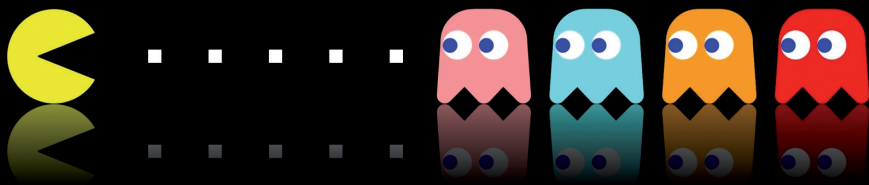# Understanding problematic game behavior

Prevalence and the role of social cognitive determinants

Maria C. Haagsma

UNDERSTANDING PROBLEMATIC GAME BEHAVIOR

PREVALENCE AND THE ROLE OF SOCIAL COGNITIVE DETERMINANTS

Maria C. Haagsma

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UNDERSTANDING PROBLEMATIC GAME BEHAVIOR

PREVALENCE AND THE ROLE OF SOCIAL COGNITIVE DETERMINANTS

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Chapter 1

General introduction

1.1 Introduction

Video games have become increasingly popular over the last 30 years and for many people are part of everyday life. Technological innovations and the Internet have contributed to the rapid development of video games in several ways. Video games have become more sophisticated and complex since their first introduction, with more and more realistic graphics and storylines. Broadband Internet has enabled gamers to play and interact online with each other. Nowadays, all video game platforms have the opportunity to support an Internet connection, some using an online gaming service such as Microsoft's Xbox Live. In addition to multiplayer gaming, it is possible to use online games networks to send messages to friends, chat, and download video game trailers and demos. Games are also integrated in other online environments, for example social games which can be played within existing social network websites. These network games are very popular nowadays (Kushner, 2011). Also, the way games are played has changed. Mobile phones have become gaming platforms and some game systems use body motion control. Motion control systems are capable of tracking the player's spatial movements without the need of a controller, such as Microsoft's Kinect. New systems include alternate controllers such as the Nintendo's Wii Fit package. These developments have changed the way gamers interact with games, resulting in a broad spectrum of video games. These games are aimed at several groups of the population, offering a new, wide range of opportunities for user entertainment and experience. With the ever-changing technologies it is expected that video games will be constantly evolving.

Apart from entertainment, video games also offer a wide range of possibilities for health promotion, education, commercial purposes, and other areas that originally did not involve games. In recent years, games have been designed to address specific problems. The general term for these games is `serious games'. Serious games are designed for other purposes than entertainment only, such as education and training. For example, a recent review reported that games that have been specifically designed for this purpose can increase language learning (Peterson, 2010). Also, some support was found for the benefits of games specifically designed to increase achievement in mathematic (Kebritchi, Hirumi, & Bai, 2010) or science (Barab, Goldstone, & Zuiker, 2009). According to Shute, Ventura, Bauer, and Zapata-Rivera (2009), combining certain commercial video game features with educational material has great potential to support and increase learning. Serious games may be powerful learning tools; however, more empirical evidence is needed to confirm

the effectiveness of serious games in educational settings (Girard, Ecalle, & Magnan, 2012). In health care, games were also found to be useful for several purposes, for example psychotherapy and physical therapy (Primack et al., 2012), disease prevention, and health promotion (Adams, 2010). Video games are also used by professionals as simulators to learn clinical skills (Kato, 2010). Other purposes of video game include advertising, reporting on recent events, and recruitment (*America's Army*).

Video games are progressively becoming a part of our general cultural awareness. There are many blogs about games, and respected newspapers such as the *Guardian* devote space to video games on their websites (The Guardian Games Blog[1]). Video games represent a multibillion-dollar industry in the U.S. (Entertainment Software Association, 2011). Given the amount of time, money, and energy devoted to producing and consuming video games, it is important to increase our understanding of the role that video games play in shaping our lives.

Despite their entertainment and learning value, the increased use of video games has also raised concern about the possible negative consequences for gamers, especially among children and adolescents. Much of the research on the negative effects of video games tends to focus on outcomes such as aggressive behavior, desensitization to violence, and decreases in pro-social behavior (Anderson & Bushman, 2001). Video games have also been associated with undesired physical health outcomes such as inactivity and obesity (Lanningham-Foster et al., 2006), seizures (Kasteleijn-Nolst Trenite et al., 2002), and physical injuries related to repetitive strain (Zapata , Moraes, Leone, Doria-Filho, & Silva, 2006). Moreover, there is increasing evidence that some players exhibit gaming habits that interfere with their life functioning (Gentile et al., 2011; Ng & Wiemer-Hastings, 2005). The main focus of this thesis is on excessive game behavior and its negative outcomes on an individual's life.

1.2   Problematic game behavior

Excessive playing patterns may cause significant dysfunction in the gamer's activities in daily life. It can, for example compromise work or school performance (Gentile, 2009), interpersonal relationships (Lo, Wang, & Fang, 2005), other leisure activities and sleep hygiene (Rehbein, Kleimann, & Mößle, 2010). In these cases, game behavior is out of

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[1]The Guardian games Blog: http://www.guardian.co.uk/technology/gamesblog.

control. The risk that video game players will engage in problematic patterns is widely agreed upon by scholars (Griffiths, 2008; Lemmens, Valkenburg, & Peter, 2009; Van Rooij, Schoenmakers, Vermulst, Van den Eijnden, & Van de Mheen, 2011). It is often assumed that engaging in problematic video game patterns reflects a behavioral addiction similar to pathological gambling. Throughout the thesis, the term problematic game behavior will be used in its broadest sense to refer to game behavior that is characterized by loss of self-control over game behavior as well as by negative outcomes such as psychological, social, school and/or work problems.

The aim of this thesis is to get a better understanding of problematic game behavior and to contribute to the development of knowledge on this topic in several ways. The first issue is the size of the problem. In the Netherlands, prevalence of `pathological gaming' was previously estimated at 2.7% among adolescents aged 12-17 years (Lemmens et al., 2009). Among adolescent online gamers aged 13 to 16, a prevalence of 3% was found (Van Rooij et al., 2011). Although these studies used samples that were nationally representative, they only included adolescents. The first aim of this thesis is to provide information on video gaming habits and problematic gaming within a broader population (Chapter 2).

The Diagnostic and Statistical Manual of Mental Disorders (DSM-IV), one of the most widely-used psychiatric manuals, carries no diagnosis for `pathological gaming' (American Psychiatric Association, 2000). `Pathological gaming' is also not included in the upcoming fifth edition of the DSM, to be released in May 2013 as a psychiatric disorder (DSM-5 [2]). Until now, there is no consensus among scholars on a definition for problematic game behavior. Whereas some researchers claim that problematic gaming is a genuine problem (Gentile et al., 2011), others claim that it is another `moral panic' (Wood, 2008) or an expression of other underlying psychosocial problems (Shaffer, Hall, & Vander Bilt, 2000). Problematic game behavior is defined and measured in different ways, resulting in discrepancies among prevalence estimates.

Several researchers attempting to define problematic game behavior have modified the DSM-IV criteria that are used to measure pathological gambling (Gentile et al., 2011; Lemmens et al., 2009). Some scholars argue that this approach is not without problems (Ferguson, Coulson, & Barnett, 2011; Olson, 2010). The assumption is that symptoms of pathological gambling can be reapplied to other pathological behaviors by rewording the items. However, it is possible that some of these gambling symptoms may not represent

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[2] Diagnostic and Statistical Manual of Mental Disorders-5: http://www.dsm5.org

problematic behavior among gamers. Some of the items in current scales used to measure problematic gaming may in fact refer to high engagement, resulting in misidentification of non-problematic gamers (Charlton & Danforth, 2007). This high engagement is distinct from problematic game behavior. Charlton (2002) states that high degrees of game use can be a positive experience without negative consequences. Hence, it is important to differentiate between game behavior that is problematic from game behavior that is not. This issue was also addressed by Tejeiro, Gomez-Vallecillo, Pelegrina, Wallace and Emberley (2012). This study showed that the group of gamers who can be considered as problematic players appeared not to be a homogeneous group with respect to psychosocial characteristics. Only some of the problem players seem to demonstrate a psychosocial pattern similar to the risk factors patterns for dependence. Other problem players only differed from non-problematic players with regard to their high involvement with games.

Nevertheless, as a first approach to examine a new phenomenon, using a measure based on gambling criteria seems a reasonable starting point. Other approaches are also used, such as a stronger focus on negative consequences (Liu & Peng, 2009). The use of different measures leads to uncertainty about what exactly is measured, and consequently, whether results from various studies using different types of measures are comparable. The lack of agreement on definition and diagnostic criteria also has consequences on daily health care practice. In the Netherlands for example, a growing number of gamers with problems related to their game use admit themselves to an addiction care center (Haagsma, Pieterse, & Peters, 2010). However, there are no guidelines for registering these clients, making it difficult to estimate the exact number of people who admit themselves. Yet, in the Netherlands professional help is provided within each care center, which mostly concerns existing treatment programs, based on cognitive behavioral therapy and motivational interviewing. Although there is some preliminary evidence that this generic treatment protocol may be useful for problematic internet users, including problematic video gamers (Van Rooij, Zinn, Schoenmakers, & Van de Mheen, 2012), specific and suitable guidelines and treatment techniques may be needed for the risk factors associated with and consequences of problematic game behavior.

Most scholars agree that some gamers display problematic gaming patterns that can be considered as pathological (Gentile et al., 2011; Hellman, Schoenmakers, Nordstrom, & Van Holst, 2012; Van Rooij et al., 2011). In addition to people who might be classified as pathological gamers, it is likely that more people experience gaming problems that are less severe. From a public health perspective it is important to address these gamers as well, as

they can be a possible at-risk group of developing addictive gaming patterns. Therefore, the studies in this thesis approach the issue of problematic online gaming from a continuum perspective rather than a categorical perspective, so that it can address a broader population of people who are potentially at risk.

1.3 Theoretical background

When developing prevention and treatment strategies it is relevant to examine which cognitive and behavioral variables play a role in the process of developing and maintaining problematic gaming patterns. Many studies identified several correlations of problematic game behavior, and more recently, causality was also addressed (Gentile et al., 2011; Lemmens, Valkenburg, & Peter, 2011). However, studies using an established theoretical framework to explain the underlying mechanisms and predictors of problematic game use appears to be less available. The second aim of this thesis is to address this limitation by empirically testing three theoretical models in the context of problematic game behavior, to identify which factors contribute to game behavior and problematic game use. The Theory of Planned Behavior (Ajzen, 1991), the model of media attendance (LaRose & Eastin, 2004), and the cognitive-behavioral model of generalized Internet use (Caplan, 2010) were applied as conceptual frameworks to understand problematic game behavior (Chapter 4-7). Also, a longitudinal design was employed in Chapter 5 and 7 to enable some causal inferences. The theories are presented in the following paragraphs.

The Theory of Planned Behavior

The Theory of Planned Behavior (TPB; Ajzen, 1991; see Figure 1.1) was designed to predict and explain almost any human behavior and has been successfully applied to a wide range of behaviors (Conner & Armitage, 1998), including excessive social network usage (Pelling & White, 2009) and gambling behavior (Wu & Tang, 2012). According to the TPB, one's behavior is determined by an intention to engage in a particular behavior. Intention is determined by three social-cognitive constructs: how people evaluate their behavior (attitude), how people perceive their significant other's evaluation of their behavior (subjective norm), and how people appraise their own control over their behavior (perceived behavioral control). If someone has favorable attitudes, positive subjective norms, and a feeling of strong behavior control, it is presumed that this person intends to perform a behavior that is under their volitional control. Besides a mediated effect through

behavioral intention, perceived behavioral control also reflects actual control in that it may have a direct impact on the performance of the behavior as well.

The TPB may be improved by including additional social influences of behavior (Grube, Morgan, & McGree, 1986; Rivis & Sheeran, 2003). It was expected that social influences would have a significant impact on problematic game behavior, given the fact that video gaming is an increasingly social activity (Cole & Griffiths, 2007; Klimmt, Schmid, & Orthmann, 2009). Moreover, online games, in which social interaction is very important, are particularly related to problematic usage (Haagsma, Pieterse, & Peters, 2012). The TPB model was extended with the variables social pressure and descriptive norm. Descriptive norm refers to perceptions of how significant others are behaving, and thus indirectly to significant others' own opinions and actions. Social pressure refers to the perceived direct influence exerted by others in a group situation, and can be considered as the actual pressure that a person encounters rather than group-norms. Playing time was included in the model as a mediating variable.
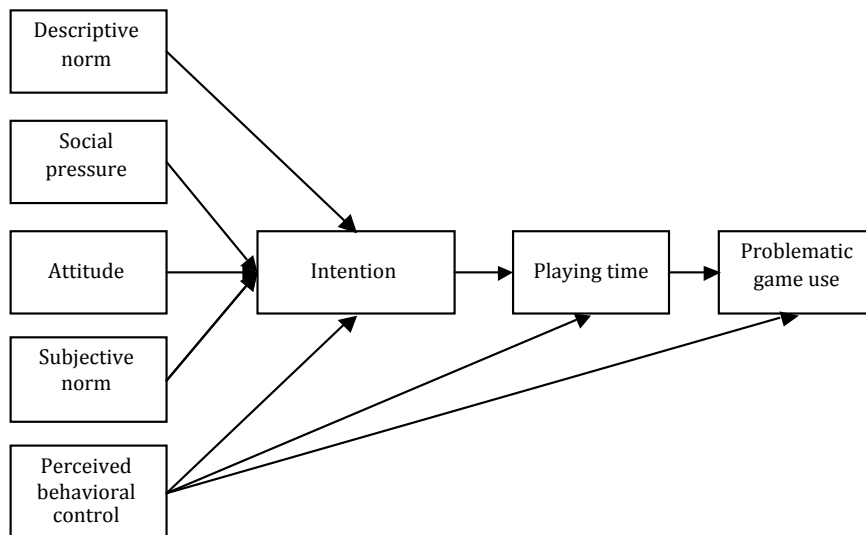
Figure 1.1. The extended model of the Theory of Planned Behavior.

