on conditional inference tree analysis, Rehbein et al. (2015) reported that the criterion “giving up other activities” and “tolerance” were key in identifying IGD. Being associated with more severe IGD levels in the present study may help explain why endorsement of these criteria corresponds to a high probability of a positive IGD diagnosis (Rehbein et al., 2015).

In parallel to these results, criteria endorsement rates suggested that criterion “preoccupation” followed by “continuation” were the two most frequently endorsed criteria, whereas “withdrawal” and “giving up other activities” were least endorsed among the whole sample. Furthermore, the endorsement rate pattern was different amongst those meeting five or more (of nine) IGD criteria as “continuation” followed by “negative consequences” were endorsed more often in comparison to the criteria “withdrawal” and “deception”. These findings contrast with those of two recent studies (i.e., Lemmens et al., 2015; Rehbein et al., 2015) that found “escape” was the most frequently endorsed criteria, while “negative consequences” (termed as “conflict” in Lemmens et al.’s study, and “risk/lose relationship/opportunities” in Rehbein et al.’s study) was the least endorsed in both the whole sample and among those meeting five or more IGD criteria. It remains unclear whether these differences derive from the different criteria operationalization or the diversity of samples (i.e., different mean age, gender rate, and/or cultural differences).

The present study’s results suggest that while the underlying structure for IGD appears to be unidimensional, the phenomenon is primarily manifested via different sets of symptoms depending on the level of disorder severity. Furthermore, the discriminatory (a) and threshold (b) parameters of each criterion provided information about the accuracy of the proposed set of IGD criteria in differentiating between gamers with less and more severe IGD levels. The accuracy of the symptoms differed depending on IGD severity, and was best at more severe levels of the disorder (peaking around $b = 2$), suggesting that the nine IGD symptoms differentiate better among individuals with more severe gaming-related problems. However, “preoccupation” and “escape” criteria had very low discriminatory power, and thus provided little information to the estimation of IGD

severity. This parallels the findings of Rehbein et al. (2015) who found that “escape” and “preoccupation” poorly predicted IGD despite being endorsed at high rates.

Additionally, Lemmens et al. (2015) found that “escape” had the lowest specificity in distinguishing between disordered and non-disordered gamers, while Ko et al. (2014) reported that “deception” and “escape” had the lowest diagnostic accuracy to discriminate individuals with IGD from non-problematic individuals. Therefore, replacing these two criteria with new ones that better discriminate (high a parameter) disordered gamers in less severe stages (low b parameter) of IGD might be beneficial. Although it is not the primary goal of DSM-5, implementing such changes in the diagnostic IGD criteria, might also facilitate more reliable assessment among “diagnostic orphans” (i.e., gamers endorsing less than five IGD criteria), which is very valuable from the perspective of research.

IGD prevalence rates were estimated on the basis of endorsement of at least five of nine IGD criteria, and via an LCA by selecting gamers with membership in the class with the highest probability of endorsing all nine criteria. Based on endorsement of five criteria as the cut-off, the IGD prevalence rate in the sample was 2.9%, while, the prevalence based on LCA results was slightly more conservative (2.6%). By adopting a similar strategy to derive IGD prevalence rates in a representative sample of Dutch adolescents, Lemmens et al. (2015) found a 6.6% prevalence rate among gamers, and 5.4% in the whole sample using a threshold endorsement of at least five of nine criteria. However, by using a stricter cut-off (i.e., endorsement of at least six criteria) a 5.2% prevalence rate was reported among gamers and 4% in the whole sample (Lemmens et al., 2015). The lowest IGD prevalence rate reported also by Lemmens et al. (2015) was 4.9% (among gamers) and was derived from the results of an LCA. Additionally, Rehbein et al. (2015) reported that IGD prevalence was around 1.16% in a representative sample of German adolescents using the cut-off of endorsing five of nine IGD criteria. These prevalence rate discrepancies might also be a consequence of different operationalization of IGD criteria and diversity of samples.

The results from the sensitivity, specificity, positive and negative predictive value, and diagnostic accuracy analysis of each possible cut-off score for IGD appeared to support the DSM-5 suggested threshold (i.e., endorsement of at least five criteria). Drawing on different methodology and study design, Ko et al. (2014) found similar results in a clinical sample of 75 Taiwanese young adults. Future clinical validation studies using samples of

Western individuals should be conducted to provide further information on the suitability of IGD cut-off as the findings of this study were entirely derived on the basis of statistical testing.

This study has several limitations that have to be taken in consideration when interpreting or using the results. Although the sample was large and heterogeneous, participants were recruited using non-probability sampling techniques. Additionally, the data was entirely collected using self-report questionnaires, which are known for producing potential biases (e.g., social desirability biases, short-term recall biases, etc.).

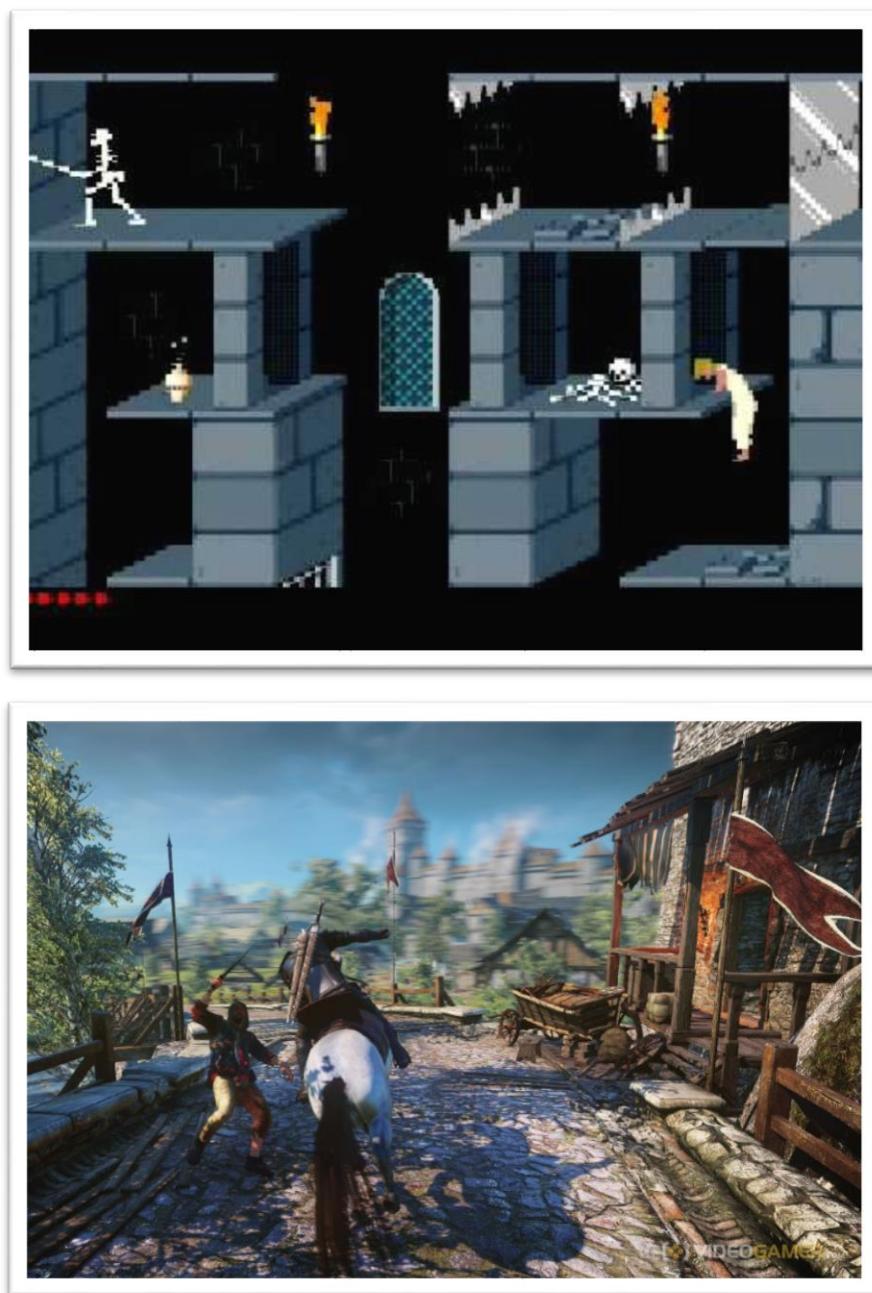
6.5 Conclusion

Generally, the present findings support the validity and reliability of the IGDT-10 to assess IGD using the DSM-5 framework and corroborate the use of the suggested cut-off threshold for classifying individuals with IGD as proposed by DSM-5. The findings of IRT analysis in regard to the criteria endorsement pattern suggested that IGD is manifested differently depending on its severity. For instance, while “continuation” and “negative consequences” were already fulfilled by individuals with less severe IGD, withdrawal symptoms were reported only in most severe cases. Furthermore, as “preoccupation” and “escape” repeatedly yielded low psychometric indices, we suggest their replacement by others (or even exclusion). Our findings pave the way for future studies to assess the characteristics and intricacies of each criterion and how they explain IGD.

7 GENERAL DISCUSSION

7.1 Introduction

Commercial video games have been played since the early 1970s, and gaming as a leisure time activity has become increasingly popular since their introduction, regardless of age and gender (Entertainment Software Association, 2015). Besides and parallel with its increasing popularity, video game technology (e.g., graphics, sound effects, artificial intelligence, game mechanics) has progressed in an incredible and unpredictable way. The cutting-edge technology of the 80s and 90s looks like a vintage car today: cute and nostalgic but ridiculously old-style (see 7.1. Figure 1). Moreover, not only the looks have been improving dramatically during the last two decades but also the game mechanisms (Goldberg, 2012; Millions, year not reported). Massively multiplayer online games for instance allow hundreds or even thousands of players to play simultaneously in the same virtual world at any given moment, using extremely complex strategies to compete or cooperate with other players (Barnett & Coulson, 2010).



7.1. Figure 1. *Prince of Persia*, an early video game released in 1989, versus *The Witcher 3*, a modern video game released in 2015

This incredibly fast technological advancement and constant change makes it extremely difficult to conduct research in the video gaming field. As research in general is lingering, (usually taking years to publish the findings of a study), research in the video gaming field is particularly challenging. For instance motivational models building on the structural characteristics of current games (Demetrovics et al., 2011; Yee, 2006c) are highly vulnerable to constant changes in gaming trends. Nevertheless, research in this field is more and more important since video gaming becomes part of our everyday lives

with numerous advantages, disadvantages, opportunities, and possible threats (e.g., gamification, educational games, problematic gaming, or video game violence).

For the aforementioned reasons, research in the video game field in general and problematic online gaming in particular is in its infancy. The first papers describing this problem appeared in the late 90s (Griffiths, 1996a; Young, 1996). Since then, research interest has been growing exponentially, and as a result Internet gaming disorder has been included in the Section 3 of the DSM-5 (American Psychiatric Association, 2013). However, there are still more questions than answers at the moment. As already discussed in details in the Introduction, there is a huge debate around the definition, the conceptualization, and the operationalization of problematic video gaming, which hinders further research regarding the prevalence, the etiology, the comorbidity, and the treatment of problematic gaming. Furthermore, the lack of consensus in these core questions also impedes the development and testing of specific treatment protocols. Consequently, in spite of the rapid advancement of the video game industry, experts must find a way to keep pace, probably by trying to reach a consensus and by trying to identify factors that are less related to specific game types or structural characteristics and more related to general gaming elements and basic human needs (such as the Self-Determination Theory in relation to gaming; Lafrenière, Verner-Filion, & Vallerand, 2012; Rigby & Ryan, 2011).

The present chapter aims to discuss and reflect upon the dissertation in general. More specifically, it comprises a summary of the main findings of the four empirical studies, followed by a section discussing how these findings contribute to the field of problematic online gaming and what their practical implications may be. Afterwards, I discuss the main limitations of the studies, the most important future directions of the field, closing the dissertation with final conclusions.

7.2 Summary of main findings

A detailed summary including the aims, the methods and the results of the four empirical studies are summarized in 7.2. Table 1.