Model of media attendance

The broader literature on media use provides a useful framework for examining problematic game behavior. LaRose and Eastin (2004) proposed a model of media attendance (MMA; see Figure 1.2) that is grounded in the social cognitive theory (Bandura, 1986). From a social cognitive perspective, human behavior is defined as a triadic, dynamic, and reciprocal interaction of personal factors, behavior, and the environment. This triadic causal mechanism is mediated by symbolizing capabilities that transform sensory experiences into cognitive models that guide actions.
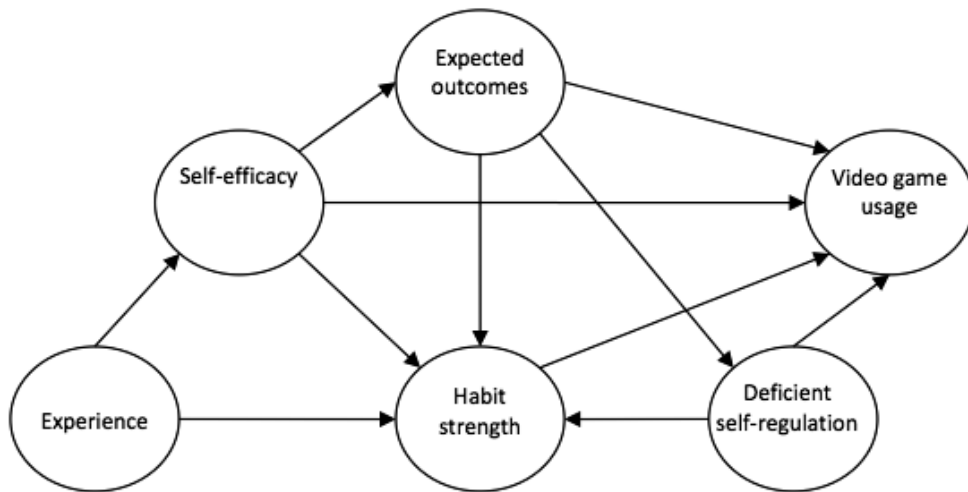
Figure 1.2. The model of media attendance (LaRose & Eastin, 2004) adapted to the context of problematic game behavior.

According to LaRose and Eastin (2004), outcome expectations, self-efficacy, prior experience, habit strength, and self-regulation are important to understand media technology behavior. Expected outcomes of media use influence both self-regulation and media use. Self-efficacy over media use influences media consumption directly and indirectly via expected outcomes and habit strength. The concept of self-regulation states that individuals use self-regulatory capabilities to predict, control, and manage their own behavior. However, when self-regulation fails, it is expected that individuals display an increase in media consumption. LaRose, Lin, and Eastin (2003) have termed this `deficient self-regulation'. They argued that deficient self-regulation is present among all media consumers. From this perspective, unregulated media use can be considered as a

continuum that extends from normal usage patterns to extreme problematic behavior. For some individuals, lapses in effective self-regulation over their media use may lead to stronger gaming habits, but not necessarily to harmful gaming patterns that could be considered addictive. Thus, this theory could be particularly useful to study the process leading to excessive gaming behavior that is not necessarily (or not yet) of a pathological nature with severe negative consequences.

Cognitive-behavioral model

Online games have received increased attention with regard to problematic gaming (Ko , Yen, Chen, Chen, & Yen, 2005; Van Rooij et al., 2011; Wood, 2008). It seems that online games, especially Massive Multiplayer Online Role Player Games (MMORPGs), are associated with problematic game behavior (Chappel, Eatough, Davies, & Griffiths, 2006; Haagsma, Pieterse, & Peters, 2012). Problematic online game use is a variant of problematic Internet use. Therefore, theories found in the broader literature on problematic Internet use may also provide a useful framework. Grounded in Davis's (2001) work, Caplan (2002; 2003) developed and advanced the cognitive-behavioral model of generalized problematic Internet use (see Figure 1.3).
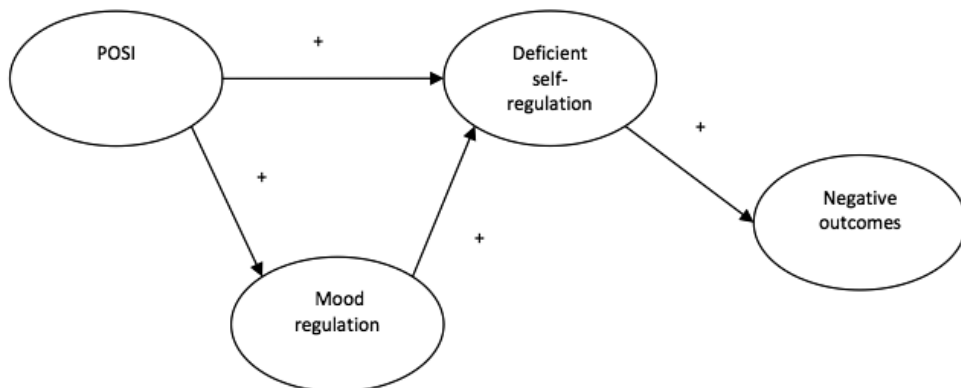

Figure 1.3. The cognitive-behavioral model of generalized problematic Internet use (Caplan, 2010).

The theory (Davis, 2001) proposes that individuals who experience feelings of loneliness and depression, develop maladaptive cognitions and use Internet to relieve their psychosocial problems. This leads to difficulties with controlling their Internet use and

subsequently negative personal and professional consequences. From this perspective, problematic Internet use is considered as a pattern of Internet related cognitions and behaviors that result in negative life outcomes. Caplan (2010) updated and tested this cognitive-behavioral model of generalized problematic Internet use, in which a preference for online social interaction and using the Internet for mood regulation, predicted deficient self-regulation of Internet use. Deficient self-regulation predicted negative outcomes of Internet use. Caplan (2010) defines problematic Internet use as maladaptive cognitions and behaviors involving game use that result in negative academic, professional, and social consequences.

From a TPB perspective, problematic game behavior is considered as volitional behavior, which is determined and maintained by both behavioral intention and perceived behavioral control. Intention to perform a certain behavior is not included in the media attendance model and the cognitive-behavioral model. The model of media attendance demonstrates similarities to the TPB, in terms of their usefulness to explain a wide range of behaviors. Both models assume that individuals make behavioral decisions based on careful consideration of available information, but they also incorporated self-control over behavior to account for more complex behaviors. Whereas the TPB and the MMA do not specifically focus on negative outcomes of behavior, the cognitive behavioral model does account for negative behavior outcomes. The TPB and MMA both aim to explain and predict the full continuum of a specific behavior. In contrast, the cognitive behavior theory aims to explain problematic behavior, including both dysfunctional cognitions and negative outcomes.

All three models are operationalized by proximal variables (e.g., attitudes, expected outcomes) that precede the dependent variable. Obviously, the models also account for more distal variables (e.g., psychosocial wellbeing, social environment), which affect behavior indirectly through the proximal determinants.

1.4   Outline of the thesis

The first study described in Chapter 2 aims to assess video gaming habits among the Dutch population and estimates the size of the group of problematic gamers. In Chapter 3 a qualitative study among excessive gamers is reported. The goal of this study was to gain more insight into game related experiences and cognitions in the development of problematic game behavior by means of in depth interviews. Chapter 4, 5, 6, and 7 examine problematic game behavior by empirically testing the three theoretical models

described above. Chapter 4 extends and validates the model of media attendance. The theory of planned behavior was applied to the context of excessive game use (Chapter 5) to explain and predict problematic game behavior. The cognitive-behavioral model of problematic game use was applied in Chapters 6 and 7. Chapter 6 presents a confirmatory factor analysis of the measurement model (Problematic Online Game Use Scale) and the results of the test of the hypothesized conceptual model. Chapter 7 examines the longitudinal relation between key constructs of the model and focusses on the role of psychosocial wellbeing. Finally, the general discussion in Chapter 8 reflects on the major findings and conclusions of the studies reported in this thesis. Limitations, theoretical and practical implications, and directions for future research are discussed.

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Chapter 2

The prevalence of problematic video gamers in the Netherlands

Abstract

This study surveyed Dutch adolescents and adults about their video gaming behavior to assess the prevalence of problematic gaming. A representative national panel of 902 respondents aged 14 to 81 took part in the study. The results show that gaming in general is a wide-spread and popular activity among the Dutch population. Browser games (small games played via the internet) and offline casual games (e.g., offline card games) were reported as most popular type of game. Online games (e.g., massively multiplayer online role-playing games) are played by a relatively small part of the respondents, yet considerably more time is spent on these online games than on browser games, offline casual games, and offline games (e.g., offline racing games). The prevalence of problematic gaming in the total sample is 1.3 %. Among adolescents and young adults problematic gaming occurs in 3.3 % of cases. Particularly male adolescents seem to be more vulnerable to developing problematic gaming habits.

2.1   Introduction

Although several studies show that playing video games may have beneficial effects (Cole & Griffiths, 2007; Griffiths, 2002), most research on video game behavior has focused on the negative effects on gamers. Currently, there is some evidence that playing videogames may have serious negative effects, including the risk for some people to develop addictive patterns of gaming (Fisher, 1994; Griffiths, 2000; Griffiths, Davies, & Chappel, 2003; Grüsser, Thalemann, & Griffiths, 2007; Salguero & Morán, 2002; Yee, 2002). A study by Gentile (2009) revealed that among a national sample of American youth aged 8 to 18 years, 8.5 % of the gamers showed problematic gaming behavior (PGB). Salguero and Morán (2002) found similar results with a prevalence of 9.9 % problematic gamers among Spanish adolescents aged 13 to 18 years. Rehbein, Kleimann, and Mößle (2010) found a lower prevalence among German adolescents; 1.7 % was considered as a problematic gamer and 2.8 % was considered as at risk for developing problematic game behavior.

The problematic gaming patterns that these excessive gamers display are associated with a range of problems such as poorer grades, attention problems (Gentile, 2009), reduced sleep time, limited leisure activities (Rehbein et al., 2010), lower self-esteem and lower satisfaction with daily life (Ko, Yen, Chen, Chen, & Yen, 2005). It is also suggested that problematic gamers substitute real human contact and relationships by virtual relationships in the online world (Ng & Wiemer-Hastings, 2005; Young, 2009).

Although `video game addiction' is currently not included as a mental disorder in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV), it may be included in 2012 according to the American Psychiatric Association (APA, 2008). This implies that consensus on a definition of problematic gaming is not yet reached. Currently, in many studies a definition that is derived from the DSM-IV criteria for pathological gambling is applied (Gentile, 2009; Lemmens, Valkenburg, & Peter, 2009; Salguero & Morán, 2002). These criteria also share some core characteristics with Brown's (1993) `components' model of addiction. Although there are people who experience considerable problems related to their gaming behavior (Gentile et al., 2011), there is no agreement on whether problematic gaming can been seen as pathological. Therefore, criteria used to measure pathological gaming should be considered as criteria to measure problems associated with game behavior instead of symptoms of pathological behavior. LaRose, Lin, and Eastin (2003) also suggested that media addiction is overstated, and that in many cases the symptoms that these addicted individuals display should be considered as problems that are within the

capability of the individual to correct. For this reason the term PGB will be used in this study instead of pathological video game use or game addiction.

Until now, most studies on problematic gaming have focused on children or adolescents and have used fairly small convenience samples (Griffiths & Hunt, 1995; Griffiths & Hunt, 1998; Salguero & Morán, 2002). In the Netherlands a few studies were conducted on gaming habits and prevalence of PGB among adolescents (Lemmens et al., 2009; Van Rooij, Schoenmakers, Meerkerk, & Van de Mheen, 2008). With the development of new gaming console machines and the use of the Internet for gaming, new games were introduced that enable people to play together online. Many different genres and platforms are available and games are also popular among adults (Griffiths et al., 2003; Griffiths, Davies, & Chappel, 2004). This implies that PGB may also occur among adult gamers. However, reliable data from older age groups are largely lacking.

The first purpose of the present study was to assess the gaming habits of a representative national sample (aged 14-81 years) in the Netherlands. The second purpose was to estimate the prevalence of PGB among both Dutch adolescents and adults. The third purpose was to identify some general risk factors, such as demographic characteristics, and game characteristics, that may be associated with PGB. Problem awareness was also assessed to compare a subjective measure of PGB with a validated scale (Lemmens et al., 2009).

2.2   Methods

Sample and procedures

Subscribers to a national panel which represents the Dutch population were invited via email to participate in an online survey. In May 2009 the data were collected by a for-profit research and consultancy company using a stratified random sampling method that employed demographics as strata. In total, 3,200 subscribers were invited to participate in the study before the number of 900 respondents was reached (non-response was 72 %). No differences were found on any of the demographic variables between the non-respondents and the participants.

The demographics and gaming prevalence of the 902 Dutch residents that took part in the study are shown in Table 2.1. There were 47.1 % male (*n* = 425) and 52.8 % female

Table 2.1. Demographics and prevalence of gamers of total sample (*N* = 902)

	N	%	Prevalence gamers %
Gender			
Man	425	47.1	39.1
Women	476	52.8	58.2
Unknown	1	0.1	-
Age			
14 - 29	214	24	71.0
30 - 44	209	23	56.5
45 - 59	280	31	45.7
60 >	199	22	22.6
Total	902	100	49.1

Note. Total sample vs. census population (CBS, 2009): 8.2% was under 20 years of age (census population = 7.3%), 22.6% was aged 20-34 years (census population = 18.1%), 56.4% was aged 35-64 years (census population = 43%), 12.9% was over 65 years of age (census population = 11.2%).

participants (n = 476). The general population in Netherlands consisted of 49.5 % males and 51.5 % females at the time of this study (CBS, 2009). The participants' age range was 14 to 81 years (M = 44.54, SD = 16.6 years). Regarding both gender and age, this sample is a reasonable representation of the Dutch population. It should be noted that due to the stratified sampling method used in this study, women were stratified until there were as many women as men in the sample, it is possible that there is an over representation of women who are well familiar with technology. However, the main purpose of this study was not to focus on differences among gamers within the gender groups.

Measures

Demographic characteristics.

Gender and age were assessed, in addition to educational level and occupational status. For occupational status respondents reported which situation best described their current occupation (see Table 2.2). Respondents who were scholars or students reported their current education level; the rest of the respondents reported the highest education level they completed (see Table 2.2).

Game genre.

Respondents were asked which type of game (e.g., massively multiplayer online role-playing games [MMORPG], sport games, browser games) they most frequently played and whether they played this genre usually online or offline. The different game types were then categorized into four broad video game genres: browser games, offline casual games, online games, and offline games (see Table 2.3). Respondents were categorized in one of these four genres according to their most frequently played game type, which was assessed by asking which game genre they played most of the time.

Game use.

To measure game use an average total weekly playing time was obtained. First, respondents were asked whether they played any games during the past 3 months, to assess prevalence of recent gaming. If they answered yes, respondents were asked to estimate how many hours they play on an average weekday and how many weekdays they usually play each week. Total playing time was calculated by multiplying the hours played on a typical weekday (Monday - Thursday) with the number of weekdays that the

Table 2.2. Demographics, playing time and problematic gaming behavior scores of gamers (n = 443)

	N	%	Playing time		Problematic gaming behavior			
			M	SD	M	SD	%	(95% CI)
Gender								
Men	166	37.5	6.7	8.26	1.45	.61	3.0	
Women	277	62.5	5.6	6.36	1.32	.49	2.5	
Total	443	100	6.0	7.15	1.37	.54	2.7	
Age								
a. 14 - 29	152	34.3	5.0	8.34	1.44	.59	3.3	(.4, 6.2)
b. 30 - 44	118	26.6	5.6	4.76	1.32	.46	1.7	(-.7, 4.1)
c. 45 - 59	128	28.9	6.8	7.30	1.37	.59	3.9	(.5, 7.3)
d. 60 +	45	10.2	7.8	7.15	1.24	.35	0	
Occupation								
a. Scholar aged 14 - 18	38	8.6	4.62	4.62	1.71[a]	.73	10.5	
b. Scholar/student aged 19 >	76	17.2	4.14	4.96	1.39	.51	0	
c. Part-time job	94	21.2	5.74	5.68	1.34	.51	2.1	
d. Fulltime job	143	32.3	5.34	4.72	1.31	.51	2.1	
e. Other (e.g. housewife/man,	92	20.8	9.23[b]	11.46	1.32	.51	3.3	
Education level								
a. Elementary school	6	1.4	4.3	5.09	1.14	.29	.0	
b. Secondary education	128	28.9	7.3	10.26	1.49	.66	4.7	
e. Senior secondary vocational	103	23.3	6.2	4.97	1.27	.46	2.9	
f. Higher professional education	122	27.5	5.0	5.67	1.33	.51	2.5	
g. University	68	15.3	4.2	4.11	1.37	.46	.0	
h. Other	16	3.6	8.6	7.47	1.36	.52	.0	

a) Post-hoc test significant: a > b, c, d, e

b) Post-hoc test significant: e > a, b, c, d

Table 2.3. Preferred game genres: percentages of gamers according to gender and age (*n* = 443)

	Browser games %	Offline casual games %	Online games %	Offline games %
Men				
14-29	10.4	14.6	20.8	54.2
30-44	18	6	18	58
45-59	13	28.3	15.2	43.5
60 >	22.7	59.1	0	18.2
Total	15.1	21.7	15.7	47.6
Women				
14-29	27.2	29.1	7.8	35.9
30-44	35.3	29.4	13.2	22.1
45-59	35.4	46.3	6.1	12.2
60 >	47.8	47.8	4.3	0
Total	33.3	35.9	8.3	22.5
Total	26.5	30.5	11.1	31.9
Hours per week (*M*)	6.3	4.6	11.3	5.0

Note. Browser games > small games played via the internet using a web browser (e.g., on-line hidden object games); Offline casual games > small games played offline (e.g., offline card games); Online games > other games played via the internet (e.g., MMORPGs); Offline games > games played offline (e.g., offline racing games).

respondent reported playing. Likewise, the total playing time on weekend days (Friday - Sunday) was calculated and added to the total on weekdays.

Problematic gaming behavior.

To measure awareness of PGB a subjective measure of PGB was used with the following three items: `I think I spend too much time on gaming', `I think my game behavior is problematic', and `I think I'm going to seek help' (scale ranged from (1) ``certainly not'' to (5) ``certainly''; α = 0.81, *M* = 4.5, *SD* = 2.05). A score of 4 or 5 was coded as presence of awareness and a score below 4 was coded as absence of awareness. The first item was used to estimate initial problem awareness. A high score (> 4) on at least one of the two latter items was scored as a dichotomous measure of high problem awareness.

Additionally, a Dutch translation of the game addiction scale (GAS) was used. This scale is developed to measure pathological gaming in an adolescent population although it was used across a wider age range (Lemmens et al., 2009). The short version of the scale includes 7 items and is based on the pathological gambling criteria found in the DSM. Validity tests demonstrated strong construct validity of the scale (Lemmens et al., 2009). As pointed out in the introduction, in this study these criteria are considered to measure problems related to game behavior instead of measuring symptoms of pathological behavior. Each statement is scored on a 5-point Likert scale (1 = ``never'', 2 = ``virtually never'', 3 = ``sometime'', 4 = ``often'', 5 = ``very often''). The internal consistency (α = 0.85, M = 1.4, SD = 0.54) is above aspiration level (a $>$ 0.70). In this study a monothetic format is used to determine problematic gaming. Lemmens (2009) suggested that the use of a monothetic format (meet all the criteria) would lead to a better prevalence estimate of problematic gaming than by using a polythetic format (at least half of the criteria must be met for a positive diagnosis), for two reasons. First, the use of polythetic formats is more likely to lead to an overestimation of prevalence, and second, a monothetic format more clearly distinguishes problematic behavior from habitual behavior. Experiencing each of the seven criteria at least ``sometimes'' ($>$ 3) is defined as problematic gaming.

Statistics

T-tests and analysis of variance were used to explore whether game behavior (playing frequency, total playing time, and PGB) is associated with demographics and type of games played. To determine whether the type of game played is associated with problematic gaming, gamers were classified according to the genre they most frequently play.

2.3   Results

Almost half of the participants (49.1 %) reported playing video games in the last 3 months. This sample of gamers was aged between 14 and 75 years, with a mean age of 38.74 years (SD = 15.4). Almost two-third (62.5 %) were women. Of the total sample, 58.2 % of all women and 39.1 % of all men recently played games. Demographics of gamers are shown in Table 2.2. As expected, gaming was most prevalent among adolescents and young adults (14-29 years). Almost all of the adolescent males in the sample played video games, two-third of female adolescents played games. The gaming prevalence significantly decreased with age for both men and women (see Table 2.4).

Gaming behavior

Playing frequency and playing time.

Of the gamers (n = 443), 16 % played every day and 47.6 % played at least 4 days a week. The mean playing time per week among gamers was 5.97 h (Median = 3.75, *SD* = 7.15). Respondents reported a wide range of hours played per week, varying from less than 5 h by 61.4 % of gamers, 5-10 h (21 %), 10-15 h (10.8 %), 15-25 h (5 %), and over 25 h (1.8 %). Two respondents reported playing 50.5 and 84 h.

Differences in playing frequency and playing time according to demographics.

Overall, no significant differences were found in mean playing time per week regarding gender and age (see Table 2). When comparing gender at different age categories, there were differences (F (1, 442) = 7.10, $p < 0.01$); men aged 14-29 spend significantly more time on gaming than young women. Further, women over 45 played more hours per week than women younger than 30.

Type of games played online versus offline.

A third of the gamers played offline casual games (e.g., offline card games, see Table 3). Another third of the gamers preferred playing other offline games, including primarily; strategy games, simulation games, and racing games. A quarter of the gamers played browser games (small games played via the Internet). Only a small percentage of gamers (11.1 %) reported playing other online games (mainly; shooters, MMORPGs, and strategy games).

Differences in playing time and playing frequency according to game genre.

Although online games (e.g., MMORPGs) were preferred by a relatively small part of the gamers, online gamers clearly spent more time (M = 11.33, *SD* = 13.92) on gaming than players of browser games (M = 6.38, *SD* = 6.35), offline casual games (M = 4.69, *SD* = 5.17), and other offline games (M = 5.01, *SD* = 4.79) (F (3, 438) = 12.52, $p < 0.01$).

Table 2.4. Prevalence of gaming, average weekly playing time and prevalence of problematic gaming behavior by gender and age category among the total sample (N = 902)

Age category	Men				Women			
	N	Prevalence gamers %[a]	Playing time (hours/week)	Problematic game behavior (M)	N	Prevalence gamers %[b]	Playing time (hours/week)	Problematic game behavior (M)
14 – 29	59	48 (81.4%)	8.9	1.70	155	104 (67.1%)	3.2	1.33
30 – 44	93	50 (53.8%)	5.8	1.39	116	68 (58.6%)	5.4	1.26
45 – 59	135	46 (34.1%)	5.0	1.38	144	82 (56.9%)	7.8	1.36
60 >	138	22 (15.9%)	7.2	1.23	61	23 (37.7%)	8.3	1.25

a) H (3) = 84.983, $p < .01$ with a mean rank of 123.12 for age category 14-29, 181.75 for age category 30-44, 223.59 for age category 45-59 and 262.12 for age category 60+

b) H (3) = 15.644, $p < .01$ with a mean rank of 217.31 for age category 14-29, 237.48 for age category 30-44, 241.47 for age category 45-59 and 287.26 for age category 60+

Differences in preferred game genre according to gender and age.

Women preferably played browser games and offline casual games, men mostly played other offline games. A comparison according to age provided another difference. Respondents older than 60 years predominantly played card and board games, both offline casual games. Among the younger respondents the genres and types of games were much more varied.

Problematic game behavior

Prevalence of problematic game behavior.

Among the total sample a prevalence of 1.3 % (95 % CI: 0.56-2.04) of problematic gaming was observed according to Lemmens' monothetic criterion. Among the subsample of gamers (*n* = 443), the prevalence was 2.7 % (95 % CI: 1.19-4.21).

When asked about the respondents own problem awareness of PGB, 8.6 % of the gamers thought they spend too much time on gaming and thus had initial problem awareness. 2 % considered their game behavior as problematic and/or was thinking about seeking help and thus had high problem awareness. For each GAS criterion the percentage of respondents who met this criterion and the reported problem awareness are shown in Table 2.5. Of the respondents who met all GAS criteria, 33.3 % reported low problem awareness and only 16.7 % reported high problem awareness. Table 2.6 shows for each of the 7 items of the GAS the percentage of respondents who experience each criterion sometimes, often, or very often.

Differences in PGB related to demographic variables.

As expected, the score on PGB was positively correlated with playing frequency (r = 0.21, $p < 0.01$) and total playing time (r = 0.31, $p < 0.01$). For gender there were significant differences in PGB scores; in general men scored somewhat higher on PGB than women (F (442) = 6.99, $p < 0.01$) (see Table 2.2). When comparing gender at different age categories, the gender difference was limited to the younger age group of men (F (431) = 3.54, $p < 0.01$). Although young men had a higher mean score on PGB, 5 of the 12 gamers who were identified as problematic gamers appeared to be adult women.

Table 2.5. Percentages of score on subjective problematic game behavior for each game addiction scale item (*n* = 443)

Addiction Scale Item (% that met the criterion)	M	SD	I think I spend too much time on gaming' (8.6%) %	I think my game behavior is problematic' or I think I'm going to seek help' (2%) %
Did you spend all day thinking about playing a game (5.2%)	1.19	.53	30.4	21.7
Did you start spending increasing amounts of time on games? (15.1%)	1.52	.83	28.4	10.4
Have you played games to forget about real life? (20.8%)	1.59	.96	18.5	7.6
Have others unsuccessfully tried to reduce your game use? (7.9%)	1.25	.69	31.4	14.3
Did you feel bad when you were unable to play? (7.7%)	1.27	.65	32.4	20.6
Did you have fights with others (e.g., family, friends) over your time spent on games? (4.3%)	1.20	.58	36.8	21.1
Have you neglected other important activities (e.g., school or work) to play games? (15.8%)	1.55	.85	30.0	8.6
GAS criterion (2.7%)	1.37	.54	33.3	16.7

Table 2.6. Percentages for each game addiction scale item for answer categories sometimes, often, very often (*n* = 443)

	Answer category			
Addiction Scale Item	Sometimes	Often	Very often	Total % that met the criterion
Did you spend all day thinking about playing a game	21 (4.7%)	2 (.5%)	-	5.2%
Did you start spending increasing amounts of time on games?	54 (12.2%)	12 (2.7%)	1 (.2%)	15.1%
Have you played games to forget about real life?	71 (16%)	15 (3.4)	6 (1.4%)	20.8%
Have others unsuccessfully tried to reduce your game use?	27 (6.1%)	4 (.9%)	4 (.9%)	7.9%
Did you feel bad when you were unable to play?	26 (5.9%)	8 (1.8%)	-	7.7%
Did you have fights with others (e.g., family, friends) over your time spent on games?	12 (2.7%)	5 (1.1%)	2 (.5%)	4.3%
Have you neglected other important activities (e.g., school or work) to play games?	55 (12.4%)	13 (2.9%)	2 (.5%)	15.8%

Differences in problematic gaming according to game genre.

The preferred game genre was associated with the score on PGB (F (3, 438) = 3.8, $p < 0.05$). Online gamers scored higher (M = 1.56, SD = 0.73) on PGB than players of offline casual games (M = 1.29, SD = 0.51). An interaction effect for gender (F (3, 162) = 2.66, $p < 0.10$) was found though, indicating that this genre related difference was significant for males, but not for females.

2.4   Discussion

The aim of this study was to assess video gaming habits among the Dutch population in general, and to estimate the prevalence of problematic gaming in particular. Results show that gaming, although clearly more common among adolescents and young adults, is a wide-spread activity across the whole Dutch population. For the large majority gaming appears to be a harmless leisure activity. However, a small but noticeable proportion of gamers show PGB. This is, as expected, more prevalent among younger males, but clearly not exclusively limited to this group. In this study 1.3 % of the respondents could be considered as problematic gamers according to the monothetic criterion based on the GAS (Lemmens et al., 2009). Among the subsample of people who play games the prevalence of problematic gaming is estimated at 2.7 %. This prevalence appears to be higher among gamers younger than 30 years (3.3 %), which is consistent with other research (Van Rooij, Schoenmakers, Vermulst, Van den Eijnden, & Van de Mheen, 2011). Surprisingly, the prevalence was also higher among gamers between 45 and 60 years (3.9 %) and 5 of the 12 identified problematic gamers were women over 30 years old.