7.2. Table 1. Detailed summary of the four empirical studies

Study number	Aims	Methods	Results
1.	<p>1) To validate the short form of the previously developed Problematic Online Gaming Questionnaire.</p> <p>2) To estimate the proportion of Hungarian adolescents who play online games regularly.</p> <p>3) To estimate the prevalence of problematic online gaming in a national sample of Hungarian adolescents.</p>	<ul style="list-style-type: none"> • Paper-and-pencil survey • Nationally representative sample of 9th–10th graders in secondary general and secondary vocational schools • 5,045 adolescents (51% male, mean age 16.4 years, SD = 0.9 years) • Psychometric analyses were carried out on the subsample of those who had played online games in the past month (n=2,804; 55.6% of total sample; 65.4% male; mean age 16.4 years, SD=0.85 years). <hr/> <ul style="list-style-type: none"> • Aim 1: Confirmatory factor analysis to test the factor structure of the instrument + testing structural and measurement invariance between gender + testing validity by comparing no-risk, low-risk and high-risk classes with Wald χ^2 test + testing internal consistency with Cronbach's alpha • Aim 2: frequency analysis • Aim 3: latent profile analysis 	<p>POGQ-SF proved to be a psychometrically sound instrument:</p> <ul style="list-style-type: none"> • CFA: optimal fit ($\chi^2= 277.35$ df=39 $p<.001$; CFI=0.972; TLI=0.953; RMSEA= 0.047 [0.042-0.052] Cfit>0.90; SRMR=0.025) • Gender invariance confirmed • Validity: high-risk class having the worst indices • Cronbach's alpha: .91 <p>55.6% of the 9th–10th graders in secondary general and secondary vocational schools play online games regularly (65.4% male, mean age 16.4 years, SD = 0.9 years)</p> <p>4.6% of the 9th–10th graders in secondary general and secondary vocational schools belong to the ‘high-risk’ group (87.2% male)</p>

2.	4) To examine the interrelationship and the overlap between problematic online gaming (POG) and problematic Internet use (PIU) along several relevant variables such as gender, time spent using the Internet and/or online gaming, psychological well-being, and preferred online activities.	<ul style="list-style-type: none"> • Paper-and-pencil survey • Nationally representative sample of 9th–10th graders in secondary general and secondary vocational schools who play video games regularly • N=2,073 adolescents (68.4% male, mean age 16.4 years, SD = 0.9 years) <hr/> <ul style="list-style-type: none"> • Contingency table to find out the interrelation between average daily Internet use and average daily online gaming • Contingency table to find out the scale of the two problem behaviors and the overlap between them • Multivariate multiple regression to compare the association of PIU and POG with relevant predictor variables 	<p>Problematic online gaming appears to be a conceptually different behavior from problematic Internet use because:</p> <ul style="list-style-type: none"> • Internet use was a common activity among adolescents, online gaming was engaged in by a considerably smaller group • More adolescents met the criteria for PIU (8.8%) than for POG (4.3%), and a small group of adolescents showed symptoms of both problem behaviors (6.7%) • POG was more strongly associated with being male • Self-esteem had low effect sizes on both behaviors; depressive symptoms were associated with both PIU and POG, affecting PIU slightly more • PIU was positively associated with online gaming, online chatting, and social networking, while POG was only associated with online gaming
3.	5) To explore the role of psychiatric distress and gaming motives in problematic online gaming by testing a complex mediation model.	<ul style="list-style-type: none"> • Online survey • Online gamer sample 	<p>Psychiatric distress had a significant positive direct effect ($\beta=.35, p<.001$) and a significant indirect (mediating) effect on POG ($\beta =.194, p<.001$) via</p>

	6) To test possible moderating effects of gender and game type (MOFPS and MMORPG) on the mediation model.	<ul style="list-style-type: none"> • N=3,186; 89.7% male, mean age 21.1, SD = 5.9 years <hr/> <ul style="list-style-type: none"> • Structural regression analyses within structural equation modeling to test the proposed mediation models • Multigroup analyses to test possible moderating effects of gender and game type on the mediation model 	<p>two gaming motives: escape ($\beta=.139, p<.001$) and competition ($\beta=.046, p<.001$)</p> <ul style="list-style-type: none"> • The comparison of the two main gamer types showed no significant differences in the model. • Comparing male and female players it was found that women had: <ul style="list-style-type: none"> (1) slightly higher escape scores (on a 5-point Likert scale: mean 2.28, SD 1.14) than men (mean 1.87, SD 0.97) (2) a stronger association between the escape motive and POG ($\beta=.64, p<.001$) than men ($\beta=.20, p=.001$)
4.	7) To validate the Ten-Item Internet Gaming Disorder Test (IGDT-10) instrument.	<ul style="list-style-type: none"> • Online survey • Online gamer sample • N=4,887; 92.5% male, mean age 22.2, SD = 6.4 years <hr/> <ul style="list-style-type: none"> • Aim 1: Confirmatory factor analysis to test the factor structure of the instrument + to test validity a pattern of covariates of IGDT-10 (with POGQ and explanatory variables) was tested with a structural regression model + testing internal consistency with Cronbach's alpha • Aim 2: Item Response Theory analysis 	<p>IGDT-10 proved to have proper psychometric qualities:</p> <ul style="list-style-type: none"> • CFA: optimal fit ($\chi^2= 194.4$ df=27 $p<.001$; CFI=0.971; TLI=0.962; RMSEA= 0.036 [0.031-0.040] Cfit>0.90; pclose=1) • Validity: <ul style="list-style-type: none"> (1) the two instruments measuring POG (IGDT-10 and POGQ) were strongly correlated; (2) their associations with psychiatric distress, gaming time, and other explanatory variables were comparable

	<ul style="list-style-type: none"> • Aim 3: latent class analysis (LCA) + sensitivity and specificity analysis 	<ul style="list-style-type: none"> • Cronbach's alpha: .68
8) To evaluate the nine Internet gaming disorder (IGD) criteria proposed by the DSM-5.		<ul style="list-style-type: none"> • IGD is manifested through a different set of symptoms depending on the level of severity of the disorder: <ul style="list-style-type: none"> ▪ “Continuation”, “preoccupation”, “negative consequences” and “escape” were associated with lower severity of IGD ▪ “Tolerance”, “loss of control”, “giving up other activities” and “deception” criteria were associated with more severe levels • “Preoccupation” and “escape” provided very little information to the estimation IGD severity.
9) To evaluate statistically the cut-off threshold (i.e., endorsing five out of nine criteria) for Internet gaming disorder proposed by the DSM-5.		<p>Our statistical analyses showed that overall the DSM-5 suggested threshold had the best sensitivity, specificity, positive and negative predictive value and accuracy indices if the fourth LCA group (i.e., the disordered group) was used as the gold standard.</p>

Overall Study 1 suggests that the 12-item POGQ-SF along with the original 18-item POGQ (Demetrovics et al., 2012) proved to be a psychometrically valid and reliable instrument to assess problematic online gaming. Additionally, it was found that 55.6% of the Hungarian 9th–10th graders in secondary general and secondary vocational schools play online games regularly, and almost two-third (65.4%) of the regular gamers are male. 4.6% of these adolescents belong to the ‘high-risk’ group, meaning that online gaming causes problems in their everyday life. Study 2 supports the argumentation than problematic Internet use and problematic online gaming are two distinct conceptual and nosological entities. Study 3 revealed that psychiatric distress had both a significant positive direct effect and a significant indirect (mediating) effect on problematic online gaming via two gaming motives: escape and competition. Moreover, it was found that women scored slightly higher on escape motive and had a stronger path between the escape motive and problematic online gaming than men. Study 4 suggests that the Ten-Item Internet Gaming Disorder Test (IGDT-10) – an instrument developed to assess the nine Internet gaming disorder (IGD) criteria proposed by the DSM-5 – also has proper psychometric characteristics. Additionally, it was found that IGD is manifested through a different set of symptoms depending on the level of severity of the disorder. More specifically, “continuation”, “preoccupation”, “negative consequences” and “escape” were associated with lower severity of IGD, while “tolerance”, “loss of control”, “giving up other activities” and “deception” criteria were associated with more severe levels. Furthermore, “preoccupation” and “escape” criteria had very low discriminatory power. Finally, the empirical data supported the DSM-5 suggestion for the IGD cut-off threshold (i.e., endorsing five out of nine criteria).

7.3 Contribution to the field and practical implications

As mentioned earlier, the field of problematic video gaming is in its infancy and it is the task of researchers to clarify the most important aspects of this problem behavior. The present sub-chapter aims to discuss how the four empirical studies contribute to the field and what their practical implications are.

7.3.1 Study 1

Study 1 aimed to psychometrically validate the short form of the previously developed Problematic Online Gaming Questionnaire. As already mentioned at the beginning of

Study 1 it would be essential for survey studies to use psychometrically validated tools that meet the following six requirements: (1) *comprehensiveness* (i.e., examining more, possibly all, aspects of problematic online gaming); (2) *brevity* (to assess the more impulsive population as well and to facilitate incorporation into time-limited surveys); (3) reliability/validity for *different methods of data collection* (online, paper-and-pencil self-rating, face-to-face); (4) reliability/validity for *different age groups* (adolescents and adults); (5) *cross-cultural* reliability/validity; (6) validated on *clinical samples* (Koronczai et al., 2011). Unfortunately, this is not the general practice. There is an uncountable number of studies for example (King et al., 2013) which use Young's (1998a) Internet Addiction Test, an instrument with controversial findings regarding its psychometric properties (Király, Nagygyörgy, et al., 2015). Moreover, I can hardly think of any measurement instruments for problematic online gaming meeting all these six requirements. Although the POGQ also lacks points (5) and (6) at the moment, it is our plan for the near future to validate it cross-culturally and using a clinical sample as well. Nevertheless, publishing another validation study that tests the instruments' reliability and validity for a different data collection method (i.e., paper-and-pencil) and a different age group (i.e., adolescents) is an important step in the comprehensive validation process. Additionally, the study also aimed to raise awareness over the need to test survey instruments thoroughly and/or to use such instruments whenever possible.

Study 1 was also the first to estimate the proportion of Hungarian adolescents who play online games regularly, and to estimate the prevalence of problematic online gaming among Hungarian adolescents. Our findings demonstrate that more than half (55.6%) of the 16 years adolescents, and almost two third of adolescent boys (65.4%) play online games regularly, suggesting that although these rates are much lower compared to 'gaming empires' such as the United States or South Korea, gaming has become one of the most preferred leisure time activities in Hungary too.

Additionally, the prevalence rate of 4.6% is comparable with survey results from Norway (i.e., 4.1% [Mentzoni et al., 2011] and 4.2% [Brunborg et al., 2013]), however, it is considerably higher than rates reported in Germany (i.e., 1.7% [Rehbein et al., 2010]) or the Netherlands (i.e., 1.3% [Haagsma et al., 2012] and 1.6% [van Rooij et al., 2011]), and considerably lower than rates reported in the 8.5% in the United States (i.e., 8.5% [Gentile, 2009]) or Singapore (i.e., 9% [Gentile et al., 2011]).

Nevertheless, there is an interesting statistical phenomenon we almost never take into consideration, even though it strongly influences such calculations. That is, when a disorder is relatively rare (has low prevalence rate in a given population), a positive test result is usually unable to reliably confirm the presence of the disorder given the low positive predictive value of the instrument and closely related to this, the high proportion of false positive cases (Heneghan, 2010; Maraz, Király, & Demetrovics, 2015). For example, using the Scale for the Assessment of Internet and Computer Game Addiction (AICA-S) (Müller, Beutel, et al., 2014) approx. nine out of ten people who score positive on the test will in fact *not* have the disorder (for a detailed explanation and the exact calculations see the aforementioned paper by Maraz, Király and Demetrovics). Consequently, survey test results are limited to serve as an early detection “gate” and only clinical interviews are suitable to determine whether a certain case is truly “pathological”. Taking this phenomenon into consideration, it is much likely that prevalence rates reported in surveys are generally highly inflated, and in reality only a fraction of those who scored positive are truly problematic. Given the moral panic surrounding video games it is an important task to recognize this phenomenon, because prevalence rates end up in the general media and scare people into believing that entire segments of the population are ‘addicted’.

7.3.2 Study 2

Study 2 aimed to examine whether problematic Internet use and problematic online gaming are two distinct conceptual and nosological entities or whether they are the same. Although this may seem to be a simple question, there is a huge confusion around these terms in the literature. More specifically, online gaming addiction or problematic online gaming was (and still is) often referred to as Internet addiction (Griffiths & Pontes, 2014; King et al., 2013). This confusion is highly problematic and had a significant negative impact on the unification of the field to date, because it makes difficult to know exactly what the respective studies measure, and thus hinders the creation of systematic reviews and meta-analyses that periodically synthesize the various findings of the field. More specifically, we do not really know whether gamers consider online gaming an Internet activity or gaming *per se*. Those who do not consider it an Internet activity (and it is my guess that there are quite a few out there) will give completely biased answers to questions using the term Internet while in reality referring to gaming. Consequently, I personally think that it is one of the main priorities in the gaming field to clarify this debate and reach

a consensus regarding the terms we use. Our empirical results support the argumentation that these two entities are different and try to draw attention to the importance of the issue itself.

7.3.3 Study 3

A large part of the studies conducted in the problematic online gaming field explored the psychological and motivational correlates of the behavior. As a result these studies suggest that psychological vulnerability in general (e.g., depressive symptoms, anxiety, social anxiety, or loneliness) and certain motives in particular (i.e., escapism, achievement/advancement/competition) are positively associated with problematic online gaming. However, in the majority of studies these psychological characteristics or motivations were tested as unique predictors of problematic use. On the contrary, we assumed that the aforementioned variables may relate to each other in complex ways. Our results suggest that psychiatric distress is both directly and indirectly (via escape and competition motives) negatively associated with problematic online gaming. These findings shed light not only on the importance of motives but on their interaction with psychiatric distress in the development of problematic online gaming. It appears that those who play for recreational purposes are very unlikely to develop problematic online gaming. However, those who are distressed, can either release tension through gaming (using it as an adaptive coping mechanism with no adverse consequences), or use gaming to avoid real-life problems that appears to work as a maladaptive coping mechanism which in certain cases leads to negative (addiction-like) real-life consequences.