Although gaming is popular among both men and women of all ages, important differences related to age and gender can be observed. Prevalence of current gaming is higher among adolescent and young adult males than among females in that age group. Moreover, these young men (14-29) spend almost three times more hours per week on gaming than young women. This is consistent with recent studies Rehbein et al., 2010; Winn & Heeter, 2009).

Hours spend on gaming is positively related with problematic game use in this study. However, as suggested in previous studies (Griffiths, 2010) playing time should not be considered as a main criterion for problematic gaming. Total playing time in this sample is much lower than found in previous studies (Lemmens, Valkenburg, & Peter, 2011; Williams, Yee, & Caplan, 2009), this is probably because of the broad age range and the fact that

gamers played all sorts of genres. For example, older respondents who play casual games spend only a few hours per week on gaming which results in a lower mean playing time. If all age groups are included, gaming is slightly more prevalent among women than among men. This is remarkable, as videogames are considered as a typical male activity for many years (Winn & Heeter, 2009). Our findings suggest that although among adolescents and young adults males play relatively more video games, it becomes a less common activity for them as they grow older. Also, the time they spend on gaming is slightly decreasing. Among women a different pattern is found, it seems that gaming prevalence slightly decreases, but the time they spend on gaming strongly increases. An explanation for this finding is that the data was collected using an online panel. Although the total sample was representative of the Dutch population regarding gender and age, it could be the case that the subsample of women was not representative regarding their gaming behavior. As mentioned earlier, it is possible that female subscribers of online panels are more technology savvy and more involved than the Dutch female population in general.

Griffiths and Wood (2000) concluded that adolescents are more vulnerable to PGB than adults. In this study this is partially confirmed, as particularly male adolescents appear to be at risk. In general, it was found that men, and young men in particular, appear to play video games continuously longer than women and scored significantly higher on PGB, therefore they may be considered as a more vulnerable risk group. Nevertheless, we also identified problematic gamers among adult women. Further research should also consider the older female population as a potential risk group. Online gamers, especially those who played MMORPGs and virtual worlds, played for more hours per week and scored higher on problematic game behavior. This confirms earlier findings which showed that especially online games may be more problematic (Chappel, Eatough, Davies, & Griffiths, 2006; Grüsser et al., 2007; Porter, Starcevic, Berle, & Fenech, 2010). More research is needed on the mechanisms that may explain this increased risk. There are many appealing structural characteristics within online games that result in prolonged gaming which in turn may lead to problematic behavior (King, Delfabbro, & Griffiths, 2010).

Limitations

As mentioned earlier, there is still controversy about whether excessive gaming should be considered as a distinct clinical problem and consequently much debate about terminology and assessment. Some researchers argue that criteria based on the DSM-IV criteria for pathological gambling for defining the concept of PGB may be inappropriate and that

problematic gaming is a symptom rather than a genuine addiction (Wood, 2008). In this study a monothetic approach was used, which probably explains the low prevalence in comparison with estimation of prevalence in other studies (Rehbein et al., 2010; Salguero & Morán, 2002). The purpose of this study was not to resolve these issues, but rather to provide relevant data on demographics of gamers, their gaming habits, and to estimate the prevalence of problematic gaming.

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Chapter 3

How gaming may become a problem: A qualitative analysis of the role of gaming related experiences and cognitions in the development of problematic game behavior

Abstract

This study focuses on the role of gaming expectancies, motives and the experiences of gamers in the development of video game behavior, from normal to problematic behavior. Qualitative interviews were conducted among 21 male gamers between 17 and 28 years of age, to get more of an insight into their excessive gaming patterns. Participants were recruited in several ways such as by distributing flyers and posting messages on gaming websites. Participants were included if they were between 14 and 26 years of age and if they had experienced game related behavior problems at the time of the study or in the past. Two processes emerged from the results that seem to contribute to the transition to an excessive gaming pattern. First, the duration of each single game session may become longer. Second, a game session may be started up more and more frequently. Gamers have several motives and expectancies that play a role in this process of increasing gaming time. Is seems that a combination of these gaming motives can lead to an increase in gaming time. Especially online role playing games were related to excessive gaming and the social mechanisms in these games seem to work as an intensifier for other motives.

3.1 Introduction

In recent years, playing video games has become one of the most popular leisure-time activities in Western societies. Gaming can have positive effects but the increasing amount of time that some individuals spend on gaming raised concern regarding the possible negative effects, including the addictive potential (Ng & Wiemer-Hastings, 2005; Wan & Chiou, 2006). Research has demonstrated that a small group of individuals develop a pattern of gaming that results in negative consequences (Gentile, 2009; Gentile et al., 2011; King, Delfabbro, & Griffiths, 2010). Studies that identified problematic gamers among representative samples report prevalence rates of 0.6% among young Norwegian adults (Mentzoni et al., 2011), 1.3% among Dutch adolescents and adults (Haagsma, Pieterse, & Peters, 2012), and 1.5% among Dutch adolescents aged 13 to 16 years (Van Rooij, Schoenmakers, Vermulst, Van den Eijnden, & Van de Mheen, 2011). The gaming patterns that these excessive gamers display are associated with a range of problems such as lowering of grades, attention problems (Gentile, 2009), reduced sleep time and limited leisure activities (Rehbein, Kleimann & Mößle, 2010). Although the clinical concept of problematic game behavior is not recognized yet (APA, 2000; WHO, 1992), most scholars agree that gaming becomes problematic when it interferes with other aspects of life, such as social activities, work and psychosocial functioning (Gentile, 2009; Lemmens, Valkenburg, & Peter, 2011).

Several studies have reported associations between gaming motivations and problematic game behavior (King & Delfabbro, 2009a ; Wan & Chiou, 2006; Yee, 2006). Playing online games for the social aspects such as online social relations (Caplan, Williams & Yee, 2009), social recognition from other players (King & Delfabbro, 2009a; 2009b) and deriving satisfaction from being part of a group (Yee, 2006) was found to be related to problematic game behavior. Using games for mood regulation is also strongly related to problematic use, such as relieving feelings of boredom and loneliness (Hussain & Griffiths, 2009; Lee & LaRose, 2007), playing for relaxation (Yee, 2006) or to escape from real life (Wan & Chiou, 2006). Caplan et al. (2009) reported that using games for immersion and escapism is the strongest predictive motive of problematic game users. Other motives such as playing for achievement (Yee, 2006), reward and curiosity (Hsu, Wen & Wu, 2009) were also found to be related to problematic game play. King and Delfabbro (2009a) suggest that shifting player motivation underlies the development of problematic gaming. Problematic gamers initially play for enjoyment and achievement. Once excessive patterns are formed they play

to relieve tension and boredom. This implies that motives may change over time and that these changes play a role in the development of problematic game behavior.

This study focuses on the development of game behavior, from normal to problematic behavior among young adult gamers. Mainly game related cognitions are addressed as opposed to psychosocial problems because these cognitions might reveal underlying mechanisms through which other determinants operate. Game related cognitions include the motives for playing games, the expectancies from gaming and the experiences during gaming. These cognitions may reflect other underlying problems, for instance, someone who experiences feelings of depression might play for mood regulation (Caplan, 2010). These cognitions are important to understand the context and circumstances of behavior. Information about what motivates a gamer to play excessively, and which expectations are related to this behavior might also strengthen possible interventions. To be able to develop behavior changing interventions it is important to understand individuals' reasons for engaging in the behavior and the expectancies about the behavior. Moreover, using a developmental perspective, and thus a dynamic view, may help to understand the complexity of gaming behavior and gain an insight of the trajectory towards a problematic behavioral pattern. This might enable interventions that prevent the onset of problematic gaming.

The majority of research on problematic game use has been conducted within a quantitative research paradigm. Griffiths (2000) suggested that other empirical techniques such as in-depth qualitative interviews are required. Few have explored this issue (Hussain & Griffiths, 2009; King & Delfabbro, 2009b; Tsai & Lin, 2003; Wan & Chiou, 2006). Tsai and Lin (2003) suggested that qualitative data gathered from interviews might not only help researchers interpret the findings revealed by quantitative methods, but may also produce a more detailed picture about problematic use. The aim of this study was to contribute to a more dynamic understanding of the complexity of excessive gaming in general and the way in which changes in cognitions interact with behavioral trajectories in particular.

3.2 Method

Participants

A total of 21 gamers participated in this study; they were all male ranging in age from 17 to 28 years. Regarding their occupations, eight of them were studying at university, five a higher vocational education, two a secondary vocational education, one a secondary education, four had a fulltime job and one respondent had no daily occupation because he was receiving psychological treatment. The current participants reported playing time varied from a few hours per week to 66 hours per week. Their past playing time varied from 10 hours to 105 hours per week. All participants had experienced game related problem behavior, although the degree varied among respondents. The problems described varied from cognitive symptoms such as: feeling bad or irritated if someone could not play games, feeling frustrated and angry when a game session was suddenly stopped, and constantly thinking about gaming when not playing, also during other activities. Participants also reported negative outcomes on other important aspects in their lives such as school and work, social life, other leisure activities, physical functioning and psychological functioning. Some participants stated that this problem awareness was mainly present among other people in their environment such as their parents. However, many of them reported that they become aware of having game related problem behavior at a certain moment. Many of the participants reported that their problematic game behavior was in the past, so they spoke in retrospect.

Materials

In this study a semi-structured interview scheme was developed to investigate the process of developing problematic game behavior, and the underlying game cognitions and experiences. The questions and themes were based on game motivation categories from the literature (King & Delfabbro, 2009b; Yee, 2006). The main aspects of the interview were: demographic information (i.e., gender, education), game behavior (i.e., ``do you usually play one game or several games?''), the motives for playing games (i.e., ``what do you like about playing games?''), risk situations with prolonged gaming (i.e., ``can you describe a situation in which you played longer than intended?''), and the consequences of gaming (i.e., ``what other activities were compromised time-wise because of your game

behavior?''). Although there were a few fixed themes in the interview scheme, a flexible format was used in order to explore themes that were introduced by the participants themselves. To test this first version, a pilot interview was conducted with an individual who fulfilled our inclusion criteria. The results from this pilot interview led to some modifications (i.e., formulation of questions, suggestions for sub questions). After we had adapted our interview scheme, the first two interviews were conducted by two researchers. The other interviews were also conducted by the two researchers, but they worked independently. All the respondents were interviewed face to face.

Procedure

Recruitment

Participants were recruited in five ways: 1) flyers were distributed at a) the University of Twente; b) schools for higher vocational education; c) a game café; and d) game shops; 2) emails were sent to persons who had recently participated in a study on game behavior; 3) messages were posted on several gaming websites; 4) through employees within the youth department of the Brijder addiction Care Group who are working with adolescents and young adults; 5) snowball sampling; participants in this study were requested to inform others in their social network about this study.

Inclusion criteria.

Participants were included if they were between 14 and 30 years of age and if they had experienced problems related to their game behavior at the time of the study or in the past. The inclusion criteria on the flyer were: `spending too much time on gaming'. The criteria on the invitation were: responding `yes' to one or more of the following statements: `Sometimes I think I spend to much time on gaming', `Playing games takes gradually more time from other activities such as school', `I usually play games for longer periods than intended', `Although gaming is not a problem anymore, my gaming behavior was out of control in the past'.

Data collection.

The interviews were conducted at the University of Twente and the city library in Enschede. Before the interview, participants were informed about the procedure, such as the duration of the interviews, themes that would be discussed, and permission to record the interview.

Participants were told that the data would be confidential and they received a fee of 10 euros for participating.

Data analysis

Inductive and deductive thematic analysis was used to analyze the data (Braun & Clarke, 2006). This process involved three steps. First, the recordings of the interviews were transcribed. Second, the most salient themes were identified resulting in a coded scheme. Both the theory-driven codes, which were based on earlier studies and were also included in the interview scheme, and the data-driven codes were defined. The third step involved using this initial code scheme as a framework to re-analyze the transcripts. The coded transcripts were tested for inter-rater reliability between the two researchers. Each transcript was coded by both researchers independently, and then any differences in coding were discussed by the two researchers and a third researcher who was involved in the project, until a consensus was reached. This open coding procedure was followed until no new codes were necessary. During this process higher-order themes and categories were identified. Direct quotes from the respondents are used to illustrate the various topics that arose during the interviews. Each quote has been assigned a coding reference which refers to the respondent's number and the respondent's age (i.e., `R3, age 18' refers to respondent 3, aged 18 years).

3.3   Results

The main focus of this study was to examine the role of game related cognitions (i.e., expectancies and motives) and experiences during the development of excessive gaming patterns among young adult gamers. Another aim was to gain more insight into the overall process (i.e., different phases in playing patterns) regarding the development of problematic game behavior. The results are presented in two broad sections. The first section describes the importance of game cognitions and experiences that emerged during the process of acquisition, development and maintenance when gaming excessively. The second section describes the process of developing problematic game behavior. This section focuses on how playing patterns may change over both short and longer time periods.

Increasing gaming time

Two processes emerged that seem to contribute to the transition to an excessive gaming pattern. First, the duration of each single game session may become longer. Second, a game session may be started more and more frequently. Several game motives, expectancies and experiences (i.e., time loss) appeared to play a role in the process of increasing gaming time. Although respondents also mentioned reasons for playing games in general, we specifically focused on the cognitions and experiences that were reported in the context of playing longer than intended and/or excessively. The main themes that emerged from the data were: reward and completion, mood regulation, and social aspects of online gaming.

Reward and completion.

Most respondents described situations in which they postponed quitting a game session because they were close to attaining a certain goal, level, or reward. Completing the story line of the game is also reported as a reason to keep playing. Apparently, the urge to complete goals in the game and to avoid losing the accomplished results is a reason to play longer than intended:

> ``*Yes, you're really part of the game; you just become addicted to it. A game like that usually lasts from three quarters of an hour to 1,5 hours, so if you stop in the middle of the game you lose everything you have achieved that day and you just don't want to do that''* (R12, age 18).

These achieved rewards or completed storylines can be considered as investments in the game. As described above, these investments lead to prolonged gaming sessions; they lead to excessive playing patterns over longer time periods. A respondent explained that the greater the amount of time invested in a game, the more difficult it may become to `leave' the game.

> ``*I think when you have achieved everything for which you have worked so long, that could also be a reason, I don't think you would want to stop so readily either''* (R15, age 28).