This argumentation can also be backed up with findings from the emotion regulation literature. Escapism can be considered a form of distraction, an emotion regulation strategy that involves diverting attention away from an emotionally difficult situation (Sheppes & Gross, 2012). When confronted with negative emotions of high intensity, distraction can serve as an effective strategy – requiring minimal effort – to block the information related to the negative emotions, by diverting the attention to neutral stimuli unrelated to the original emotions (Campbel-Sills & Barlow, 2007). For instance the person has experienced a work-related conflict or failure, and to divert his attention away from the unpleasant thoughts and feelings he/she sits down to play. The problem is that this strategy is expected to be non-effective in the long run (Kross & Ayduk, 2008) because it hinders elaborated processing of the aversive emotional event (Campbel-Sills

& Barlow, 2007; Sheppes & Gross, 2012). The person may feel better while playing, however, the negative emotions related to the conflict or failure persist and reappear as soon as the person stops playing. As Sheppes and Gross describe (2012), “distraction can be considered as a ‘bandage’ regulation strategy that can stop the ‘bleeding’ but not offer actual remedy.” The question is how often the person uses this strategy to avoid negative feelings, and whether this is the only way he/she tries to ease the feelings of distress. If the person has a rich variety of different emotion regulation strategies which can be flexibly implemented depending on the situation (Aldao, Sheppes, & Gross, 2015), it is unlikely that the gaming behavior would become problematic. However, this argumentation needs further examination together with escapism as a possible emotion regulation strategy.

Kardefelt-Winther (2014d, 2014e) who also investigated the complex associations between psychological characteristics, gaming motives and negative outcomes reported similarly interesting results. He found that the relationship between escapism and negative outcomes was only positive for individuals with high stress or low self-esteem, and only for individuals who experience negative outcomes above average. Based on these findings, he proposed an alternative conceptualization for Internet addiction (with special attention to video game addiction), namely, *compensatory Internet use*, stating that escapist online gaming is a coping strategy (rather than addiction) which compensates for psychosocial problems (Kardefelt-Winther, 2014a) (another example of blending the terms Internet addiction and video game addiction by the way). Although this theory needs further testing, it also sheds light on the complexity of problematic online gaming. Consequently, exploring psychological characteristics together with gaming motivations may be particularly helpful when preparing prevention or treatment programs.

7.3.4 Study 4

The inclusion of Internet gaming disorder in the Section 3 of the DSM-5 has stirred a heated scholarly debate regarding the proposed criteria and their operationalization (for a detailed summary of this debate see the section entitled *1.4.2. Recent conceptualization: DSM-5* in the Introduction). Some of the questions in this debate are the following: (1) are these nine criteria exhaustive or are there some additional criteria that could be included (e.g., craving), (2) how do these nine criteria perform, and (3) how should they be phrased? Our study aims to contribute to this debate in two ways. First, it offers an

operationalization for the nine criteria by developing the IGDT-10 instrument. Secondly, it evaluates how the nine criteria (in the proposed operationalization) perform in terms of their ability to differentiate between problematic and non-problematic gamers. Additionally, we also tested (using statistical methods) the performance of possible cut-off scores for IGD. Since the aforementioned scholarly debate has mostly been theoretical until now, it is essential to test the different proposals/arguments/theoretical ideas also empirically. Study 4 aims to join the few empirical studies that exist to date (Ko et al., 2014; Lemmens et al., 2015; Rehbein et al., 2015) and to draw attention to the need of similar studies in the near future.

As far as the concrete results of the study are concerned, an interesting question comes up. When comparing the results of Study 3 and Study 4, it can be noticed that escapism behaves fairly differently. As a motive, it stands out from the others due to its association with POG and by being the strongest mediator between psychiatric distress and POG (Study 3), while as an IGD criterion, it has a relatively low discriminatory power (i.e., it cannot differentiate well between those with and without IGD at different IGD severity levels) (Study 4). This apparent contradiction is fairly interesting and I can only speculate about the possible reasons. Study 4 shows that the endorsement of the escapism criterion is relatively high both in the total sample (13%) and among those with IGD (76%). Additionally, although its association with POG is the highest among all the motives, it is still not very high ($\beta=.26$; Study 3). Therefore, its low discriminatory power and its low to moderate association with POG may be related to the relatively high endorsement rate. In other words, the fact that lots of gamers play for escapism, though only a minority of them have IGD, may be the reason for the low discriminatory power and for the low to moderate level of association with POG. Besides, the findings of Kardefelt-Winther (2014d, 2014e) described in section 7.3.3. (i.e., the relationship between escapism and negative outcomes was only positive for individuals with high stress or low self-esteem, and only for individuals who experience negative outcomes above average) also suggest that escapism alone is not sufficient to differentiate between those with and without IGD.

Summing all this up, it appears that playing to escape is not necessarily problematic, but if it couples with high personal stress (i.e., psychiatric distress, stress, low self-esteem), it may increase the risk of problematic use. Finally, we also should bear in mind that although labeled the same way (i.e., escape/escapism), the constructs were

operationalized differently, which also may have an influence upon this speculative sequence of ideas.

7.4 Limitations

Limitations of the four empirical studies have been discussed separately at the end of each paper. Now I would like to briefly summarize the main limitations of all our studies, and more broadly, of the methodological approach we used.

All our studies were self-administered, survey-type, questionnaire studies, collecting cross-sectional data from Hungarian-only participants, and as such have several limitations. Self-reported data is sensible to short-term recall biases and also to social desirability bias, especially in the case of sensitive topics such as addiction. Survey-type, questionnaire studies are adequate to test broad and general hypothesis, but are not suitable to explore deep underlying mechanisms behind a problem behavior. The cross-sectional nature of the data unfortunately makes it impossible to infer causality regarding the variables tested. And finally, the national and cultural homogeneity of our samples must be taken into consideration when generalizing the results to other cultures. Additionally, two of the studies used self-selected online samples that affect the samples' representativeness (Khazaal et al., 2014) and therefore the generalizability of the results as well. The other two studies used a nationally representative adolescent sample, therefore self-selection was not an issue in those cases.

Of course, it is extremely difficult or even impossible to address all the aforementioned limitations. However, cooperating with other research groups which use different methods can be particularly fruitful, especially in a field that is still in its infancy. More specifically, I think that (interview based or content analysis based) qualitative inquiries are particularly important, longitudinal studies and studies using clinical samples are desperately needed, experiments would be interesting and useful but are very difficult to design in this particular field, and finally, a number of cross-cultural studies are just around the corner. Additionally, studies analyzing in-game behavioral metrics (such as the number of days a player needs to reach maximum level in a game, the types of achievements the player obtains, or the number of hugs the player gives to others) may also provide useful insights and would address the limitations of self-reported data. (For such studies see: Yee, Ducheneaut, Nelson, & Likanish, 2011; Yee, Ducheneaut, Shiao, & Nelson, 2012; Yee, Ducheneaut, Yao, & Nelson, 2011).

7.5 Future directions

IGD has been included in the DSM-5 (Section 3) to encourage and foster future research in the field. Therefore, the short term goal is to carry out enough quality research in the near future to be able to reach (or at least approach) a consensus regarding the conceptualization, the definition and the assessment of problematic online/video gaming that makes it possible to decide whether it should be considered an addiction, and thus a mental disorder, or a different framework would be more appropriate. In terms of quality research, in my opinion, the following would be the most important and urgent.

As discussed in chapter 1.8 (entitled ‘Assessment’), numerous instruments exist to measure problematic online gaming and lots of them have promising psychometric characteristics. What is generally missing though, is the clinical and cross-cultural validation of these instruments. A clinical validation provides sensitivity and specificity values for the screening test, evaluating its ability to correctly estimate prevalence rates. Without such clinical validation, the estimation of prevalence rates by any instrument might be highly inaccurate. Cross-cultural validation is also important, especially, if we plan to use the instruments to compare different cultures.

Another important issue that can facilitate the conceptualization of problematic gaming as a psychiatric disorder is information on its natural course. It is essential to find out whether problem gaming has a chronic or an episodic nature (Gentile et al., 2011; Thege, Woodin, Hodgins, & Williams, 2015). If it turns out that it is simply a phase that many gamers go through, it should not be conceptualized as a mental disorder. To find this out longitudinal studies (enduring for more than three years) are needed, targeting both large scale general population samples and small clinical samples.

In addition to longitudinal studies, brain imaging studies may contribute to the conceptualization of the problem behavior by exploring the neurobiological mechanisms underlying problematic gaming (Kuss & Griffiths, 2012a). The main question in this case is whether and how these mechanisms are similar to or different from the mechanisms characterizing traditional addictions (i.e., substance dependence and pathological gambling).

As mentioned in the Limitations section, it would also be beneficial to use in-game behavioral data whenever possible to increase objectivity and reliability. Gaming habits and behavior, as well as exact gaming time can be assessed directly, while motivations

for instance can be assessed indirectly through examining different gaming styles. I personally think that these studies will grow in number in the near future and I am quite curious to see how they will contribute to the gaming field in general.

Finally, another line of research should concentrate on the evaluation of the effectiveness of different treatment methods and prevention programs for problematic gaming (King & Delfabbro, 2014b). As discussed in chapter 1.13 (entitled ‘Treatment’), several treatment methods are practiced around the world; however, few studies evaluate their short term and long term effectiveness, their cultural determination, or compare different methods with each other. Such studies are indispensable to create well-functioning treatment systems in the affected countries or cultures.

7.6 Final conclusions

The theoretical part of the present dissertation aims to provide an overview of problematic online gaming, while the four empirical studies wish to contribute to some of the field’s important questions and challenges such as conceptualization, assessment, or exploration of underlying psychological and motivational mechanisms. Unfortunately, the central question, namely, whether problematic gaming is a psychiatric disorder or not, remains unanswered. Future task of researchers in the field is to pile up well-designed, methodologically correct studies which help clarify the most important questions and reach (or at least approach) a consensus. This consensus would be a great help to treat the problem adequately, both on the individual and the societal level. Video games have become one of the most popular leisure time activities, therefore we need to learn how to use them in a healthy and responsible way. Research is indispensable to differentiate between real dangers and media scaremongering, and it is the task of researchers and fellow experts to educate the society about healthy media use including video games.

8 REFERENCES

- Aldao, A., Sheppes, G., & Gross, J. J. (2015). Emotion regulation flexibility. *Cognitive Therapy and Research*, 39(3), 263-278.
- Allison, S. E., von Wahlde, L., Shockley, T., & Gabbard, G. O. (2006). The development of the self in the era of the internet and role-playing fantasy games. *American Journal of Psychiatry*, 163(3), 381-385.
- American Psychiatric Association. (1994). *Diagnostic and Statistical Manual of Mental Disorders. (4th ed.)*. Washington, DC: Author.
- American Psychiatric Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders – Text Revision. 5th edition*. DC, USA: American Psychiatric Association.
- Armstrong, L., Phillips, J. G., & Saling, L. L. (2000). Potential determinants of heavier internet usage. *International Journal of Human-Computer Studies*, 53(4), 537-550. doi: <http://dx.doi.org/10.1006/ijhc.2000.0400>
- Bagozzi, R. P., & Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the Academy of Marketing Science*, 16, 74-94.
- Barnett, J., & Coulson, M. (2010). Virtually real: A psychological perspective on massively multiplayer online games. *Review of General Psychology*, 14(2), 167-179.
- Bartle, R. (1996). Hearts, clubs, diamonds, spades: players who suit MUDs. *Journal of MUD Research*, 1(1).
- Bartle, R. (2003). *Designing virtual worlds*. Indianapolis: New Riders Press.
- Batthyany, D., Müller, K. W., Benker, F., & Wölfling, K. (2009). [Computer game playing: clinical characteristics of dependence and abuse among adolescents]. *Wiener Klinische Wochenschrift*, 121(15-16), 502-509.
- Baumeister, R. F. (1990). Suicide as escape from self. *Psychological Review*, 97(1), 90-113.
- Baumeister, R. F., & Sommer, K. L. (1997). What do men want? Gender differences and two spheres of belongingness: comment on Cross and Madson (1997). *Psychological Bulletin*, 122(1), 38-44; discussion 51-35.
- Beard, K. W., & Wolf, E. M. (2001). Modification in the proposed diagnostic criteria for Internet addiction. *CyberPsychology & Behavior*, 4(3), 377-383.
- Billieux, J., Chanal, J., Khazaal, Y., Rochat, L., Gay, P., Zullino, D., & Van der Linden, M. (2011). Psychological Predictors of Problematic Involvement in Massively Multiplayer Online Role-Playing Games: Illustration in a Sample of Male Cybercafé Players. *Psychopathology*, 44, 165-171.
- Billieux, J., Van der Linden, M., Achab, S., Khazaal, Y., Paraskevopoulos, L., Zullino, D., & Thorens, G. (2013). Why do you play World of Warcraft? An in-depth exploration of self-reported motivations to play online and in-game behaviours in the virtual world of Azeroth. *Computers in Human Behavior*, 29(1), 103-109. doi: <http://dx.doi.org/10.1016/j.chb.2012.07.021>
- Bioulac, S., Arfi, L., & Bouvard, M. P. (2008). Attention deficit/hyperactivity disorder and video games: A comparative study of hyperactive and control children. *European Psychiatry*, 23(2), 134-141.
- Blaszczynski, A. (2006). Internet use: In search of an addiction. *International Journal of Mental Health and Addiction*, 4(1), 7-9.
- Blum, K., Cull, J. G., Braverman, E. R., & Comings, D. E. (1996). Reward deficiency syndrome. *American Scientist*, 84(2), 132-145.