Most respondents reported ``time loss'' during prolonged gaming sessions especially when striving to reach a next level or reward, as they had lost track of time:

``I do try to keep an eye on the time, but then it's a matter of just quickly doing this, or just quickly doing that. And then, just this and okay, we'll stop. And then something happens half way through and you're at it again. And before you know, you lose track of time and another hour has gone by'' (R19, age 25).

Mood regulation. Playing games to modulate mood was mentioned by almost all respondents as a reason for increasing their gaming time. Many respondents reported playing games to relieve feelings of boredom, when they have nothing else to do. Some respondents also explained that they could not find a better way to spend their time. Games seem to offer a good way of escaping from reality in these situations. One respondent explains:

``Yes, it was more of an escape, because there's not much going on at home. Ye', then I enter into my own world, actually the reason was more to escape from reality'' (R9, age 21).

Social aspects of online gaming. The social aspects of online games were also reported as a reason for increasing gaming time. This was specifically mentioned by online shooters and MMORPG's. These social aspects are closely related to completion, as cooperation is imperative for the game to progress. One respondent describes that when he started playing the game he was more focused on discovering the game world, and the social aspect became more important later on:

``No, that really comes as time passes. First it's real, you're in the game. Do this, do that, it's fun. Exploring, getting better and so on. Just keep at it a little longer and then it eases and when you really raid well again, the social aspect is noticeable at that point in time. And it has always been that way'' (R6, age 23).

Many online games require a group of players to join in and cooperate. Consequently, this means having to make appointments. These appointments are then perceived as being a responsibility and this sometimes dictates the frequency of a gamer playing:

``That was Sunday up to Thursday, standard, you had to be there at quarter to eight. Actually half past seven, because you had to be there by quarter to eight and at 8 o' clock you definitely had to be there, no matter what. Otherwise, you

would be told off, as you have a certain level and you become one of those raiders, one of the core players. And each one just has to be there. And, let's just say, they have certain privileges'' (R1, age 21).

As well as playing more frequently, joining a group also leads to prolonged gaming sessions. The feeling of belonging to a team seems to enhance the urge to progress in the game and enhance immersion in the game:

``*Then you work a lot as a team and you also feel you are part of a team. Then you've done it for your team and then everything has to be done all over again. (...) That is even more active and it is also more addictive because every time you think once more, once more'' (R8, age 17).*

The previous quote also indicates that missing a game session or quitting prematurely is considered as abandoning the team. One respondent explained that the social pressure and obligations that are part of belonging to a team leads to addictive playing patterns:

``*Other than the appointments themselves, yes, there was the obligation of always being prepared for those 5 days. So no matter what, you had to be present during those 5 days, but you also had to be prepared. And I must say that that really is an addictive lifestyle'' (R1, age 21).*

Respondents reported the online relationships as a reason to maintain their excessive playing patterns. Once the social aspect has become important and relationships have been formed, the need for social interaction may even become the primary reason for some respondents to enter an online game session, and eventually to keep returning to a game even after it has been fully played:

``*Indeed, that is a reason to continue playing. Because a few times I actually thought what am I still doing here? Would it not be better if I stopped? But then you think of those friends with whom you occasionally do something that's fun. OK, I'm not going to stop then'' (R6, age 23).*

Gaming patterns

This section focuses on the gaming patterns of problematic gamers. The main themes that emerged from the data were the strong variation in individuals playing patterns over time, and the process of decreasing gaming time.

Variation in playing patterns.

The playing pattern of most respondents was characterized by a high variability in playing intensity. No clear distinction was observed between several phases. Episodes of excessive gaming during the weekend, vacation, or following a new game release, are often followed by interludes of reduced gaming. One respondent described that he plays longer in the weekend, after he has finished his week:

> ``Usually you've finished your week, you're happy that it's weekend. You automatically tend to want to do something that's fun, I want to get the most out of it. So you automatically keep on playing longer, but you don't play longer for a tangible reason'' (R6, age 23).

The above quote also reflects automatic habitual behavior. Gamers may develop habitual gaming patterns in which playing becomes a more or less automatic way to spend free time, more than a motivated choice. This is illustrated by a respondent who continued to play a particular game he had already finished completely:

> ``I have played Guild Wars four times and I almost know it all (. . .). Irrespective of the titles, I would still play Guild Wars, not because I really wanted everything or something like that. It feels so normal when I play it, at least I have something to do and I am not wasting my time doing nothing, at least you have something to do'' (R11, age 22).

Most respondents also experienced several points in their lives when they played excessively over longer time periods:

> ``Ultimately I go back to World of Warcraft. Actually it's like an on-off relationship. And a year ago an addition was released. I started playing it

again. Soon I returned to the top again. A lot of people reacted with something like hi, hi, oh, is that you. Hey! Then I invested a lot of time on it'' (R19, age 25)

Decreasing gaming time. Respondents reported several reasons why they reduced their playing time. The most important reason was that the amount of time they spent on gaming was interfering with other aspects of their lives. Respondents reported becoming aware of the negative consequences of the time they invested on gaming. Their priorities shifted from gaming to other important factors of their life, such as studying, work, friends or a relationship. For most respondents, study was the main reason for reducing time on gaming.

> ``*And you really have to clear up and make free time to start studying. Yes, because at a certain moment you also realize that the studies need to be completed. (. . .) Gaming gets lower and lower on your priority list'' (R15, age 28).*

One respondent describes that he stopped playing World of Warcraft when he realized the benefits of stopping outweighed the disadvantages of stopping:

> ``*Each time I stopped playing World of Warcraft I thought that the advantages of stopping outweighed the disadvantages. The fact that you continue with the `guild', maybe there's the social aspect of seeing people again and that you do want to continue in the game. But then you'd rather spend time on studies, on friends, on sports, those kind of things, and ye', eventually I made that choice again.'' (R1, age 21)*

Here, another respondent reported that the amount of time needed to achieve the game does not lead to a satisfying amount of recognition:

> ``*But now I have to invest too much time into something with too little recognition, so to speak. And I just don't think it's worth it. It doesn't give me satisfaction any more'' (R1, age 21).*

It seems that in most cases, spending time on other activities is automatically replacing the time spent on gaming. Some methods used to reduce gaming time were: removing the

console, joining another guild which requires less time, quitting together with another person, or creating other responsibilities such as joining a sport club. This transition seems to have been easy for most respondents, however, some of them described several periods of relapse when they started playing excessively again. Furthermore, although they had reduced their gaming time, some respondents reported still spending too much time on gaming. Finally, restrictions set by parents were also mentioned as the cause of reduced gaming.

3.4 Discussion

The aim of this study was to gain more of an insight into the development of game behavior from normal to problematic behavior by exploring game related motives and expectancies of a selection of young adult gamers who currently or recently experienced problematic game behavior. This study illustrates the complexity of game behavior in a number of ways. The results show that gamers in this sample have highly variable playing patterns, both in terms of intensity and underlying cognitions, which can change over relatively short periods of time. Several motives and expectancies play a role in the development of excessive gaming patterns, whereby both the frequency of game sessions and the length of game sessions are increased. The motives to play and gaming expectancies were related to three main themes: reward and completion; mood regulation; and the social aspects of online gaming. Experiences during a particular gaming session such as time loss, immersion, and escapism also seem to contribute to prolonged gaming. These motives and expectancies were different for each respondent, for example, the immersive nature of gaming was perceived as negative by some respondents and positive by others. There was also variation within a person, depending on the type of game played.

Another important finding of this study is the development of game behavior. It seems that the playing patterns of most respondents were characterized by a high variability in playing intensity over both short and longer time periods. Most respondents described several episodes of excessive gaming, with episodes of reduction or abstinence in between. Self-awareness of the negative outcomes of time spent on gaming, and the interference with other activities in their lives, was mentioned as the main reason of reducing or stopping.

Development of problematic gaming

The interviews suggest that several motives and expectancies in the game may lead to an increase in playing time through several pathways. First, they lead to starting a game session more frequently. Second, they lead to a situation in which it is difficult to stop a game session which results in prolonged gaming. These motives and expectancies could be categorized into three main topics: reward and completion, mood regulation, and social aspects of online gaming. These categories are closely related to each other. For most of the respondents a combination of several motives and expectancies leads to an increase in gaming time. Many respondents also play a variety of games to fulfill several needs because each genre offers a different game experience. This study suggests that these motives to play reinforce each other. For example, the urge to complete a goal in the game seems to be more salient when playing together with team members.

Consistent with the existing literature, the interviews showed that the gamers who are more prone to spending increasing amounts of time and developing excessive gaming patterns prefer online games, MMORPG's in particular. The relation between playing for social motives and problematic game use was found in earlier studies (Caplan et al., 2009; Yee, 2006). Although achievement was the main reason to spend increasingly more time on gaming, the social aspects of online games seem to reinforce the urge to achieve and complete goals in the game. Thus, this increased risk may be a combination of certain gaming characteristics such as social pressure, appointments and teamwork. Social aspects were also closely related to playing games for mood regulation. The combination of achieving the game together with other players seems to lead to an experience of immersion and time loss. Especially these types of games appear to provide a good way to escape from reality. Relations and friendships were mentioned as becoming more important after a while, and a reason to keep playing. Thus, the social mechanisms in these games contribute both to developing problematic gaming behavior and to the maintenance of these excessive patterns.

Gaming patterns

From the results it became apparent that some of these players were able to reduce their gaming time when they became aware of their excessive behavior and the negative consequences. Hence, reducing game time may be part of a cycle, the starting point being

a new game, playing it increasingly more often and longer followed by a loss of control until negative consequences or shifting priorities prelude a phase of reduced gaming. Lee and LaRose (2007) also suggested that individuals were able to re-establish self-control and that problematic gaming should be correctable for most people. Nevertheless, most respondents in this study reported repeated cycles of this process, for example when a new game is released. And even in cases in which a gamer regained self-control, the excessive gaming pattern did have a significant impact on other aspects of their lives such as study, friends and family. It is possible that this has lasting effects on for example establishing social relationships. Results regarding duration and severity of problematic game behavior are contradictory. Although some findings suggests that problematic game behavior is a primary problem (Gentile et al., 2011), another study showed that only half of problematic gamers showed problematic behavior one year later (Van Rooij et al., 2011).

Many researchers use measures based on the DSM criteria for pathological gambling (Gentile et al., 2011; Lemmens, Valkenburg, & Peter, 2009). This is a categorical approach to distinguish between normal healthy gamers and pathological gamers. Another perspective is to consider problematic game behavior as a continuum that extends from normal behavior to extremely problematic behavior (Kuss & Griffiths, 2012; LaRose, Lin & Eastin, 2003). The high variability between the individual gaming patterns of problematic gamers in this study indicates that a categorical approach may not adequately reflect the true nature of this behavior. Individual gaming careers are characterized by episodic fluctuations, from normal to excessive gaming. A similar dimensional approach is common in alcohol abuse research. Besides the DSM criteria for alcohol dependence, there are other measures for hazardous drinking behavior such as binge drinking (Wechsler & Nelson, 2001). Binge drinking refers to excessive use of alcohol, for example during the weekend. These excessive patterns can lead to alcohol dependency. A similar pattern emerged from our data. Although the physical negative effects of binge drinking are not comparable with the effects of excessive gaming it may be that gamers who play excessively during the weekends are more vulnerable of becoming problematic gamers.

Implications

One of the issues that emerge from these findings is that gamers play for very different reasons, and thus, the same video game may have different meanings or consequences for gamers. Also there are differences within each individual. When developing prevention and treatment regimens, these differences should be taken into account.

Apparently problematic gamers go through intermittent episodes of reduced gaming; this may provide opportunities to intervene. This also indicates that excessive and problematic gaming may be context-dependent and that these contextual determinants need further exploration.

Interventions aimed at reducing problematic game use may include strategies for building self-awareness. It seems that in many cases the amount of time spent on gaming interferes with other activities and leads to negative consequences. Therefore, it may also be helpful if excessive gamers can gain more insight into their amount of gaming time by monitoring their game use. For example, by installing an aid on the computer that gives a notification after a certain period of gaming.

Prevention and treatment could also focus on social relationships, as online social relations seem to play a role in the maintenance of problematic gaming patterns. Examining the social links by means of a graphic representation in both the game world and the real world may serve as a starting point when discussing and working on (individual) social relationships.

Limitations

Although this study attempted to give a better insight into the development of problematic game behavior from a dynamic point of view, the data are essentially retrospective in nature. Longitudinal, prospective research is needed to enable causal inference. Following a group of gamers over time would provide this information. Also a social network analysis of the perspectives of other people in the gamers' environment could be included, such as parents, friends, and other gamers, providing a more in-depth view on the development of problematic game behavior.

There were also limitations regarding the representativeness of the sample in the study; the gamers in this study may not be representative of the subgroup of excessive gamers. First, although some participants reported spending excessive amounts of time on gaming at the time of the study, many participants reported their game behavior in retrospect. Their perception of their gaming behavior and related cognitions may have changed fundamentally since `recovery'. Possibly, gamers who are not able to regain control over their gaming behavior should have been recruited for this study. It is also unknown whether the participants will ever experience problematic gaming again. This is not

unlikely, given the fact that many respondents had experienced several relapses of problematic gaming. A second limitation is that most of the gamers were rather highly educated. It is possible that these individuals are more resourceful and have a higher ability to regain self-control. Third, the data only included the gamers' self-reported perceptions. This implies that factors not open to introspection remain hidden. Additionally, social desirability and memory bias may have limited the validity of this study.

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Chapter 4

A social cognitive perspective on problematic game behavior

Abstract

In this study the model of media attendance (LaRose & Eastin, 2004) was extended and validated in the context of problematic game behavior. In total 443 gamers aged between 14 and 75 years participated in the study. On the basis of structural equation analysis, the results show that deficient self-regulation has a significant influence on both experiencing problematic game behavior and habit strength. Although habit strength leads to more game use, time spent on gaming has little influence on problematic game behavior. Conclusively, it seems that deficient self-regulation is the most important factor that explains experiencing game behavior as problematic or not.