- Brown, R. I. F. (1991). Gaming, gambling and other addictive play. In J. H. Kerr & M. J. Apter (Eds.), *Adult play: A reversal theory approach* (pp. 101-118). Amsterdam: Swets & Zeitlinger.
- Brown, R. I. F. (1993). Some contributions of the study of gambling to the study of other addictions. In W. R. Eadington & J. A. Cornelius (Eds.), *Gambling behavior and problem gambling* (pp. 241-272). Reno, NV: University of Nevada.
- Browne, M., & Cudek, R. (1993). Alternative ways of assessing model fit. In K. Bollen & J. Long (Eds.), *Testing structural equation models* (pp. 136–162). Newbury Park, CA: Sage.
- Brunborg, G. S., Mentzoni, R. A., & Frøyland, L. R. (2014). Is video gaming, or video game addiction, associated with depression, academic achievement, heavy episodic drinking, or conduct problems? *Journal of Behavioral Addictions*, 3(1), 27-32. doi: 10.1556/JBA.3.2014.002
- Brunborg, G. S., Mentzoni, R. A., Melkevik, O. R., Torsheim, T., Samdal, O., Hetland, J., . . . Palleson, S. (2013). Gaming addiction, gaming engagement, and psychological health complaints among Norwegian adolescents. *Media Psychology*, 16(1), 115-128. doi: 10.1080/15213269.2012.756374
- Byrne, B. M. (2010). *Structural Equation Modeling with AMOS: Basic Concepts, Applications, and Programming* (2nd Ed.). New York: Routledge.
- Campbel-Sills, L., & Barlow, D. H. (2007). Incorporating emotion regulation into conceptualizations and treatments of anxiety and mood disorders. In J. J. Gross (Ed.), *Handbook of Emotion Regulation* (pp. 542-559). New York: Guilford Press.
- Caplan, S. E. (2002). Problematic Internet use and psychosocial well-being: development of a theory-based cognitive-behavioral measurement instrument. *Computers in Human Behavior*, 18(5), 553-575. doi: [http://dx.doi.org/10.1016/S0747-5632\(02\)00004-3](http://dx.doi.org/10.1016/S0747-5632(02)00004-3)
- Cha, A. E. (2007, 22 February). In China, Stern Treatment For Young Internet 'Addicts'. *The Washington Post*. from <http://www.washingtonpost.com/wp-dyn/content/article/2007/02/21/AR2007022102094.html>
- Chan, E., & Vorderer, P. (2006). Massively multiplayer online games. In P. Vorderer & J. Bryant (Eds.), *Playing video games: Motives, responses, and consequences* (pp. 77–88). Hillsdale, NJ: Erlbaum.
- Chan, P. A., & Rabinowitz, T. (2006). A cross-sectional analysis of video games and attention deficit hyperactivity disorder symptoms in adolescents. *Ann Gen Psychiatry*, 5, 16.
- Chappell, D., Eatough, V., Davies, M., & 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. doi: 10.1007/s11469-006-9028-6
- Charlton, J. P. (2002). A factor-analytic investigation of computer 'addiction' and engagement. *British Journal of Psychology*, 93(Pt 3), 329-344.
- 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.
- Charlton, J. P., & Danforth, I. D. W. (2010). Validating the distinction between computer addiction and engagement: online game playing and personality. *Behaviour & Information Technology*, 29(6), 601-613.
- Chee, F. (2005, June 16-20). *Understanding Korean experiences of online game hype, identity, and the menace of the "Wang-tta"*. Paper presented at the Digital Games

- Research Conference 2005, Changing Views: Worlds in Play, Vancouver, British Columbia, Canada.
- Chee, F. (2006). The games we play online and offline: Making Wang-tta in Korea. *Popular Communication, 4*(3), 225-239.
- Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Structural equation modeling, 14*, 464-504.
- Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural equation modeling, 9*, 233-255.
- Choi, D. S., & Kim, J. (2004). Why people continue to play online games: In search of critical design factors to increase customer loyalty to online contents. *CyberPsychology & Behavior, 7*(1), 11-24.
- Chou, C., & Tsai, M. J. (2007). Gender differences in Taiwan high school students' computer game playing. *Computers in Human Behavior, 23*(1), 812-824.
- Clark, N., & Scott, P. S. (2009). *Game Addiction: The Experience and the Effects*. Jefferson, North Carolina: McFarland & Company, Inc.
- Cole, D. A., & Preacher, K. J. (2014). Manifest variable path analysis: potentially serious and misleading consequences due to uncorrected measurement error. *Psychological Methods, 19*(2), 300-315. doi: 10.1037/a0033805
- Cole, H., & Griffiths, M. D. (2007). Social interactions in massively multiplayer online role-playing gamers. *CyberPsychology & Behavior, 10*(4), 575-583.
- Collins, L., & Lanza, S. (2010). *Latent class and latent transition analysis*. Hoboken, NJ: Wiley.
- Cooper, M. L., Frone, M. R., Russell, M., & Mudar, P. (1995). Drinking to regulate positive and negative emotions: a motivational model of alcohol use. *Journal of Personality and Social Psychology, 69*(5), 990-1005.
- Demetrovics, Z., & Griffiths, M. D. (2012). Behavioral addictions: Past, present and future. *Journal of Behavioral Addictions, 1*(1), 1-2.
- Demetrovics, Z., Szeredi, B., & Rózsa, S. (2008). The three-factor model of internet addiction: the development of the Problematic Internet Use Questionnaire. *Behavior Research Methods, 40*(2), 563-574. doi: 10.3758/BRM.40.2.563
- Demetrovics, Z., Urbán, R., Nagygyörgy, K., Farkas, J., Griffiths, M. D., Pápay, O., . . . Oláh, A. (2012). The development of the Problematic Online Gaming Questionnaire (POGQ). *PLoS ONE, 7*(5), e36417. doi: 10.1371/journal.pone.0036417
- Demetrovics, Z., Urbán, R., Nagygyörgy, K., Farkas, J., Zilahy, D., Mervő, B., . . . Harmath, E. (2011). Why do you play? The development of the Motives for Online Gaming Questionnaire (MOGQ). *Behavior Research Methods, 43*(3), 814-825.
- Derogatis, L. R. (1975). *Brief Symptom Inventory*. Baltimore, MD: Clinical Psychometric Research.
- Derogatis, L. R. (1993). *BSI Brief Symptom Inventory. Administration, Scoring, and Procedures Manual. 4th edition*. Minneapolis, MN: National Computer Systems.
- Desai, R. A., Krishnan-Sarin, S., Cavallo, D., & Potenza, M. N. (2010). Video-gaming among high school students: health correlates, gender differences, and problematic gaming. *Pediatrics, 126*(6), e1414-1424. doi: 10.1542/peds.2009-2706
- Dowling, N. A. (2014). Issues raised by the DSM-5 internet gaming disorder classification and proposed diagnostic criteria. *Addiction, 109*(9), 1408-1409.
- Elekes, Z. (2012). ESPAD 2011, Country report – Hungary [Manuscript].

- Entertainment Software Association. (2015). Facts about the Computer and Video Game Industry. from <http://www.theesa.com/wp-content/uploads/2015/04/ESA-Essential-Facts-2015.pdf>
- Fackler, M. (2007, 18 November). In Korea, a Boot Camp Cure for Web Obsession. *The New York Times*. from http://www.nytimes.com/2007/11/18/technology/18rehab.html?pagewanted=all&_r=0
- Ferguson, C. J., Coulson, M., & Barnett, J. (2011). A meta-analysis of pathological gaming prevalence and comorbidity with mental health, academic and social problems. *Journal of Psychiatric Research*, 45(12), 1573-1578. doi: 10.1016/j.jpsychires.2011.09.005
- Forbes. (2012). New Reports Forecast Global Video Game Industry Will Reach \$82 Billion By 2017. Retrieved augusztus 15, 2012, from <http://www.forbes.com/sites/johngaudiosi/2012/07/18/new-reports-forecasts-global-video-game-industry-will-reach-82-billion-by-2017/>
- Forner, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18, 39-50.
- Forsense. (2013). Okostelefonok és számítógép-használat a magyar középiskolások körében [Smart phone and PC-usage among Hungarian secondary school students]. Retrieved 22.08.2014, from forsense.hu/piac/okostelefonok-es-szamitogep-hasznalat-a-magyar-kozepiskolasok-koreben
- Garvey, C. (1990). *Play*. Cambridge, MA: Harvard University Press.
- Gaudiosi, J. (2012). New reports forecast global video game industry will reach \$82 billion by 2017. Retrieved 04.10., 2014, from <http://www.forbes.com/sites/johngaudiosi/2012/07/18/new-reports-forecasts-global-video-game-industry-will-reach-82-billion-by-2017/> (Archived by WebCite® at <http://www.webcitation.org/6OjUvhrdh>)
- Gentile, D. A. (2009). Pathological video-game use among youth ages 8 to 18: a national study. *Psychological Science*, 20(5), 594-602.
- Gentile, D. A., Choo, H., Liau, A., Sim, T., Li, D. D., Fung, D., & Khoo, A. (2011). Pathological video game use among youths: a two-year longitudinal study. *Pediatrics*, 127(2), 319-329. doi: 10.1542/peds.2010-1353
- Goldberg, H. (2012). The 25 greatest breakthroughs in video game history. Retrieved 23 July, 2015, from <http://www.ign.com/articles/2012/01/30/the-25-greatest-breakthroughs-in-video-game-history>
- Golub, A., & Lingley, K. (2008). "Just Like the Qing Empire" Internet Addiction, MMOGs, and Moral Crisis in Contemporary China. *Games and Culture*, 3(1), 59-75.
- Goodkind, N. (2014). How the video game industry became bigger than movies and music. Retrieved 16 June, 2015, from <http://finance.yahoo.com/blogs/daily-ticker/how-the-video-game-industry-became-bigger-than-movies-and-music-171225174.html>
- Grant, J. E., Potenza, M. N., Weinstein, A., & Gorelick, D. A. (2010). Introduction to behavioral addictions. *American Journal of Drug and Alcohol Abuse*, 36, 233-241.
- Green, C. S., & Bavelier, D. (2006). The cognitive neuroscience of video games. In P. Messaris & L. Humphreys (Eds.), *Digital media: Transformations in human communication* (pp. 211-223). New York: Peter Lang.

- Griffiths, M. D. (1993). Fruit machine gambling: The importance of structural characteristics. *Journal of Gambling Studies*, 9(2), 101-120.
- Griffiths, M. D. (1996a). Internet addiction: An issue for clinical psychology? *Clinical Psychology Forum*, 97, 32-36.
- Griffiths, M. D. (1996b). Nicotine, tobacco and addiction. *Nature*, 384(6604), 18.
- Griffiths, M. D. (1998). Internet addiction: Does it really exist? In J. Gackenbach (Ed.), *Psychology and the internet: Intrapersonal, interpersonal, and transpersonal implications* (pp. 61-75). New York: Academic Press.
- Griffiths, M. D. (1999a). Gambling Technologies: Prospects for Problem Gambling. *Journal of Gambling Studies*, 15(3), 265-283.
- Griffiths, M. D. (1999b). Internet addiction: fact or fiction? *Psychologist*, 12, 246-250.
- Griffiths, M. D. (1999c). Internet addiction: Internet fuels other addictions. *Student British Medical Journal*, 7, 428-429.
- Griffiths, M. D. (2000). Internet addiction – Time to be taken seriously? *Addiction Research*, 8, 413-418.
- Griffiths, M. D. (2003a). Internet gambling: issues, concerns, and recommendations. *CyberPsychology & Behavior*, 6(6), 557-568. doi: 10.1089/109493103322725333
- Griffiths, M. D. (2003b). Video games: Advice for teachers and parents. *Education and Health*, 21, 48-49.
- 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), 644-646.
- Griffiths, M. D. (2008). Diagnosis and management of video game addiction. *New Directions in Addiction Treatment and Prevention*, 12, 27-41.
- Griffiths, M. D. (2010a). Online video gaming: what should educational psychologists know? *Educational Psychology in Practice*, 26(1), 35-40.
- Griffiths, M. D. (2010b). The role of context in online gaming excess and addiction: some case study evidence. *International Journal of Mental Health and Addiction*, 8(1), 119-125.
- Griffiths, M. D., Davies, M. N. O., & Chappell, D. (2003). Breaking the stereotype: The case of online gaming. *CyberPsychology & Behavior*, 6(1), 81-91.
- Griffiths, M. D., Davies, M. N. O., & Chappell, D. (2004). Online computer gaming: a comparison of adolescent and adult gamers. *Journal of Adolescence*, 27(1), 87-96.
- Griffiths, M. D., King, D. L., & Demetrovics, Z. (2014). DSM-5 internet gaming disorder needs a unified approach to assessment. *Neuropsychiatry*, 4(1), 1-4. doi: 10.2217/npy.13.82
- Griffiths, M. D., Király, O., Pontes, H. M., & Demetrovics, Z. (2015). An overview of problematic gaming. In V. Starcevic & E. Aboujaoude (Eds.), *Mental Health in the Digital Age: Grave Dangers, Great Promise* (pp. 27-45). Oxford: Oxford University Press.
- Griffiths, M. D., Kuss, D. J., & Demetrovics, Z. (2014). Social networking addiction: An overview of preliminary findings. In K. Rosenberg & L. Feder (Eds.), *Behavioral Addictions: Criteria, Evidence and Treatment* (pp. 119-141). New York: Elsevier.
- Griffiths, M. D., Kuss, D. J., & King, D. L. (2012). Video game addiction: Past, present and future. *Current Psychiatry Reviews*, 8(4), 308-318.

- Griffiths, M. D., & Lewis, A. (2011). Confronting gender representation: A qualitative study of the experiences and motivations of female casual-gamers. *Aloma: Revista de Psicología, Ciències de l'Educació i de l'Esport*, 28, 245-272.
- Griffiths, M. D., & Meredith, A. (2009). Videogame Addiction and its Treatment. *Journal of Contemporary Psychotherapy*, 39(4), 247-253.
- Griffiths, M. D., & Pontes, H. (2014). Internet addiction disorder and internet gaming disorder are not the same. *Journal of Addiction Research and Therapy*, 5: e124. doi: 10.4172/2155-6105.1000e124
- Grigoriadis, S., & Robinson, G. E. (2007). Gender issues in depression. *Annals of Clinical Psychiatry*, 19(4), 247-255. doi: 10.1080/10401230701653294
- Grubb, J. (2015). League of Legends, Dota 2 will lead PC gaming's fastest-growing sector to \$500M this year in North America. Retrieved 16 June, 2015., from <http://venturebeat.com/2015/03/30/league-of-legends-dota-2-will-lead-pc-gamings-fastest-growing-sector-to-500m-this-year-in-north-america/>
- Grusser, S. M., Thalemann, R., & Griffiths, M. D. (2007). Excessive computer game playing: Evidence for addiction and aggression? *CyberPsychology & Behavior*, 10(2), 290-292.
- Gupta, R., & Derevensky, J. L. (1998). An Empirical Examination of Jacobs' General Theory of Addictions: Do Adolescent Gamblers Fit the Theory? *Journal of Gambling Studies*, 14(1), 17-49.
- Haagsma, M. C., Pieterse, M. E., & Peters, O. (2012). The prevalence of problematic video gamers in the Netherlands. *Cyberpsychology, Behavior, and Social Networking*, 15(3), 162-168.
- Hagström, D., & Kaldo, V. (2014). Escapism among players of MMORPGs--conceptual clarification, its relation to mental health factors, and development of a new measure. *Cyberpsychology, Behavior, and Social Networking*, 17(1), 19-25. doi: 10.1089/cyber.2012.0222
- Hahn, A., & Jerusalem, M. (2001). Internetsucht: Validierung eines Instruments und explorative Hinweise auf personale Bedingungen [Internet Addiction: Validation of an Instrument and Explorative Evidence on Personal Causes]. In A. Theobald, M. Dreyer & T. Starsetzki (Eds.), *Handbuch zur Online-Marktforschung. Beiträge aus Wissenschaft und Praxis* (pp. 213–233). Wiesbaden: Gabler.
- Han, D. H., Hwang, J. W., & Renshaw, P. F. (2010). Bupropion sustained release treatment decreases craving for video games and cue-induced brain activity in patients with Internet video game addiction. *Experimental and Clinical Psychopharmacology*, 18, 297-304.
- Han, D. H., Lee, Y. S., Na, C., Ahn, J. Y., Chung, U. S., Daniels, M. A., . . . Renshaw, P. F. (2009). The effect of methylphenidate on Internet video game play in children with attention-deficit/hyperactivity disorder. *Comprehensive Psychiatry*, 50(3), 251-256.
- Heller, A. (2008, 2 November). Short Takes. *Boston Globe*. from http://www.boston.com/ae/books/articles/2008/11/02/short_takes_boston_globe/
- Heneghan, C. (2010). Why autism can't be diagnosed with brain scans. Retrieved 27 July, 2015, from <http://www.theguardian.com/science/blog/2010/aug/12/autism-brain-scan-statistics>
- Herodotou, C., Kambouri, M., & Winters, N. (2011). The role of trait emotional intelligence in gamers' preferences for play and frequency of gaming. *Computers in Human Behavior*, 27(5), 1815-1819.

- Hibell, B., Guttormsson, U., Ahlström, S., Balakireva, O., Bjarnason, T., Kokkevi, A., & Kraus, L. (2009). The 2007 ESPAD Report—substance use among students in 35 European countries.
- Hibell, B., Guttormsson, U., Ahlström, S., Balakireva, O., Bjarnason, T., Kokkevi, A., & Kraus, L. (2012). The 2011 ESPAD Report—substance use among students in 36 European countries. Stockholm, Sweden: The Swedish Council for Information on Alcohol and other drugs (CAN).
- Hollander, E., & Stein, D. J. (2006). *Clinical Manual of Impulse-control Disorders*. Arlington, VA: American Psychiatric Publishing.
- Hsu, S. H., Wen, M. H., & Wu, M. C. (2009). Exploring user experiences as predictors of MMORPG addiction. *Computers & Education*, 53(3), 990-999. doi: 10.1016/j.compedu.2009.05.016
- Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural equation modeling*, 6(1), 1-55. doi: 10.1080/10705519909540118
- Huang, X. Q., Li, M. C., & Tao, R. (2010). Treatment of internet addiction. *Current Psychiatry Reports*, 12(5), 462-470. doi: 10.1007/s11920-010-0147-1
- Huang, X. Q., Zhang, C. H., Li, M., Wang, J., Zhang, Y., & Tao, R. (2010). Mental health, personality, and parental rearing styles of adolescents with Internet addiction disorder. *Cyberpsychology, Behavior, and Social Networking*, 13(4), 401-406. doi: 10.1089/cyber.2009.0222
- Huizinga, J. (1938). *Homo ludens: A study of the play-element in culture*. Boston: Beacon Press.
- Hussain, Z., & Griffiths, M. D. (2009). Excessive use of massively-multi-player online role-playing games: a pilot study. *International Journal of Mental Health and Addiction*, 7, 563-571.
- Hutchins, B. (2006, 4-7 December). *Computer gaming, media and e-Sport*. Paper presented at the Tasa Conference, University of Western Australia & Murdoch University.
- Hyun, G. J., Han, D. H., Lee, Y. S., Kang, K. D., Yoo, S. K., Chung, U. S., & Renshaw, P. F. (2015). Risk factors associated with online game addiction: A hierarchical model. *Computers in Human Behavior*, 48(0), 706-713. doi: <http://dx.doi.org/10.1016/j.chb.2015.02.008>
- IBM Corp. (2011). IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.
- IBM Corp. (2013). IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.
- Jacobs, D. F. (1986). A general theory of addictions: A new theoretical model. *Journal of Gambling Behavior*, 2(1), 15-31. doi: 10.1007/BF01019931
- Jäger, S., Müller, K. W., Ruckes, C., Wittig, T., Batra, A., Musalek, M., . . . Beutel, M. (2012). Effects of a manualized short-term treatment of internet and computer game addiction (STICA): study protocol for a randomized controlled trial. *Trials*, 13(43), 43.
- Jansz, J., & Tanis, M. (2007). Appeal of playing online first person shooter games. *CyberPsychology & Behavior*, 10, 133-136.
- Jeong, E. J., & Kim, D. H. (2011). Social Activities, Self-Efficacy, Game Attitudes, and Game Addiction. *Cyberpsychology, Behavior and Social Networking*, 14(4), 213-221.
- Jin, D. Y., & Chee, F. (2008). Age of New Media Empires A Critical Interpretation of the Korean Online Game Industry. *Games and Culture*, 3(1), 38-58.

- Jonasson, K., & Thiborg, J. (2010). Electronic sport and its impact on future sport. *Sport in society*, 13(2), 287-299.
- Karakus, T., Inal, Y., & Cagiltay, K. (2008). A descriptive study of Turkish high school students' game-playing characteristics and their considerations concerning the effects of games. *Computers in Human Behavior*, 24(6), 2520-2529.
- Kardefelt-Winther, D. (2014a). A conceptual and methodological critique of internet addiction research: Towards a model of compensatory internet use. *Computers in Human Behavior*, 31, 351-354.
- Kardefelt-Winther, D. (2014b). A critical account of DSM-5 criteria for internet gaming disorder. *Addiction Research & Theory*(0), 1-6.
- Kardefelt-Winther, D. (2014c). Meeting the unique challenges of assessing internet gaming disorder. *Addiction*, 109(9), 1568-1570.
- Kardefelt-Winther, D. (2014d). The moderating role of psychosocial well-being on the relationship between escapism and excessive online gaming. *Computers in Human Behavior*, 38, 68-74.
- Kardefelt-Winther, D. (2014e). Problematizing excessive online gaming and its psychological predictors. *Computers in Human Behavior*, 31, 118-122.
- Kaysen, D., Dillworth, T. M., Simpson, T., Waldrop, A., Larimer, M. E., & Resick, P. A. (2007). Domestic violence and alcohol use: trauma-related symptoms and motives for drinking. *Addictive Behaviors*, 32(6), 1272-1283. doi: 10.1016/j.addbeh.2006.09.007
- Khantzian, E. J. (1985). The self-medication hypothesis of addictive disorders: focus on heroin and cocaine dependence. *American Journal of Psychiatry*, 142(11), 1259-1264.
- Khazaal, Y., van Singer, M., Chatton, A., Achab, S., Zullino, D., Rothen, S., . . . Thorens, G. (2014). Does self-selection affect samples' representativeness in online surveys? An investigation in online video game research. *Journal of Medical Internet Research*, 16(7), e164. doi: 10.2196/jmir.2759
- Kim, E. J., Namkoong, K., Ku, T., & Kim, S. J. (2008). The relationship between online game addiction and aggression, self-control and narcissistic personality traits. *European Psychiatry*, 23(3), 212-218.
- Kim, K., Ryu, E., Chon, M.-Y., Yeun, E.-J., Choi, S.-Y., Seo, J.-S., & Nam, B.-W. (2006). Internet addiction in Korean adolescents and its relation to depression and suicidal ideation: A questionnaire survey. *International Journal of Nursing Studies*, 43(2), 185-192. doi: http://dx.doi.org/10.1016/j.ijnurstu.2005.02.005
- Kim, M. G., & Kim, J. (2010). Cross-validation of reliability, convergent and discriminant validity for the problematic online game use scale. *Computers in Human Behavior*, 26(3), 389-398.
- Kim, S. M., Han, D. H., Lee, Y. S., Kim, J. E., & Renshaw, P. F. (2012). Changes in brain activity in response to problem solving during the abstinence from online game play. *Journal of Behavioral Addictions*, 1(2), 41-49.
- King, D. L., & Delfabbro, P. H. (2013a). Issues for DSM-5: video-gaming disorder? *Australian and New Zealand Journal of Psychiatry*, 47(1), 20-22. doi: 10.1177/0004867412464065
- King, D. L., & Delfabbro, P. H. (2013b). Video-gaming disorder and the DSM-5: Some further thoughts. *Australian and New Zealand Journal of Psychiatry*, 47(9), 875-876.
- King, D. L., & Delfabbro, P. H. (2014a). The cognitive psychology of Internet gaming disorder. *Clinical Psychology Review*, 34(4), 298-308.

- King, D. L., & Delfabbro, P. H. (2014b). Internet Gaming Disorder treatment: A review of definitions of diagnosis and treatment outcome. *Journal of Clinical Psychology*, 70(10), 942–955.
- King, D. L., Delfabbro, P. H., & Griffiths, M. D. (2010a). Cognitive behavioral therapy for problematic video game players: conceptual considerations and practice issues. *Journal of Cybertherapy And Rehabilitation*, 3, 261-273.
- King, D. L., Delfabbro, P. H., & Griffiths, M. D. (2010b). The role of structural characteristics in problem video game playing: A review. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace*, 4(1).
- King, D. L., Delfabbro, P. H., & Griffiths, M. D. (2010c). Video game structural characteristics: a new psychological taxonomy. *International Journal of Mental Health and Addiction*, 8(1), 90-106.
- King, D. L., Delfabbro, P. H., & Griffiths, M. D. (2011). The role of structural characteristics in problematic video game play: An empirical study. *International Journal of Mental Health and Addiction*, 9(3), 320-333.
- King, D. L., Delfabbro, P. H., & Griffiths, M. D. (2012). Clinical interventions for technology-based problems: Excessive Internet and video game use. *Journal of Cognitive Psychotherapy*, 26(1), 43-56.
- King, D. L., Haagsma, M. C., Delfabbro, P. H., Gradisar, M., & Griffiths, M. D. (2013). Toward a consensus definition of pathological video-gaming: a systematic review of psychometric assessment tools. *Clinical Psychology Review*, 33(3), 331-342. doi: 10.1016/j.cpr.2013.01.002
- Király, O., Griffiths, M. D., & Demetrovics, Z. (2015). Internet gaming disorder and the DSM-5: Conceptualization, debates, and controversies. *Current Addiction Reports*, 2, 254-262. doi: 10.1007/s40429-015-0066-7.
- Király, O., Nagygyörgy, K., Griffiths, M. D., & Demetrovics, Z. (2014). Problematic online gaming. In K. Rosenberg & L. Feder (Eds.), *Behavioral Addictions: Criteria, Evidence and Treatment* (pp. 61-95). New York, NY: Elsevier.
- Király, O., Nagygyörgy, K., Koronczai, B., Griffiths, M. D., & Demetrovics, Z. (2015). Assessment of Problematic Internet Use and Online Video Gaming. In E. Aboujaoude & V. Starcevic (Eds.), *Mental Health in the Digital Age: Grave Dangers, Great Promise* (pp. 46-68). Oxford: Oxford University Press.
- Király, O., Urbán, R., Griffiths, M. D., Ágoston, C., Nagygyörgy, K., Kökönyei, G., & Demetrovics, Z. (2015). Psychiatric symptoms and problematic online gaming: The mediating effect of gaming motivation. *Journal of Medical Internet Research*, 17(4), e88. doi: 10.2196/jmir.3515
- Kline, R. B. (2005). *Principles and Practice of Structural Equation Modeling*. 2nd edition. New York, NY: Guilford Press.
- Kneer, J., Rieger, D., Ivory, J. D., & Ferguson, C. (2014). Awareness of risk factors for digital game addiction: Interviewing players and counselors. *International Journal of Mental Health and Addiction*, 12(5), 585-599.
- Ko, C. H. (2014). Internet Gaming Disorder. *Current Addiction Reports*, 1(3), 177-185.
- Ko, C. H., Liu, G. C., Hsiao, S. M., Yen, J. Y., Yang, M. J., Lin, W. C., . . . Chen, C. S. (2009). Brain activities associated with gaming urge of online gaming addiction. *Journal of Psychiatric Research*, 43, 739-747.
- Ko, C. H., Yen, J. Y., Chen, C. C., Chen, S. H., & Yen, C. F. (2005a). Gender differences and related factors affecting online gaming addiction among Taiwanese adolescents. *Journal of Nervous and Mental Disease*, 193(4), 273-277.