4.1　Introduction

The aim of this study was to extend and validate the model of media attendance (LaRose & Eastin, 2004) in the context of problematic video game behavior. The concept of problematic game behavior has received increased interest from researchers the last few decades (King, Delfabbro, & Griffiths, 2010; Van Rooij, Zinn, Schoenmakers, & Van de Mheen, 2012). Many studies found associations between problematic game behavior, lower psychosocial well-being and other related problems. The terms ``game addiction'' or ``pathological gaming'' are mostly used in this context. In many studies a definition that is derived from the pathological gambling criteria found in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) is applied (Gentile, 2009; Lemmens, Valkenburg, & Peter, 2009; Salguero & Morán, 2002). Meeting half or more criteria usually means that an individual is considered as addicted to playing games. Although there are people who experience considerable problems related to their gaming behavior, this does not guarantee that they meet the necessary condition of having severe life consequences (Shaffer, Hall, & Vander Bilt, 2000). Until know, there is no agreement on whether problematic gaming can been seen as pathological. As a consequence problematic game behavior is currently not included as a mental disorder in the DSM-IV (American Psychiatric Association, 2000) and probably will not be included in the DSM-V (Gever, 2010). Instead of using a categorical approach, LaRose, Lin, and Eastin (2003) stated that media use can be viewed along a continuum of unregulated media behavior that lies between normal use and problematic use. Therefore, criteria used to measure pathological gaming could be considered as problems associated with game behavior instead of symptoms of pathological behavior. Because the term ``addiction'' is questionable in the understanding of excessive media use among normal populations (LaRose et al., 2003), the term ``problematic'' media use is adopted by many media researchers (Caplan, 2005; LaRose et al., 2003; Lee & LaRose, 2007). In this study instead of pathological video game use or game addiction, the term problematic gaming behavior (PGB) will be used and can be considered as cognitive and behavioral symptoms that result in negative social, academic, or professional consequences.

A social cognitive perspective on problematic game behavior

LaRose and Eastin (2004) proposed a model of media attendance (see Figure 4.1) that is grounded in social cognitive theory (Bandura, 1986). From a social cognitive perspective,

human behavior is defined as a triadic, dynamic, and reciprocal interaction of personal factors, behavior, and the environment. This triadic causal mechanism is mediated by symbolizing capabilities that transform sensory experiences into cognitive models that guide actions. According to LaRose and Eastin (2004), concepts from social cognitive theory such as outcome expectations, self-efficacy and self-regulation are important to understand media technology behavior.
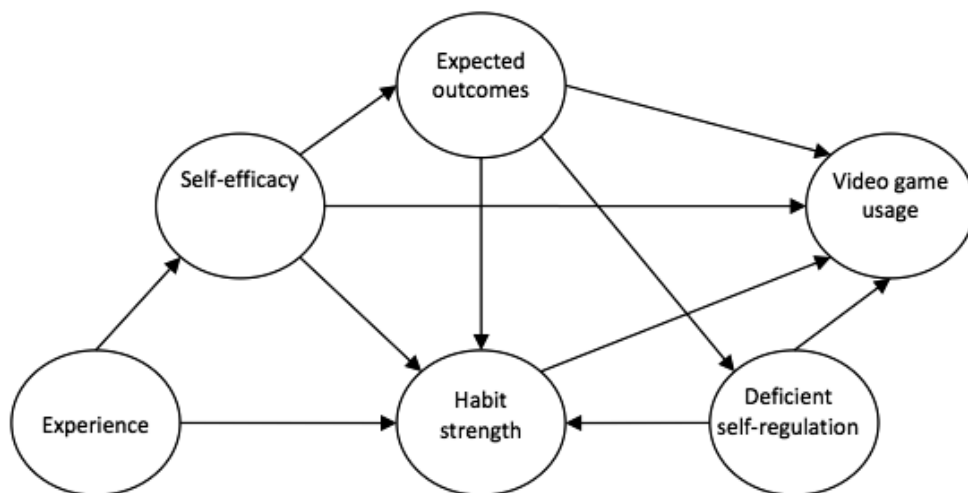
Figure 4.1. The model of media attendance (LaRose & Eastin, 2004) adapted to the context of problematic game behavior.

Constructs of the model of media attendance

Expected outcomes.

Outcome expectations, defined as judgments of the likely consequences of a behavior, provide incentives for enacting behavior (Bandura, 1986). These expected outcomes are organized around six basic incentive categories; activity, novel, social, status, monetary and self-reactive incentives. Lee and LaRose (2007) found that in the context of game behavior, individuals spent more time on gaming because their game playing can provide self-reactive incentives to relieve boredom or pass the time. Furthermore, these self-reactive outcomes not only promote the loss of self-control but also lead to the development of habitual gaming patterns. Besides playing to regulate one's psychological state, other expected outcomes such as playing for social and status outcomes may also

determine game behavior. Based on earlier studies (LaRose & Eastin, 2004; Peters, 2009), the following outcome expectations were operationalized for game behavior; activity outcomes (i.e., fun and entertainment), social outcomes (i.e., social interaction and communication), status outcomes (i.e., feeling important and respected), novel outcomes (i.e., playing the latest games), and self-reactive outcomes (i.e., relax or relieve boredom). The broader literature on gaming motives identified dimensions that were also included in this study; achievement/challenge (i.e., progressing in the game), competition (i.e., competing with other players) and escape (i.e., using the game world to escape from reality) (Jansz & Tanis, 2007; Yee, 2006).

Self-efficacy and experience.

Self-efficacy is the belief in one's capacity to organize and execute a particular course of action (Bandura, 1997). Individuals who have high self-efficacy with reference to a particular activity will invest more effort to achieve successful outcomes than individuals who have low self-efficacy. LaRose and Eastin (2004) concluded that self-efficacy is directly and indirectly related to media usage through expected outcomes. Prior experience in turn leads to more self-efficacy (Eastin & LaRose, 2000).

Self-regulation: habit strength and deficient self-regulation.

The mechanism of self-regulation is a central aspect in social cognitive theory. Self-regulatory capabilities are used to predict, control, and manage behavior. Habit is a failure of the self-monitoring sub function of self-regulation. Habit strength is determined by expected outcomes and self-efficacy. Deficient self-regulation is closely related to habit strength, because persons with deficient self-control may also be expected to engage in habitual behavior. Deficient self-regulation is a failure of the judgmental and self-reactive sub functions, which leads to a state in which conscious self-control is diminished (LaRose et al., 2003, LaRose & Eastin, 2004). LaRose et al. (2003) found that deficient self-regulation and habit strength leads to decreased self-regulation of media use that often leads to problematic patterns of use. LaRose, Mastro, and Eastin (2001) consider symptoms of internet addiction as indicators of habitual use, which results from deficient self-regulation. Lee and LaRose (2007) proposed a theoretical model of video game consumption which integrated Bandura's (1991) social cognitive theory of self-regulation and theory of flow experience (Csikszentmihalyi, 1997). Lee and LaRose (2007) found that deficient self-regulation appears to play a central role in the development of problematic game

behavior. In a study by Seay and Kraut (2007), deficient self-regulation also was the most important predictor of negative consequences of gaming.

Game use.

Time spent on gaming is also included as a determinant of problematic game behavior in the hypothesized model of problematic game behavior. Although it is argued that problematic gaming should not only be characterized by the amount of time spent on gaming (Griffiths, 2010), problematic gamers were found to invest twice as much time as non-problematic gamers (Gentile, 2009).

Hypotheses

To test the model of media attendance in the context of problematic game behavior the following hypotheses are proposed:

H1. Self-efficacy, expected outcomes, habit strength, and deficient self-regulation are positively related to game use.

H2. Self-efficacy, expected outcomes, and deficient self-regulation are positively related to habit strength.

H3. Self-efficacy is positively related to expected outcomes.

H4. Prior game experience is positively related to self-efficacy and habit strength.

H5. Expected outcomes are positively related to deficient self-regulation.

H6. Game use, habit strength, and deficient self-regulation are positively related to problematic game behavior.

4.2   Method

Sample and procedures

Subscribers to a national panel which represents the Dutch population were invited via email to participate in an online survey. In May 2009 the data were collected by a for-profit research and consultancy company using a stratified random sampling method that employed demographics as strata. Each subscriber receives a small monetary compensation for participating in a study. In total, 3200 subscribers were invited to participate in the study before the number of 900 respondents was reached (response rate was 28%). No differences were found on any of the demographic variables between the non-respondents and the participants.

The sample of gamers was derived from a total sample of 902 respondents. In total 902 Dutch residents took part in the study. There were 47.1% male (n = 425) and 52.8% females (n = 476). The general population in the Netherlands consisted of 49.5% males and 51.5% females at the time of this study (CBS, 2009). The participants' age range was 14 to 81 years (M = 44.54, SD = 16.6 years). Regarding both gender and age, this sample is a reasonable representation of the Dutch population aged over 13 years.

Half of the participants (49%) played games themselves; only these 443 gamers were included in the analysis. Playing games was defined as playing all types of both online and/or offline computer games on a personal computer, console or handheld. The sample of gamers ranged between 14 and 75 years, with the mean age of 38.74 years (SD = 15.4). Almost two thirds (62.5%) of them were women.

Measures

Game use.

To measure game use during the past 3 months an average total weekly playing time was obtained. Respondents were asked to estimate how many hours they play on an average weekday and how many weekdays they usually play each week. Total playing time was calculated by multiplying the hours played on a typical weekday (Monday - Thursday) with the number of weekdays that the respondent reported playing. Likewise, the total playing time on weekend days (Friday - Sunday) was calculated and added to the total on weekdays.

The mean playing time per week among gamers was 5.97 hours (Median = 3.75, *SD* = 7.15).

Problematic gaming behavior (PGB).

To measure problematic game behavior a Dutch translation of the game addiction scale (GAS) was used. This scale is developed to measure pathological gaming (Lemmens et al., 2009). The scale includes 7 items and is based on the pathological gambling criteria found in the DSM (α = .85, *M* = 1.4, *SD* = .54). As pointed out in the introduction, in this study these criteria are considered to measure problems related to game behavior instead of measuring symptoms of pathological behavior. The items are presented in Table 4.2. Each statement is scored on a 5-point Likert scale (1 = 'never', 2 = 'virtually never', 3 = 'sometimes', 4 = 'often', 5 = 'very often').

Expected outcomes.

Expected outcomes were measured with 23 items. The original items by LaRose and Eastin (2004) were rephrased in the context of game use. Furthermore, additional items were collected from prior studies on game use (Jansz & Tanis, 2007; Yee, 2006) and classified in accordance with the conceptual definitions found in Bandura (1986). Table 4.2 presents the item wording for each expected outcome category: activity outcomes (α = .67, *M* = 4.03, *SD* = .56), competition outcomes (α = .80, *M* = 1.82, *SD* = .95), achievement outcomes (α = .69, *M* = 2.73, *SD* = 1.09), self-reactive outcomes (α = .74, *M* = 3.35, *SD* = .87), escapism outcomes (α = .80, *M* = 1.85, *SD* = .90), social outcomes (α = .88, *M* = 1.67, *SD* = .79), status outcomes (α = .78, *M* = 1.62, *SD* = .74), and novel outcomes (α = .74, *M* = 2.03, *SD* = .88). Social outcomes were operationalized as social interaction and communication within the game world. Status outcomes were operationalized as status within the game world. Novel outcomes were operationalized in the context of the latest developments in games. Each statement is scored on a 5-point Likert scale (1 = 'totally disagree', 2 = 'disagree', 3 = 'disagree/agree', 4 = 'agree', 5 = 'totally agree'). The internal consistencies of activity outcomes (α = .67) and achievement outcomes (α = .69) were below aspiration level ($>$.70) and were removed from further analysis.

Deficient self-regulation.

Deficient self-regulation (α = .91, *M* = 1.45, *SD* = .68) was measured with 4 items. The items were based on prior studies (LaRose & Eastin, 2004; Lee & LaRose, 2007) and rephrased in the context of game use. The items are presented in Table 4.2. Each statement is scored on

a 5-point Likert scale (1 = 'totally disagree', 2 = 'disagree', 3 = 'disagree/agree', 4 = 'agree', 5 = 'totally agree').

Experience

Experience was measured by asking for how long the respondent is playing games. Response categories were: ``less than one year'', ``1 to 2 years'', ``2 to 3 years'', ``3 to 4 years'', ``4 to 5 years'', ``5 to 10 years'', ``10 to 15 years'', ``15 to 20 years'', ``20 to 25 years'', and ``longer than 25 years'' (Median = ``10 to 15 years'').

Habit strength.

Habit strength (α = .83, *M* = 2.49, *SD* = .94) was measured with 4 items. The items were based on prior studies (LaRose & Eastin, 2004) and rephrased in the context of game use. The items are presented in Table 4.2. Each statement is scored on a 5-point Likert scale (1 = 'totally disagree', 2 = 'disagree', 3 = 'disagree/agree', 4 = 'agree', 5 = 'totally agree').

Self-efficacy.

Self-efficacy (α = .81, *M* = 3.75, *SD* = .71) was measured with 4 items. The items were based on prior studies (LaRose & Eastin, 2004) and rephrased in the context of game use. The items are presented in Table 4.2. Each statement is scored on a 5-point Likert scale (1 = 'totally disagree', 2 = 'disagree', 3 = 'disagree/agree', 4 = 'agree', 5 = 'totally agree').

Data analysis

Prior to the analyses, data were checked for normality. Because of skewness to the upper end of the distribution of the game use measure, a log10(x+1) transformation was performed to correct skew. First, correlations were calculated using PASW statistics 18. Structural equation analysis using Amos 19.0 with maximum likelihood estimation was used to test the hypothesized model of problematic game behavior. In this study, as suggested by Holbert and Stephenson (2002) the following model fit indices will be used: the Chi-square estimate with degrees of freedom given that it is still the most commonly used means by which to make comparisons across models (Hoyle & Panter, 1995). The ratio between Chi-square and degrees of freedom should not exceed 3 for models with a good fit (Ullman, 2001). Additionally, the standardized root mean squared residual (SRMR) as a second absolute fit statistic (Hu & Bentler, 1999) in combination with the Tucker-Lewis

index (TLI) as incremental index and the root mean squared error of approximation (RMSEA) (Browne & Cudeck, 1993) are reported. Hu and Bentler (1999) recommend using a cutoff value close to .95 for TLI in combination with a cutoff value close to .09 for SRMR to evaluate model fit and the RMSEA close to .06 or less.