- Ko, C. H., Yen, J. Y., Chen, C. C., Chen, S. H., & Yen, C. F. (2005b). Proposed diagnostic criteria of Internet addiction for adolescents. *The Journal of nervous and mental disease*, 193(11), 728-733.
- Ko, C. H., Yen, J. Y., Chen, S. H., Wang, P. W., Chen, C. C., & Yen, C. F. (2014). Evaluation of the diagnostic criteria of Internet gaming disorder in the DSM-5 among young adults in Taiwan. *Journal of Psychiatric Research*, 53, 103-110. doi: 10.1016/j.jpsychires.2014.02.008
- Koronczai, B., Urbán, R., Kókönyei, G., Paksi, B., Papp, K., Kun, B., . . . Demetrovics, Z. (2011). Confirmation of the three-factor model of problematic internet use on off-line adolescent and adult samples. *Cyberpsychology, Behavior, and Social Networking*, 14, 657-664. doi: 10.1089/cyber.2010.0345
- Kross, E., & Ayduk, O. (2008). Facilitating adaptive emotional analysis: Distinguishing distanced-analysis of depressive experiences from immersed-analysis and distraction. *Personality and Social Psychology Bulletin*, 34(7), 924-938.
- Kuntsche, E., Knibbe, R., Engels, R., & Gmel, G. (2007). Drinking motives as mediators of the link between alcohol expectancies and alcohol use among adolescents. *Journal of Studies on Alcohol and Drugs*, 68(1), 76-85.
- Kuntsche, E., Knibbe, R., Gmel, G., & Engels, R. (2005). Why do young people drink? A review of drinking motives. *Clinical Psychology Review*, 25(7), 841-861.
- Kuss, D. J., & Griffiths, M. D. (2011). Online social networking and addiction - a review of the psychological literature. *International Journal of Environmental Research and Public Health*, 8(9), 3528-3552. doi: 10.3390/ijerph8093528
- Kuss, D. J., & Griffiths, M. D. (2012a). Internet and gaming addiction: a systematic literature review of neuroimaging studies. *Brain Sciences*, 2(3), 347-374.
- Kuss, D. J., & Griffiths, M. D. (2012b). Internet gaming addiction: a systematic review of empirical research. *International Journal of Mental Health and Addiction*, 10(2), 278-296. doi: 10.1007/s11469-011-9318-5
- Kuss, D. J., & Griffiths, M. D. (2012c). Online gaming addiction in children and adolescents: a review of empirical research. *Journal of Behavioral Addictions*, 1(1), 3-22. doi: 10.1556/JBA.1.2012.1.1
- Kuss, D. J., Griffiths, M. D., Karila, L., & Billieux, J. (2014). Internet addiction: A systematic review of epidemiological research for the last decade. *Current Pharmaceutical Design*, 20, 4026-4052.
- Kuss, D. J., Louws, J., & Wiers, R. W. (2012). Online gaming addiction? Motives predict addictive play behavior in massively multiplayer online role-playing games. *Cyberpsychology, Behavior, and Social Networking*, 15(9), 480-485.
- Kuss, D. J., van Rooij, A. J., Shorter, G. W., Griffiths, M. D., & van de Mheen, D. (2013). Internet addiction in adolescents: Prevalence and risk factors. *Computers in Human Behavior*, 29(5), 1987-1996.
- Kwon, J.-H., Chung, C.-S., & Lee, J. (2011). The effects of escape from self and interpersonal relationship on the pathological use of internet games. *Community Mental Health Journal*, 47(1), 113-121.
- Lafrenière, M.-A. K., Verner-Filion, J., & Vallerand, R. J. (2012). Development and validation of the Gaming Motivation Scale (GAMS). *Personality and Individual Differences*, 53(7), 827-831. doi: http://dx.doi.org/10.1016/j.paid.2012.06.013
- Lau, C. H., Griffiths, S. M., & Kim, J. H. (2011). An inspiration from Internet addiction mal-treatment in China. In H. O. Price (Ed.), *Internet Addiction* (pp. 71-84). New York: Nova Science Publishers, Inc.
- Lee, H. C., & Ahn, C. Y. (2002). Development of the internet game addiction diagnostic scale. *The Korean Journal of Health Psychology*, 7, 211-239.

- 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 & Behavior*, 10(2), 278-285. doi: 10.1089/cpb.2006.9958
- Lemmens, J. S., Valkenburg, P. M., & Gentile, D. A. (2015). The Internet Gaming Disorder Scale. *Psychological Assessment*, 27(2), 567-582. doi: 10.1037/pas0000062
- Lemmens, J. S., Valkenburg, P. M., & Peter, J. (2009). Development and validation of a game addiction scale for adolescents. *Media Psychology*, 12, 77-95.
- Lemmens, J. S., Valkenburg, P. M., & Peter, J. (2011). Psychosocial causes and consequences of pathological gaming. *Computers in Human Behavior*, 27(1), 144-152.
- Lemola, S., Brand, S., Vogler, N., Perkinson-Gloor, N., Allemand, M., & Grob, A. (2011). Habitual computer game playing at night is related to depressive symptoms. *Personality and Individual Differences*, 51(2), 117-122.
- Lin, S. S. J., & Tsai, C.-C. (1999). *Internet addiction among high schoolers in Taiwan*. Paper presented at the American Psychological Association Annual Meeting, Boston.
- Lo, S. K., Wang, C. C., & Fang, W. C. (2005). Physical interpersonal relationships and social anxiety among online game players. *CyberPsychology & Behavior*, 8(1), 15-20.
- Maraz, A., Király, O., & Demetrovics, Z. (2015). The diagnostic pitfalls of surveys: if you score positive on a test of addiction, you still have a good chance not to be addicted. A response to Billieux et al. 2015. *Journal of Behavioral Addictions*, 4(3), 151-154.
- McLean, L., & Griffiths, M. D. (2013). Female gamers: A thematic analysis of their gaming experience. *International Journal of Game-Based Learning (IJGBL)*, 3(3), 54-71.
- Meerkerk, G. J., Van Den Eijnden, R. J., & Garretsen, H. F. (2006). Predicting compulsive Internet use: it's all about sex! *CyberPsychology & Behavior*, 9(1), 95-103. doi: 10.1089/cpb.2006.9.95
- Meerkerk, G. J., Van Den Eijnden, R. J., Vermulst, A. A., & Garretsen, H. F. (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 den Eijnden, R. J. J. M., Franken, I. H. A., & Garretsen, H. F. L. (2010). Is compulsive internet use related to sensitivity to reward and punishment, and impulsivity? *Computers in Human Behavior*, 26(4), 729-735. doi: <http://dx.doi.org/10.1016/j.chb.2010.01.009>
- Mehroof, 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
- Mentzoni, R. A., Brunborg, G. S., Molde, H., Myrseth, H., Skouvere, K. J., Hetland, J., & Pallesen, S. (2011). Problematic video game use: estimated prevalence and associations with mental and physical health. *Cyberpsychology, behavior and social networking*, 14(10), 591-596. doi: 10.1089/cyber.2010.0260
- Millions, D. (year not reported). A Look At Technological Advances In Video Games. Retrieved 23 July, 2015, from http://www.streetdirectory.com/travel_guide/138770/gaming/a_look_at_technological_advances_in_video_games.html

- Montag, C., Bey, K., Sha, P., Li, M., Chen, Y. F., Liu, W. Y., . . . Reuter, M. (2014). Is it meaningful to distinguish between generalized and specific Internet addiction? Evidence from a cross-cultural study from Germany, Sweden, Taiwan and China. *Asia-Pacific Psychiatry*. doi: 10.1111/appy.12122
- Müller, K. W., Beutel, M., & Wölfling, K. (2014). A contribution to the clinical characterization of Internet addiction in a sample of treatment seekers: validity of assessment, severity of psychopathology and type of co-morbidity. *Comprehensive Psychiatry*, 55(4), 770-777. doi: 10.1016/j.comppsych.2014.01.010
- Müller, K. W., Glaesmer, H., Brähler, E., Wölfling, K., & Beutel, M. (2014). Prevalence of internet addiction in the general population: results from a German population-based survey. *Behaviour & Information Technology*, 33(7), 757-766. doi: 10.1080/0144929X.2013.810778
- Müller, K. W., Janikian, M., Dreier, M., Wölfling, K., Beutel, M., Tzavara, C., . . . Tsitsika, A. (2015). Regular gaming behavior and internet gaming disorder in European adolescents: results from a cross-national representative survey of prevalence, predictors, and psychopathological correlates. *European Child and Adolescent Psychiatry*, 24(5), 565-574. doi: 10.1007/s00787-014-0611-2
- Mullich, D. (2014). Who makes more money Hollywood or the video game industry? Retrieved 16 June, 2015, from <http://www.quora.com/Who-makes-more-money-Hollywood-or-the-video-game-industry>
- Muthén, L. K., & Muthén, B. O. (1998-2007). *Mplus User's Guide. Fifth Edition*. Los Angeles, CA: Muthén & Muthén.
- Muthén, L. K., & Muthén, B. O. (1998-2010). *Mplus User's Guide. 6th edition*. Los Angeles, CA: Muthén & Muthén.
- Muthén, L. K., & Muthén, B. O. (1998-2012). *Mplus User's Guide. Seventh Edition*. Los Angeles, CA: Muthén & Muthén.
- Nagygyörgy, K., Mihalik, Á., & Demetrovics, Z. (2012). Az online játékok pszichológiai vonatkozásai [Psychological aspects of online games]. In E. Gabos (Ed.), *A média hatása a gyermekkre és fiatalokra VI*. (pp. 242-248). Budapest: Nemzetközi Gyermekmentő Szolgálat Magyar Egyesülete.
- Nagygyörgy, K., Urbán, R., Farkas, J., Griffiths, M. D., Zilahy, D., Kökönyei, G., . . . Demetrovics, Z. (2013). Typology and socio-demographic characteristics of massively multiplayer online game players. *International Journal of Human-Computer Interaction*, 29(3), 192-200.
- Ng, B. D., & Wiemer-Hastings, P. (2005). Addiction to the internet and online gaming. *CyberPsychology & Behavior*, 8(2), 110-113.
- Niemz, K., Griffiths, M. D., & Banyard, P. (2005). Prevalence of pathological Internet use among university students and correlations with self-esteem, the General Health Questionnaire (GHQ), and disinhibition. *CyberPsychology & Behavior*, 8(6), 562-570. doi: 10.1089/cpb.2005.8.562
- Oldenburg, R. (1989). *The Great Good Place: Café, Coffee Shops, Community Centers, Beauty Parlors, General Stores, Bars, Hangouts, and How They Get You through the Day*: Paragon House Publishers.
- Oxford Dictionaries. (2015). 'video game' in Oxford Dictionaries: Oxford University Press. Retrieved from <http://www.oxforddictionaries.com/definition/english/video-game>.
- Pápay, O., Urbán, R., Griffiths, M. D., Nagygyörgy, K., Farkas, J., Elekes, Z., . . . Demetrovics, Z. (2013). Psychometric properties of the Problematic Online Gaming Questionnaire Short-Form (POGQ-SF) and prevalence of problematic

- online gaming in a national sample of adolescents. *Cyberpsychology, Behavior, and Social Networking*, 16(5), 340-348. doi: 10.1089/cyber.2012.0484
- Parke, A., Griffiths, M. D., & Irving, P. (2004). Personality traits in pathological gambling: sensation seeking, deferment of gratification and competitiveness as risk factors. *Addiction Research and Theory*, 12(3), 201-212.
- Parke, J., & Griffiths, M. D. (2007). The role of structural characteristics in gambling. In G. Smith, D. Hodgins & R. Williams (Eds.), *Research and Measurement Issues in Gambling Studies* (pp. 211-243). New York: Elsevier.
- Pemberton, M. B., Insko, C. A., & Schopler, J. (1996). Memory for and experience of differential competitive behavior of individuals and groups. *Journal of Personality and Social Psychology*, 71(5), 953-966.
- Peng, W., & Liu, M. (2010). Online gaming dependency: a preliminary study in China. *Cyberpsychology, Behavior and Social Networking*, 13(3), 329-333.
- Peters, C. S., & Malesky, L. A. (2008). Problematic usage among highly-engaged players of massively multiplayer online role playing games. *CyberPsychology & Behavior*, 11(4), 480-483.
- Petry, N. M., Rehbein, F., Gentile, D. A., Lemmens, J. S., Rumpf, H. J., Mossle, T., . . . O'Brien, C. P. (2014). An international consensus for assessing internet gaming disorder using the new DSM-5 approach. *Addiction*, 109(9), 1399-1406. doi: 10.1111/add.12457
- Pies, R. (2009). Should DSM-V designate "Internet addiction" a mental disorder? *Psychiatry (Edgmont)*, 6(2), 31.
- Pigott, T. A. (1999). Gender differences in the epidemiology and treatment of anxiety disorders. *Journal of Clinical Psychiatry*, 60 Suppl 18, 4-15.
- Pontes, H. M., & Griffiths, M. D. (2014). Assessment of internet gaming disorder in clinical research: Past and present perspectives. *Clinical Research and Regulatory Affairs*, 31(2-4), 35-48. doi: 10.3109/10601333.2014.962748
- Pontes, H. M., & Griffiths, M. D. (2015). Measuring DSM-5 internet gaming disorder: Development and validation of a short psychometric scale. *Computers in Human Behavior*, 45, 137-143. doi: 10.1016/j.chb.2014.12.006
- Pontes, H. M., Király, O., Demetrovics, Z., & Griffiths, M. D. (2014). The conceptualisation and measurement of DSM-5 Internet gaming disorder: The development of the IGD-20 test. *PLoS ONE*, 9(10), e110137. doi: 10.1371/journal.pone.0110137
- Porter, G., Starcevic, V., Berle, D., & Fenech, P. (2010). Recognizing problem video game use. *The Australian and New Zealand Journal of Psychiatry*, 44, 120-128.
- Przybylski, A. K., Ryan, R. M., & Rigby, C. S. (2009). The Motivating Role of Violence in Video Games. *Personality and Social Psychology Bulletin*, 35(2), 243-259. doi: 10.1177/0146167208327216
- Radloff, L. S. (1977). The CES-D scale: a self-report depression scale for research in the general population. *Applied Psychological Measurement*, 1, 385-401.
- Reeve, B. B., & Fayers, P. (2005). Applying item response theory modelling evaluating questionnaire item and scale properties. In P. Fayers & R. Hays (Eds.), *Assessing Quality of Life in Clinical Trials: Methods and Practice* (pp. 55-74). New York: Oxford University Press.
- Rehbein, F., & Baier, D. (2013). Family-, media-, and school-related risk factors of video game addiction. *Journal of Media Psychology*, 25(3), 118-128. doi: 10.1027/1864-1105/a000093