4.3 Results

Social cognitive model of problematic game behavior

The results obtained from testing the validity of a causal structure of the hypothesized model showed that the initial model moderately fit the data, $\chi^2(684)$ = 1640.99, χ^2/df = 2.40, SRMR = .07, TLI = .89, RMSEA = .06 (90% confidence interval [CI]: .05, .06). Post hoc modification indices suggested an improved fit by correlating the error terms of escapism outcomes 3 with game addiction 3 (r = .59), and competition outcomes 1 with social outcomes (r = .53 - .60) (see Table 4.2). The respecified model generated a good fit, $\chi^2(682)$ = 1474.12, χ^2 /df = 2.16, SRMR = .06, TLI = .91, RMSEA = .05 (CI: .05, .06). The correlation matrix of the observed variables, experience, game use, and problematic game behavior is shown in Table 4.1.

Table 4.1. Correlations between outcome expectations, self-efficacy, game use, habit strength, deficient self-regulation and problematic game behavior (N = 443)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1.																						
2.	.27*																					
3.	.32*	.53*																				
4.	.25*	.32*	.44*																			
5.	.19*	.46*	.47*	.36*																		
6.	.20*	.62*	.53*	.44*	.53*																	
7.	.27*	.63*	.47*	.39*	.60*	.65*																
8.	.15*	.42*	.55*	.43*	.46*	.48*	.45*															
9.	.17*	.27*	.30*	.11*	.15*	.24*	.24*	.20*														
10.	.17*	.25*	.26*	.22*	.19*	.29*	.28*	.16*	.68*													
11.	.00	.04	.13*	.18*	.03	.03	.11*	.10*	.12*	.14*												
12.	.06	.11*	.13*	.17*	.06	.04	.09	.07	.14*	.19*	.58*											
13.	.01	-.08	.09	.11*	.02	-.03	-.05	.06	.04	.06	.50*	.39*										
14.	.23*	.32*	.29*	.41*	.25*	.41*	.37*	.23*	.32*	.39*	.11*	.14*	.08									
15.	.24*	.28*	.29*	.37*	.21*	.32*	.29*	.17*	.29*	.35*	.08	.10*	.12*	.66*								
16.	.17*	.21*	.31*	.59*	.23*	.36*	.30*	.26*	.18*	.31*	.21*	.22*	.18*	.60*	.51*							
17.	.20*	.37*	.27*	.22*	.28*	.31*	.34*	.19*	.53*	.51*	.14*	.18*	.05	.44*	.36*	.30*						

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
18.	.32*	.34*	.30*	.20*	.25*	.35*	.30*	.20*	.61*	.55*	.05	.15*	.02	.47*	.40*	.32*	.66*							
19.	.26*	.36*	.29*	.13*	.26*	.30*	.30*	.17*	.64*	.50*	.08	.15*	.03	.41*	.39*	.25*	.61*	.68*						
20.	.22*	.33*	.30*	.20*	.23*	.31*	.31*	.24*	.60*	.48*	.10*	.19*	.05	.45*	.39*	.29*	.55*	.70*	.66*					
21.	.16*	.38*	.31*	.19*	.25*	.33*	.31*	.24*	.51*	.53*	.05	.15*	.02	.46*	.41*	.35*	.60*	.66*	.61*	.61*				
22.	.19*	.39*	.40*	.21*	.21*	.43*	.30*	.28*	.48*	.54*	.15*	.17*	.06	.52*	.48*	.37*	.52*	.55*	.59*	.50*	.61*			
23.	.23*	.37*	.35*	.25*	.27*	.32*	.28*	.30*	.40*	.45*	.19*	.19*	.11*	.44*	.45*	.37*	.37*	.47*	.44*	.41*	.50*	.61*		
24.	.20*	.19*	.25*	.15*	.15*	.27*	.17*	.14*	.32*	.36*	.16*	.21*	.16*	.38*	.36*	.26*	.32*	.35*	.27*	.31*	.31*	.46*	.61*	
25.	.23*	.21*	.19*	.16*	.11*	.21*	.16*	.11*	.45*	.46*	.16*	.13*	.14*	.37*	.42*	.22*	.44*	.51*	.44*	.43*	.42*	.48*	.50*	.59*
26.	.18*	.31*	.28*	.20*	.22*	.32*	.29*	.21*	.39*	.45*	.19*	.15*	.12*	.48*	.48*	.38*	.42*	.44*	.42*	.43*	.48*	.40*	.57*	
27.	.21*	.50*	.47*	.39*	.45*	.52*	.50*	.50*	.27*	.33*	.12*	.19*	.05	.42*	.34*	.39*	.32*	.37*	.32*	.38*	.40*	.45*		
28.	.13*	.43*	.38*	.37*	.43*	.51*	.48*	.47*	.23*	.31*	.11*	.19*	.03	.44*	.37*	.39*	.31*	.34*	.31*	.35*	.40*	.42*		
29.	.14*	.46*	.46*	.39*	.45*	.51*	.51*	.50*	.23*	.28*	.13*	.13*	.01	.39*	.30*	.39*	.30*	.33*	.30*	.34*	.35*	.40*		
31.	.18*	.51*	.43*	.33*	.42*	.53*	.52*	.49*	.22*	.31*	.16*	.16*	.00	.42*	.30*	.36*	.33*	.39*	.33*	.41*	.42*	.44*		
32.	.34*	.19*	.32*	.22*	.15*	.30*	.15*	.29*	.26*	.18*	.14*	.14*	.19*	.36*	.31*	.28*	.22*	.29*	.22*	.24*	.24*	.23*		
33.	.50*	.29*	.36*	.30*	.26*	.31*	.25*	.30*	.17*	.23*	.12*	.12*	.02	.36*	.28*	.35*	.26*	.30*	.26*	.24*	.27*	.29*		
34.	.39*	.24*	.28*	.16*	.19*	.26*	.18*	.23*	.19*	.22*	.06	.06	.09	.28*	.22*	.23*	.25*	.33*	.25*	.29*	.28*	.27*		
35.	.42*	.23*	.40*	.27*	.28*	.32*	.24*	.36*	.22*	.26*	.11*	.18*	.13*	.32*	.29*	.31*	.27*	.29*	.27*	.25*	.22*	.29*		
36.	.24*	.08	.15*	.07	.08	.11*	.06	.14*	.23*	.12*	.15*	.13*	.16*	.14*	.13*	.08	.14*	.19*	.21*	.20*	.09	.12*		
37.	.18*	.04	.05	.03	-.05	.08	-.01	.02	.14*	.05	.17*	.11*	.16*	.13*	.13*	.09	.09	.16*	.13*	.15*	.04	.06		
38.	.19*	.10*	.14*	.05	.06	.08	.05	.11*	.16*	.08	.15*	.13*	.16*	.11*	.12*	.09	.09	.12*	.16*	.15*	.05	.10*		
40.	.08	-.06	.04	-.02	.02	-.02	-.05	.06	.07	-.01	.05	.04	.12*	.02	.09	.03	-.05	.01	-.01	.02	-.04	-.05		
41.	.09	.00	.05	-.01	.04	-.02	-.01	.06	.15*	.07	.11*	.07	.00	.06	.13*	-.02	.08	.08	.10*	.05	.02	.01		

Note. *Significant at the .05 level. ** Significant at the .01 level.

	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
24. NOV 1	.29**																
25. NOV 2	.38**	.55**															
26. NOV 3	.41**	.51**	.46**														
27. DSR 1	.38**	.24**	.23**	.43**													
28. DSR 2	.31**	.22**	.20**	.41**	.74**												
29. DSR 3	.38**	.13**	.14**	.36**	.70**	.72**											
30. DSR 4	.34**	.21**	.22**	.39**	.75**	.72**	.70**										
31. HAB 1	.27	.39**	.34**	.24**	.23**	.21**	.20**	.19**									
32. HAB 2	.31**	.24**	.16**	.25**	.42**	.38**	.38**	.38**	.47**								
33. HAB 3	.27**	.22**	.17**	.21**	.31**	.25**	.23**	.30**	.37**	.63**							
34. HAB 4	.30**	.30**	.20**	.26**	.42**	.35**	.34**	.34**	.51**	.75**	.53**						
35. SE 1	.20**	.25**	.24**	.14**	.07	.01	.05	.02	.33**	.15**	.19**	.25**					
36. SE 2	.11*	.17*	.17*	.11*	-.02	-.05	-.05	-.06	.26**	.09	.11*	.16**	.61**				
37. SE 3	.20**	.21**	.18**	.13**	.07	.05	.09	.04	.22**	.14**	.14**	.18**	.53**	.49**			
38. SE 4	.10*	.09	.03	-.01	-.07	-.09	-.06	-.12*	.21**	.09	.04	.19**	.46**	.58**	.43**		
39. EXP	.08	.09	.10*	.07	.04	.06	.04	.05	.19**	.04	.05	.11*	.22**	.12**	.20**	.18**	

Note. *Significant at the .05 level. ** Significant at the .01 level.

Table 4.2. Mean and standard deviation, Cronbach's α, factor loading, and squared multiple correlation of the observed indicators

Scale (Chronbach's α)	M	SD	β	R^2
Game use	5.97	7.15		.46
Problematic Game Behavior (α = .85)				.62
did you think about playing a game all day long?	1.19	.53	.74	.55
did you spend increasing amounts of time on games?	1.52	.83	.69	.48
did you play games to forget about real life?	1.59	.96	.50	.25
have others unsuccessfully tried to reduce your game use?	1.25	.69	.69	.47
have you felt bad when you were unable to play?	1.27	.65	.79	.63
did you have fights with others (e.g., family, friends) over your time spent on games?	1.20	.58	.78	.61
have you neglected other important activities (e.g., school, work, sports) to play games?	1.55	.85	.65	.43
Activity Outcomes (excluded from analysis)				
to relax from daily occupations	4.02	.77		
to enjoy myself	4.10	.69		
because it's a pleasant activity	3.97	.69		
Competition Outcomes (α = .80)				.63
to compete with others	1.95	1.15	.77	.60
to eliminate other players	1.68	.92	.86	.75
Achievement Outcomes (excluded from analysis)				
to progress in the game	2.97	1.25		
to reach a higher level as soon as possible	2.48	1.24		
Self-Reactive Outcomes (α = .74)				.06
when I'm bored	3.40	1.10	.83	.70
as a way to pass time	3.09	1.17	.69	.48
when I've got nothing else to do	3.57	.93	.59	.34
Escape Outcomes (α = .80)				.60
because I feel better in the game world than in the real world	1.70	.94	.86	.73
because in the game there are no boundaries like in the real world	1.92	1.09	.76	.58
to forget my problems	1.94	1.13	.62	.38
Social Outcomes (α = .88)				.76
to help others	1.62	.83	.74	.55

	M	SD	β	R^2
to have contact with others	1.71	1.0	.85	.73
to work together with others	1.74	.98	.81	.66
because I have an appointment in the game	1.63	.87	.80	.64
Status Outcomes (α = .78)				.97
to be part of an important group	1.46	.76	.77	.59
to collect item other players will never have	1.57	.84	.80	.65
to become powerful in the game	1.84	1.05	.66	.44
Novel Outcomes (α = .74)				.69
to play the latest games	2.35	1.24	.66	.43
to discover the latest player options	2.15	1.12	.71	.50
to play on the latest game console	1.59	.85	.75	.56
Deficient Self-Regulation (α = .91)				.39
I find it difficult to control my game behavior	1.47	.78	.87	.75
I have tried unsuccessfully to cut down on my play time	1.45	.75	.85	.72
I sometimes try to conceal how much time I play from my family or friends	1.50	.81	.82	.67
I feel my game playing is out of control	1.37	.71	.86	.73
Habit Strength (α = .83)				.36
I would miss video games if I could not play them anymore	2.83	1.21	.58	.34
Playing video games is part of my usual routine	2.19	1.12	.88	.78
I find myself playing video games about the same time each day	2.36	1.14	.68	.47
Playing video games is a habit I have gotten into	2.57	1.17	.84	.71
Self-Efficacy (α = .81)				.07
I have the knowledge and skills to play games	3.76	.88	.77	.59
It would be no problem for me to play games	3.81	.82	.79	.62
I can solve game related problems myself	3.42	.98	.66	.43
I would handle games without the help of others	4.00	.89	.66	.44

Note. The R^2 of a latent dependent predictor is the percentage of the variance in the latent dependent variable accounted for by the latent independent variable. The R^2 of an observed indicator is the estimated percentage variance explained in that variable. In other words, the error variance of a variable is approximately 1 minus the percentage of the variance of the variable itself. *M*, mean; *SD*, standard deviation; β, factor loading; R^2, squared multiple correlation.

Table 4.2 summarizes the mean and standard deviation, Cronbach's α, the factor loading (β), and the squared multiple correlation (R^2) of the observed indicators to explain problematic game behavior. The path model with standardized path coefficients is featured in Figure 4.2.

All hypotheses were supported (see Figure 4.2), although some constructs were only indirectly related. H1 predicted that self-efficacy, expected outcomes, habit strength, and deficient self-regulation are positively related to game use. The standardized path

coefficients in Figure 4.2 show a significant direct effect of habit strength on game use (β = .70). The direct effect of outcome expectations on game use was non-significant. There is an indirect effect of outcome expectations on game use (β = .14), mediated by the direct effect of habit strength on game use. There is a significant negative direct effect of deficient self-regulation on game use. The indirect effect of deficient self-regulation on game use (β = .26) is mediated by the direct effect of habit strength on game use. The total effect of deficient self-regulation on game use mediated by habit strength is positive (β = .07). There is a significant direct effect of self-efficacy on game use. The indirect effect of self-efficacy on game use is mediated by the indirect effect of outcome expectations on game use via habit strength (β = .03), by the indirect effect of outcome expectations on game use via deficient self-regulation (β = -.02), and by the direct effect of habit strength on game use (β = .15). The total effect of self-efficacy on game use mediated by outcome expectations and habit strength is positive (β = .26).

H2 predicted that self-efficacy, expected outcomes, and deficient self-regulation are positively related to habit strength. The standardized path coefficient shows a significant direct effect of self-efficacy, a significant effect of expected outcomes, and a significant effect of deficient self-regulation on habit strength. Self-efficacy also had an indirect effect on habit strength (β = .04), mediated by the direct effect of expected outcomes on habit strength. The total effect of self-efficacy on habit strength mediated by expected outcomes is positive (β = .26).

H3 predicted that self-efficacy will be positively related to expected outcomes. The standardized path coefficient shows a significant positive direct effect of self-efficacy on expected outcomes on habit strength.