- Rehbein, F., Kleimann, M., & 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.
- Rehbein, F., Kliem, S., Baier, D., Mößle, T., & Petry, N. M. (2015). Prevalence of Internet Gaming Disorder in German adolescents: diagnostic contribution of the nine DSM-5 criteria in a statewide representative sample. *Addiction*, 110(5), 842-851. doi: 10.1111/add.12849
- Rehbein, F., & Mößle, T. (2013). Video Game and Internet Addiction: Is there a Need for Differentiation? *SUCHT*, 59 (3), 129-142.
- Rice, R. A. (2006). *MMO Evolution*. Raleigh, NC: Lulu press.
- Rigby, C. S., & Ryan, R. M. (2011). *Glued to games: how video games draw us in and hold us spellbound*. Santa Barbara, California: Praeger.
- Rosenberg, M. (1965). *Society and the adolescent self-image*. Princeton, NJ: Princeton University Press.
- Ryan, R. M., Rigby, C. S., & Przybylski, A. (2006). The motivational pull of video games: A self-determination theory approach. *Motivation and Emotion*, 30(4), 347-363.
- Satorra, A., & Bentler, P. (1994). Corrections to test statistics and standard errors in covariance structure analysis. In A. von Eye & C. Clogg (Eds.), *Latent Variables Analysis: Applications for Developmental Research* (pp. 399-419). Thousand Oaks, CA: Sage Publications.
- Scott, S. (2007). Electronic game addiction? Part 3 of 4. Interview with Shavaun Scott psychotherapist. Retrieved 27 June, 2015, from http://www.youtube.com/watch?v=QoDLN6gGd_g&list=PL9ECB0D59EF3A32C5
- Seay, A. F., & Kraut, R. E. (2007). *Project massive: Self-regulation and problematic use of online gaming*. Paper presented at the CHI 2007: Proceedings of the ACM conference on human factors in computing systems, San Jose, CA, USA.
- Shaffer, H. J., Hall, M. N., & Vander Bilt, J. (2000). "Computer addiction": a critical consideration. *American Journal of Orthopsychiatry*, 70(2), 162-168.
- Shapira, N. A., Goldsmith, T. D., Keck Jr, P. E., Khosla, U. M., & McElroy, S. L. (2000). Psychiatric features of individuals with problematic internet use. *Journal of Affective Disorders*, 57(1), 267-272.
- Sheppes, G., & Gross, J. (2012). Emotion regulation effectiveness: What works when. In H. A. Tennen & J. M. Suls (Eds.), *Handbook of Psychology, 2nd edition* (pp. 391–406). Indianapolis, IN: Wiley-Blackwell Press.
- Snodgrass, J. G., Lacy, M. G., Dengah, H. J. F., & Fagan, J. (2011). Enhancing one life rather than living two: Playing MMOs with offline friends. *Computers in Human Behavior*, 27(3), 1211-1222.
- Snodgrass, J. G., Lacy, M. G., Francois Dengah, H. J., 2nd, Fagan, J., & Most, D. E. (2011). Magical flight and monstrous stress: technologies of absorption and mental wellness in Azeroth. *Culture, Medicine and Psychiatry*, 35(1), 26-62.
- Starcevic, V. (2013a). Is Internet addiction a useful concept? *Australian and New Zealand Journal of Psychiatry*, 47(1), 16-19.
- Starcevic, V. (2013b). Video-gaming disorder and behavioural addictions. *Australian and New Zealand Journal of Psychiatry*, 47(3), 285-286.
- Starcevic, V., Berle, D., Porter, G., & Fenech, P. (2011). Problem video game use and dimensions of psychopathology. *International Journal of Mental Health and Addiction*, 9(3), 248-256. doi: 10.1007/s11469-010-9282-5
- Stetina, B. U., Kothgassner, O. D., Lehenbauer, M., & Kryspin-Exner, I. (2011). Beyond the fascination of online-games: probing addictive behavior and depression in the

- world of online-gaming. *Computers in Human Behavior*, 27(1), 473-479. doi: <http://dx.doi.org/10.1016/j.chb.2010.09.015>
- Stewart, S. H., Zvolensky, M. J., & Eifert, G. H. (2001). Negative-reinforcement drinking motives mediate the relation between anxiety sensitivity and increased drinking behavior. *Personality and Individual Differences*, 31(2), 157-171.
- Studenski, S., Perera, S., Hile, E., Keller, V., Spadola-Bogard, J., & Garcia, J. (2010). Interactive video dance games for healthy older adults. *The Journal of Nutrition, Health & Aging*, 14(10), 850-852.
- Szablewicz, M. (2010). The ill effects of “opium for the spirit”: a critical cultural analysis of China's Internet addiction moral panic. *Chinese Journal of Communication*, 3(4), 453-470.
- Tao, R., Huang, X. Q., Wang, J., Zhang, H., Zhang, Y., & Li, M. (2010). Proposed diagnostic criteria for internet addiction. *Addiction*, 105(3), 556-564.
- Taylor, S. E., Klein, L. C., Lewis, B. P., Gruenewald, T. L., Gurung, R. A., & Updegraff, J. A. (2000). Biobehavioral responses to stress in females: tend-and-befriend, not fight-or-flight. *Psychological Review*, 107(3), 411-429.
- Tejeiro Salguero, R. A., & Moran, R. M. (2002). Measuring problem video game playing in adolescents. *Addiction*, 97(12), 1601-1606.
- Thege, B. K., Woodin, E. M., Hodgins, D. C., & Williams, R. J. (2015). Natural course of behavioral addictions: a 5-year longitudinal study. *BMC Psychiatry*, 15(1), 4.
- Thorens, G., Achab, S., Billieux, J., Khazaal, Y., Khan, R., Pivin, E., . . . Zullino, D. (2014). Characteristics and treatment response of self-identified problematic Internet users in a behavioral addiction outpatient clinic. *Journal of Behavioral Addictions*, 3(1), 78-81. doi: 10.1556/jba.3.2014.008
- Urbán, R., Kökönyei, G., & Demetrovics, Z. (2008). Alcohol outcome expectancies and drinking motives mediate the association between sensation seeking and alcohol use among adolescents. *Addictive Behaviors*, 33(10), 1344-1352. doi: 10.1016/j.addbeh.2008.06.006
- Urbán, R., Kun, B., Farkas, J., Paksi, B., Kökönyei, G., Unoka, Z., . . . Demetrovics, Z. (2014). Bifactor structural model of symptom checklists: SCL-90-R and Brief Symptom Inventory (BSI) in a non-clinical community sample. *Psychiatry Research*, 216(1), 146-154. doi: 10.1016/j.psychres.2014.01.027
- van Rooij, A. J., & Praise, N. (2014). A critical review of “Internet addiction” criteria with suggestions for the future. *Journal of Behavioral Addictions*, 3(4), 203-213. doi: 10.1556/JBA.3.2014.4.1
- van Rooij, A. J., Schoenmakers, T. M., van de Eijnden, R. J., & van de Mheen, D. (2010). Compulsive Internet use: the role of online gaming and other internet applications. *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., Vermulst, A. A., & van der Mheen, D. (2012). Video game Addiction Test (VAT): validity and psychometric characteristics. *Cyberpsychology, Behavior, and Social Networking*, 15, 507-511. doi: 10.1089/cyber.2012.0007
- 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.
- Vandenberg, R. J., & Lance, C. E. (2000). A Review and Synthesis of the Measurement Invariance Literature: Suggestions, Practices, and Recommendations for Organizational Research. *Organizational Research Methods*, 3(1), 4-70. doi: 10.1177/109442810031002

- Walters, A. E., Stuhlmacher, A. F., & Meyer, L. L. (1998). Gender and Negotiator Competitiveness: A Meta-analysis. *Organizational Behavior and Human Decision Processes*, 76(1), 1-29.
- Walther, B., Morgenstern, M., & Hanewinkel, R. (2012). Co-occurrence of addictive behaviours: personality factors related to substance use, gambling and computer gaming. *European Addiction Research*, 18(4), 167-174. doi: 10.1159/000335662
- Wan, C. S., & Chiou, W. B. (2006). Psychological motives and online games addiction: A test of flow theory and humanistic needs theory for Taiwanese adolescents. *CyberPsychology & Behavior*, 9(3), 317-324.
- Wan, C. S., & Chiou, W. B. (2007). The motivations of adolescents who are addicted to online games: a cognitive perspective. *Adolescence*, 42, 179-197.
- Wang, C. C., & Chu, Y. S. (2007). Harmonious passion and obsessive passion in playing online games. *Social Behavior and Personality*, 35(7), 997-1005.
- Wang, E. S., Chen, L. S., Lin, J. Y., & Wang, M. C. (2008). The relationship between leisure satisfaction and life satisfaction of adolescents concerning online games. *Adolescence*, 43(169), 177-184.
- Williams, D., Ducheneaut, N., Xiong, L., & Yee, N. (2006). From Tree House to Barracks - The Social Life of Guilds in World of Warcraft. *Games and Culture*, 1(4), 338-360.
- Wölfling, K., Müller, K. W., & Beutel, M. (2011). [Reliability and validity of the Scale for the Assessment of Pathological Computer-Gaming (CSV-S)]. *Psychotherapie, Psychosomatik, Medizinische Psychologie*, 61(5), 216-224. doi: 10.1055/s-0030-1263145
- Wood, R. T. A. (2008). The problem with the concept of video game "addiction": Some case examples. *International Journal of Mental Health & Addiction*, 6, 169-178.
- 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.
- World Health Organization. (1994). *BNO-10: International Statistical Classification of Diseases and Health Related Problems*. Geneva.
- Yau, Y. H., Potenza, M. N., & White, M. A. (2013). Problematic Internet Use, Mental Health and Impulse Control in an Online Survey of Adults. *Journal of Behavioral Addictions*, 2(2), 72-81. doi: 10.1556/jba.1.2012.015
- Yee, N. (2006a). The demographics, motivations and derived experiences of users of massively-multiuser online graphical environments. *PRESENCE: Teleoperators and Virtual Environments*, 15(3), 309-329.
- Yee, N. (2006b). The Labor of Fun - How Video Games Blur the Boundaries of Work and Play. *Games and Culture*, 1(1), 68-71.
- Yee, N. (2006c). Motivations for play in online games. *CyberPsychology & Behavior*, 9(6), 772-775. doi: 10.1089/cpb.2006.9.772
- Yee, N. (2006d). The psychology of MMORPGs: emotional investment, motivations, relationship formation, and problematic usage. In R. Schroeder & A. Axelsson (Eds.), *Avatars at work and play: Collaboration and interaction in shared virtual environments* (pp. 187–207). London: Springer.
- Yee, N., Ducheneaut, N., Nelson, L., & Likarish, P. (2011). *Introverted elves & conscientious gnomes: the expression of personality in world of warcraft*. Paper presented at the Proceedings of the SIGCHI Conference on Human Factors in Computing Systems.
- Yee, N., Ducheneaut, N., Shiao, H. T., & Nelson, L. (2012). *Through the azerothian looking glass: mapping in-game preferences to real world demographics*. Paper

- presented at the Proceedings of the SIGCHI Conference on Human Factors in Computing Systems.
- Yee, N., Ducheneaut, N., Yao, M., & Nelson, L. (2011). *Do men heal more when in drag?: Conflicting identity cues between user and avatar*. Paper presented at the Proceedings of the SIGCHI Conference on Human Factors in Computing Systems.
- Yen, C. F., Ko, C. H., Yen, J. Y., Chang, Y. P., & Cheng, C. P. (2009). Multi-dimensional discriminative factors for Internet addiction among adolescents regarding gender and age. *Psychiatry and Clinical Neurosciences*, 63(3), 357-364. doi: 10.1111/j.1440-1819.2009.01969.x
- Young, K. S. (1996). Psychology of computer use: XL. Addictive use of the Internet: a case that breaks the stereotype. *Psychological Reports*, 79(3), 899-902. doi: 10.2466/pr0.1996.79.3.899
- Young, K. S. (1998a). *Caught in the Net: How to recognize the signs of Internet addiction and a winning strategy for recovery*. New York: Wiley.
- Young, K. S. (1998b). Internet addiction: The emergence of a new clinical disorder. *CyberPsychology & Behavior*, 1, 237-244.
- Young, K. S. (1999a). Internet addiction: Evaluation and treatment. *Student British Medical Journal*, 7, 351–352.
- Young, K. S. (1999b). Internet addiction: Symptoms, evaluation, and treatment. In L. Vande Creek & T. Jackson (Eds.), *Innovations in clinical practice: A source book* (pp. 17, 19–31). Sarasota, FL: Professional Resource Press.
- Young, K. S. (2009). Understanding online gaming addiction and treatment issues for adolescents. *American Journal of Family Therapy*, 37, 355–372. doi: 10.1080/01926180902942191
- Young, K. S. (2010). When Gaming becomes an Obsession: Help for Parents and their Children to treat Online Gaming Addiction. Retrieved 27 July, 2015, from <http://www.netaddiction.com/articles/Online%20Gaming%20Treatment.pdf>
- Zanetta Dauriat, F., Zermatten, A., Billieux, J., Thorens, G., Bondolfi, G., Zullino, D., & Khazaal, Y. (2011). Motivations to play specifically predict excessive involvement in massively multiplayer online role-playing games: Evidence from an online survey. *European Addiction Research*, 17(4), 185-189. doi: 10.1159/000326070
- Zhou, Y., & Li, Z. (2009). Online game addiction among chinese college students measurement and attribution. *Studies in Health Technology and Informatics*, 144, 149-154.

9 APPENDICES

9.1 Appendix A: Problematic Online Gaming Questionnaire Short Form (POGQ-SF)

Please read the statements below regarding *online gaming*. The questionnaire REFERS TO ONLINE GAMES exclusively, but we use the expression 'game' in each statement for simplicity's sake. Please indicate on the scale from 1 to 5 to what extent, and how often, these statements apply to you!

	Never	Seldom	Occasionally	Often	Always
1. When you are not gaming, how often do you think about playing a game or think about how would it feel to play at that moment?	1	2	3	4	5
2. How often do you play longer than originally planned?	1	2	3	4	5
3. How often do you feel depressed or irritable when not gaming only for these feelings to disappear when you start playing?	1	2	3	4	5
4. How often do you feel that you should reduce the amount of time you spend gaming?	1	2	3	4	5
5. How often do the people around you complain that you are gaming too much?	1	2	3	4	5
6. How often do you fail to meet up with a friend because you were gaming?	1	2	3	4	5
7. How often do you daydream about gaming?	1	2	3	4	5
8. How often do you lose track of time when gaming?	1	2	3	4	5
9. How often do you get restless or irritable if you are unable to play games for a few days?	1	2	3	4	5
10. How often do you unsuccessfully try to reduce the time you spend on gaming?	1	2	3	4	5
11. How often do you argue with your parents and/or your partner because of gaming?	1	2	3	4	5
12. How often do you neglect other activities because you would rather game?	1	2	3	4	5

preoccupation	immersion	withdrawal	overuse	interpersonal conflicts	social isolation
1, 7	2, 8	3, 9	4, 10	5, 11	6, 12

9.2 Appendix B: Correlation matrix including the subscales of the BSI, the MOGQ, and the POGQ

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
(1) Global Severity Index (GSI)	1	.782**	.860**	.848**	.863**	.883**	.783**	.788**	.833**	.889**	.509**	.286**	.357**	.105**	-.009	.203**	.093**	.357**	.381**	.429**	.418**	.361**	.486**	.547**
(2) BSI: Somatization		1	.648**	.550**	.543**	.700**	.597**	.655**	.562**	.638**	.327**	.164**	.228**	.091**	-.048**	.127**	.073**	.260**	.276**	.314**	.310**	.257**	.370**	.401**
(3) BSI: Obsession-Compulsion			1	.695**	.708**	.739**	.622**	.650**	.678**	.744**	.433**	.276**	.322**	.064**	.018	.177**	.073**	.325**	.381**	.420**	.357**	.327**	.427**	.505**
(4) BSI: Interpers. sensitivity				1	.759**	.707**	.585**	.632**	.743**	.782**	.474**	.268**	.338**	.092**	.011	.168**	.093**	.332**	.332**	.353**	.378**	.337**	.428**	.481**
(5) BSI: Depression					1	.724**	.606**	.574**	.678**	.780**	.493**	.237**	.312**	.056**	.002	.140**	.075**	.289**	.341**	.357**	.358**	.295**	.385**	.455**
(6) BSI: Anxiety						1	.694**	.692**	.689**	.742**	.449**	.261**	.303**	.086**	-.009	.159**	.072**	.305**	.329**	.362**	.341**	.291**	.421**	.461**
(7) BSI: Hostility							1	.571**	.646**	.633**	.379**	.230**	.286**	.084**	-.019	.210**	.069**	.291**	.275**	.369**	.324**	.330**	.430**	.454**
(8) BSI: Phobic Anxiety								1	.628**	.677**	.350**	.199**	.253**	.105**	-.009	.160**	.072**	.294**	.284**	.324**	.362**	.277**	.394**	.432**
(9) BSI: Paranoid Ideation									1	.713**	.431**	.280**	.318**	.142**	.013	.236**	.111**	.298**	.290**	.363**	.344**	.312**	.411**	.453**
(10) BSI: Psychoticism										1	.479**	.259**	.340**	.096**	-.021	.172**	.079**	.314**	.357**	.367**	.402**	.317**	.421**	.488**
(11) MOGQ: Escape											1	.599**	.610**	.242**	.178**	.271**	.291**	.416**	.312**	.397**	.365**	.321**	.472**	.509**

(12) MOGQ: Coping with stress										1	.503**	.407**	.411**	.380**	.420**	.348**	.209**	.343**	.242**	.241**	.373**	.394**
(13) MOGQ: Fantasy										1	.303**	.292**	.284**	.341**	.407**	.217**	.336**	.268**	.212**	.338**	.395**	
(14) MOGQ: Skill development										1	.234**	.381**	.446**	.170**	.090**	.148**	.129**	.140**	.180**	.188**		
(15) MOGQ: Recreation										1	.234**	.346**	.210**	.000	.191**	.081**	.077**	.102**	.145**			
(16) MOGQ: Competition										1	.323**	.280**	.193**	.289**	.267**	.298**	.334**	.368**				
(17) MOGQ: Social										1	.241**	.194**	.195**	.147**	.218**	.204**	.262**					
(18) POGQ: Preoccupation										1	.392**	.448**	.466**	.454**	.579**	.709**						
(19) POGQ: Overuse										1	.433**	.390**	.503**	.432**	.704**							
(20) POGQ: Immersion										1	.446**	.457**	.541**	.779**								
(21) POGQ: Social isolation										1	.452**	.557**	.725**									
(22) POGQ: Interpersonal conflict										1	.541**	.728**										
(23) POGQ: Withdrawal																						.827**
(24) POGQ Total Score																						1

Note: BSI: Brief Symptom Inventory; MOGQ: Motives for Online Gaming Questionnaire; POGQ: Problematic Online Gaming Questionnaire

9.3 Appendix C: Ten-Item Internet Gaming Disorder Test (IGDT-10)

Please read the statements below regarding video gaming. The questionnaire refers to ONLINE GAMES²², but the reference to 'game' or 'gaming' is used for the sake of simplicity. Please, indicate on the scale from 0 to 2 (Never, Sometimes, Often) to what extent, and how often, these statements applied to you over the **PAST 12 MONTHS!**

	Never	Sometimes	Often
1. When you were not playing, how often have you fantasized about gaming, thought of previous gaming sessions, and/or anticipated the next game?	0	1	2
2. How often have you felt restless, irritable, anxious and/or sad when you were unable to play or played less than usual?	0	1	2
3. Have you ever in the past 12 month felt the need to play more often or played for longer periods to feel that you have played enough?	0	1	2
4. Have you ever in the past 12 month unsuccessfully tried to reduce the time spent on gaming?	0	1	2
5. Have you ever in the past 12 month played games rather than meet your friends or participate in hobbies and pastimes that you used to enjoy before?	0	1	2
6. Have you played a lot despite negative consequences (for instance losing sleep, not being able to do well in school or work, having arguments with your family or friends, and/or neglecting important duties)?	0	1	2
7. Have you tried to keep your family, friends or other important people from knowing how much you were gaming or have you lied to them regarding your gaming?	0	1	2
8. Have you played to relieve a negative mood (for instance helplessness, guilt, or anxiety)?	0	1	2
9. Have you risked or lost a significant relationship because of gaming?	0	1	2
10. Have you ever in the past 12 month jeopardized your school or work performance because of gaming?	0	1	2

Scoring: In order to measure the DSM-5 criteria items are recoded into a dichotomous format according to the following: answers "Never" and "Sometimes" are evaluated as the criterion is not met (0 point), while "Often" is evaluated as the criterion is met (1 point).

²² The present study targeted online gamers only therefore the instructions were phrased as such. However, in line with the recommendations of the DSM-5, the IGDT-10 can be applied for video games in general. In that case online gaming should be replaced with video gaming, and ONLINE GAMES should be replaced by 'VIDEO GAMES (both online and offline, played on any platform)' in the instructions.

point). **Important:** Question 9 and 10 belong to the same criterion, that is, answer “Often” on either Item 9 or Item 10 (or both items) means only 1 point.

Evaluation: DSM-5 considers the case clinically relevant if five or more criteria are met.

ADATLAP
a doktori értekezés nyilvánosságra hozatalához

I. A doktori értekezés adatai

A szerző neve: Király Orsolya

A doktori értekezés címe és alcíme: A problémás onlinejáték-használat mérése és pszichológiai háttérmechanizmusai

A doktori iskola neve: Pszichológiai Doktori Iskola

A doktori iskolán belüli doktori program neve: Személyiség- és egészségpszichológiai program

A témavezető neve és tudományos fokozata: Prof. Dr. Demetrovics Zsolt

A témavezető munkahelye: ELTE PPK Pszichológiai Intézet

MTMT-azonosító: 10029755

DOI-azonosító²³: 10.15476/ELTE.2015.160

II. Nyilatkozatok

1. A doktori értekezés szerzőjeként²⁴

a) hozzájárulok, hogy a doktori fokozat megszerzését követően a doktori értekezésem és a tézisek nyilvánosságra kerüljenek az ELTE Digitális Intézményi Tudástárban. Felhatalmazom a Pszichológiai Doktori Iskola hivatalának ügyintézőjét, Madar Veronikát, hogy az értekezést és a téziseket feltöltsen az ELTE Digitális Intézményi Tudástárba, és ennek során kitöltsen a feltöltéshez szükséges nyilatkozatokat.

b) kérem, hogy a mellékelt kérelemben részletezett szabadalmi, illetőleg oltalmi bejelentés közzétételéig a doktori értekezést ne bocsássák nyilvánosságra az Egyetemi Könyvtárban és az ELTE Digitális Intézményi Tudástárban;²⁵

c) kérem, hogy a nemzetbiztonsági okból minősített adatot tartalmazó doktori értekezést a minősítés (*dátum*)-ig tartó időtartama alatt ne bocsássák nyilvánosságra az Egyetemi Könyvtárban és az ELTE Digitális Intézményi Tudástárban;²⁶

d) kérem, hogy a mű kiadására vonatkozó mellékelt kiadó szerződésre tekintettel a doktori értekezést a könyv megjelenéséig ne bocsássák nyilvánosságra az Egyetemi

²³ A kari hivatal ügyintézője tölti ki.

²⁴ A megfelelő szöveg aláhúzandó.

²⁵ A doktori értekezés benyújtásával egyidejűleg be kell adni a tudományági doktori tanácshoz a szabadalmi, illetőleg oltalmi bejelentést tanúsító okiratot és a nyilvánosságra hozatal elhalasztása iránti kérelmet.

²⁶ A doktori értekezés benyújtásával egyidejűleg be kell nyújtani a minősített adatra vonatkozó közokiratot.

Könyvtárban, és az ELTE Digitális Intézményi Tudástárban csak a könyv bibliográfiai adatait tegyék közzé. Ha a könyv a fokozatszerzést követően egy évig nem jelenik meg, hozzájárulok, hogy a doktori értekezésem és a tézisek nyilvánosságra kerüljenek az Egyetemi Könyvtárban és az ELTE Digitális Intézményi Tudástárban.²⁷

2. A doktori értekezés szerzőjeként kijelentem, hogy

a) a ELTE Digitális Intézményi Tudástárba feltöltendő doktori értekezés és a tézisek saját eredeti, önálló szellemi munkám és legjobb tudomásom szerint nem sértem vele senki szerzői jogait;

b) a doktori értekezés és a tézisek nyomtatott változatai és az elektronikus adathordozón benyújtott tartalmak (szöveg és ábrák) mindenben megegyeznek.

3. A doktori értekezés szerzőjeként hozzájárulok a doktori értekezés és a tézisek szövegének plágiumkereső adatbázisba helyezéséhez és plágiumellenőrző vizsgálatok lefuttatásához.

Kelt: Budapest, 2015. október 6.

a doktori értekezés szerzőjének
aláírása

²⁷ A doktori értekezés benyújtásával egyidejűleg be kell nyújtani a mű kiadásáról szóló kiadói szerződést.