H4 predicted that experience is positively related to self-efficacy and habit strength. The standardized path coefficient shows a significant positive direct effect of experience on self-efficacy. The direct effect of self-efficacy on habit strength was non-significant. The indirect effect of experience on habit strength is mediated by the indirect effect of self-efficacy on habit strength via expected outcomes (β = .01) and by the direct effect of self-efficacy on habit strength (β = .06). The total effect of experience on habit strength is positive (β = .07).

H5 predicted that expected outcomes are positively related to deficient self-regulation. The standardized path coefficient shows a significant direct effect of expected outcomes on deficient self-regulation.

H6 predicted that game use, habit strength and deficient self-regulation will be positively related to problematic game behavior. The standardized path coefficient shows a significant direct effect of game use and deficient self-regulation on problematic game behavior. Deficient self-regulation also had an indirect effect on problematic game behavior via two ways. First, mediated by the direct effect of deficient self-regulation on habit strength and the direct effect of habit strength on game use (β = .03) and second, mediated by the indirect effect of deficient self-regulation on problematic game behavior via game use (β = -.02). The total effect of deficient self-regulation on problematic game behavior mediated by habit strength is positive (β = .75).
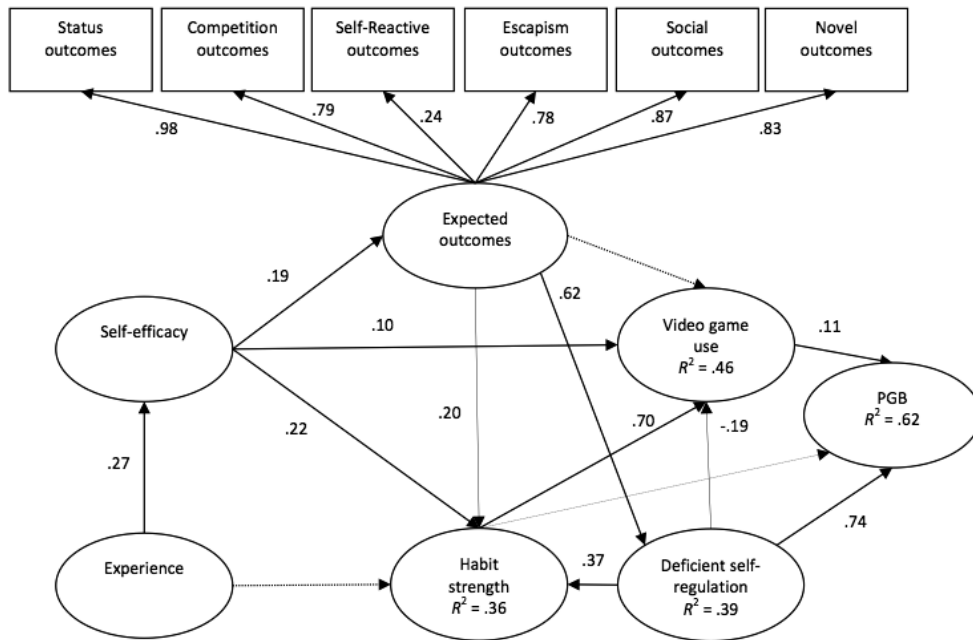

Figure 4.2. Standardized path coefficients of the social cognitive model to explain game use and problematic game behavior.
Note. *Significant at the .05 level, dotted lines are non-significant paths (*ns*), PGB = Problematic game behavior.

The direct effect of habit strength on problematic game behavior was non-significant. The indirect effect of habit strength on problematic game behavior (β = .08) is mediated by the direct effect of game use on problematic game behavior. The total effect of habit strength on problematic game behavior mediated by game use is positive (β = .08).

Squared multiple correlations provide information about the variance accounted for by the complete set of variables and showed that the model accounted for 62% of variance in problematic game behavior (see Table 4.2).

4.4 Discussion

The results show that the hypothesized social cognitive model of problematic game behavior fit the data, all hypotheses were supported. From the results it can be concluded that deficient self-regulation and habit strength both play an important role in explaining problematic game behavior. Deficient self-regulation had a positive direct effect on habit strength, suggesting that loss of self-control over game use could lead to more habitual game behavior, which in turn may result in higher playing time. Deficient self-regulation had a direct negative effect on game use, which was mediated by habit strength, implying that deficient self-regulation leads to stronger gaming habits but not necessarily to excessive patterns of use. This is consistent with earlier research among Internet users conducted by LaRose et al. (2003). They found that people spend more time on the Internet because they experience loss of self-control and in turn develop repeated pattern of Internet use. The results indicate that although stronger gaming habits lead to higher playing frequency, there was no direct relationship with problematic game behavior. Thus, habit strength only lead to problematic use if playing frequency increases.

Game use only had a small positive direct effect on problematic game behavior. This suggests that the experience of game behavior as a problem is largely independent of the amount of playing time. Deficient self-regulation had a strong positive direct effect on problematic game behavior. This implies that loss of self-control leads directly to more experience of problematic game behavior. LaRose et al. (2003) concluded that media addiction is the same as unregulated media consumption. If someone has the experience that behavior is no longer under control it may become problematic, even if playing time itself is at a modest level. This study demonstrates that deficient self-regulation and problematic game behavior are closely related constructs. An explanation for this finding is that some of the items of the game addiction scale overlay some of the items to measure deficient self-regulation. Furthermore, there were similarities between some items from the game addition scale and items used for measuring self-reactive outcomes and escapism outcomes. In other words, some of the criteria that are used to measure problematic game behavior are comparable with the theoretical constructs used in this study in which

relations between certain cognitions are tested. These criteria could be considered as cognitions related to problematic game behavior. Caplan (2010) suggested that theory-based measurement models should be confirmed and also test the hypothesized structural model in order to better understand problematic use. Although the scale used for measuring problematic game behavior was developed and validated using confirmatory analyses, it was not tested as a structural model. In this study a causality approach from a social cognitive perspective is used. Hypotheses on the relation between the constructs are tested in order to investigate underlying mechanism of problematic game behavior. This is different from a categorical approach based on the DSM in which problematic game behavior is measured as a categorical variable and classification is done on basis of symptoms. Using a causality approach gives more insight in the mechanisms underlying problematic game behavior.

Expected outcomes of playing video games are part of the explanation for the amount of time people spend on gaming and for the degree in which people develop habitual patterns of gaming. The relationship between outcomes and use is fully mediated by habit strength. Once habitual playing patterns are formed, individuals are probably less influenced by the expected outcomes they have of playing games. It is possible that individuals who just started playing games have more active consideration of their expected outcomes as individuals who are more experienced gamers. In a study on the adoption of mobile phone usage, Peters (2009) suggested the influence of individual habitualization. The process of habitualization for mobile phone use is almost complete; therefore the effect of expected outcomes no longer has influence on mobile communication technology behavior. This also might be the case for game behavior. Expected outcomes only had minor influence in explaining habit strength and game use. However, expected outcomes were strongly related with deficient self-regulation, suggesting that expectations about game behavior strongly influence the degree of perceived self-control over game behavior. Given the fact that some expected outcomes were relatively high correlated with items measuring deficient self-regulation and problematic game behavior (i.e., status outcomes), it is possible that some expected outcomes have a direct influence. Lee and LaRose (2007) found a direct relationship between self-reactive outcomes and deficient self-regulation. Self-reactive outcomes were less important than other outcome categories, suggesting that, for example, expectations about socializing and competing were more active than expectations about regulating a negative psychological state. The current study included new outcome categories as some of the motives from the broader literature on gaming motivation does not seem to fit within the definition of the incentive categories. From our

results it seems that competition outcomes, novel outcomes, social outcomes, status outcomes, and escape outcomes were closely related constructs.

In this study self-efficacy had a direct and indirect effect via outcome expectations on habit strength. The feeling that someone is capable of playing video games, in terms of gaming skills and problem solving, influences outcome expectations and habit strength. This is consistent with earlier findings in other contexts (LaRose & Eastin, 2004). Self-efficacy also had a direct effect on game use, confirming earlier findings (LaRose & Eastin, 2004; LaRose et al., 2003).

Limitations and suggestions for future studies

The measurement of activity and achievement outcomes as latent indicators to explain game use was limited in terms of reliability; these constructs were excluded from further analysis. Although achievement outcomes, competition outcomes, and escapism outcomes were identified as new outcome categories, the operationalization needs further improvement. For example, achievement outcomes also might be considered as status outcomes because they also are related to winning and being important. In future studies, the items should be developed more specifically to match game behavior to permit a stronger operationalization of the latent constructs.

To improve the fit of the model to explain problematic game behavior, post hoc modification indices suggested the correlation between several constructs. In particular the error terms of the items of the scale used for measuring problematic game behavior were correlated to improve the fit of the model. As mentioned earlier, this is probably because some of the items are closely related to deficient self-regulation and escapism outcomes.

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Chapter 5

Assessing problematic video gaming using the Theory of Planned Behavior: A longitudinal study of Dutch young people

Abstract

Although excessive video gaming has been linked to a range of psychological problems in young people, there have been few systematic attempts to conceptualize problem gaming using established psychological theory. The aim of this study was to examine problematic game use (PGU) using the Theory of Planned Behavior (TPB). A two-wave, six-month longitudinal study examined relationships between core components of the TPB model, video gaming activity and problematic video-game play. Respondents were recruited from nine pre-vocational and senior vocational schools in the western region of the Netherlands. The sample consisted of 810 video game-playing adolescents and young adults (72.8% boys) aged 12 to 22 years. The results showed that TPB predictors, including subjective norm, perceived behavioral control (PBC) and descriptive norm, explained 13% of the variance in video gaming intention. Although TBP variables accounted for a significant amount of variance in PGU scores at baseline, the TPB model was less useful in predicting future gaming behavior and PGU. Perceived behavioral control was found to be the most important factor in predicting problem video-gaming behavior, this has some practical implications with regard to the treatment of problem video-gaming among young people. For example, assessing a client's perceived lack of control over gaming may be a simple but useful screening measure to evaluate risk of future problem play. Furthermore, treatment strategies may be aimed at helping the client to rebuild self-control.

5.1 Introduction

In the last two decades, there has been growing academic attention on the phenomenon of problematic game use (PGU) (Gentile et al., 2011; King & Delfabbro, 2010a; Lemmens, Valkenburg, & Peter, 2011). Empirical research has consistently identified a subgroup of gamers in Western, industrial countries who report adverse psychosocial consequences related to their video-gaming behavior (Gentile, 2009; King & Delfabbro, 2010b; Ko, Yen, Chen, Chen, & Yen, 2005; Mentzoni et al., 2011; Rehbein, Kleimann, & Mößle, 2010). In the Netherlands, Haagsma, Pieterse, and Peters (2012) reported a prevalence rate of 1.3 % for problematic game use among adolescents and adults. Similarly, Van Rooij , Schoenmakers, Vermulst, Van den Eijnden, & Van de Mheen (2011) reported that 1.5% of Dutch adolescents could be classified as `problematic' gamers. PGU has been associated with a range of psychological problems, such as reduced sleep time (Rehbein et al., 2010), attention problems and worse school achievement (Gentile, 2009), anxiety and depression (Mentzoni et al., 2011) and lower life satisfaction (Ko et al., 2005). Although many studies have examined correlated and risk factors associated with PGU (Lemmens et al., 2011), very few studies have examined PGU using an established theoretical framework (Lee & LaRose, 2007; Liu & Peng, 2009).

Theory of Planned Behavior

The Theory of Planned Behavior (TPB; Ajzen, 1991) is proposed to offer new insights into the mechanistic pathways of problem game use. The TPB model, based on the Theory of Reasoned Action (Fishbein & Ajzen, 1975), included the perceived behavioral control (PBC) construct to enable more accurate predictions of intention and behavior (Ajzen, 1991). According to the TPB, one's behavior is determined by an intention to engage in a particular behavior. Intention is a function of three social-cognitive constructs: attitude, subjective norm, and perceived behavioral control. Attitude refers to the overall positive or negative evaluation of a particular behavior. The more favorable an attitude towards excessive gaming, for example, the more likely it is that someone will play excessively. Subjective norm refers to perceived expectations of others to perform (or not to perform) a certain behavior. Thus, if someone perceives that significant others expect that he or she should not spend too much time on gaming, this will result in lower intention to do so. Perceived Behavioral Control (PBC) refers to one's perception of how difficult it is to perform the behavior. The more control one has over their gaming behavior, the lower the intention to

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play excessively will be. Besides a mediated effect through behavioral intention, PBC also reflects actual control in that it may have a direct impact on performance of the behavior as well.

The TPB model has good predictive validity for a range of behavioral intentions and actual behaviors, and has been applied to several media-using behaviors. For example, Pelling and White (2009) reported that attitude and subjective norm were significantly related to intention to engage in high levels of online social networking. Intention also significantly predicted excessive social networking behavior one week later. Another study by Wu and Tang (2012) examined the TPB in relation to problem gambling. They reported that attitudes, subjective norm, and perceived control were significantly related to gambling intentions, whereas intention and PBC were significantly related to problem gambling symptoms. Some research studies have examined the TPB in relation to video game playing. Hsu and Lu (2004) found that subjective norm and attitude were related to intention to play online games. Lee and Tsai (2010) reported that attitudes, subjective norm and PBC had a positive influence on players' intention to play online games. However, these studies focused on gaming intentions and video game use in general, and not specifically problematic video gaming behavior. Thus, the extent to which the TPB model may explain *problematic* video game use remains empirically untested.

Extension to the TPB: Social Influences

It has been suggested that the TPB model may be improved by the inclusion of additional social influences underpinning behavior (Grube, Morgan, & McGree, 1986). Social influences refer to the process whereby thoughts, feelings, and actions are directly or indirectly influenced by other persons. Rivis and Sheeran (2003) have suggested that descriptive norm and social pressure may be important social determinants of behavior (Rivis & Sheeran, 2003). Research studies (De Vries, Backbier, Kok, & Dijkstra, 1995; Sheeran & Orbell, 1999; Rivis & Sheeran, 2003) report that social influences include three separate constructs: subjective norm, descriptive norm, and direct social pressure. Descriptive norm refers to perceptions of how significant others are behaving, and thus indirectly to significant others' own opinions and actions. Subjective norm refers to perceived expectations of others to perform a certain behavior and has been termed `group-norms'. Social pressure refers to the perceived direct influence exerted by others in a group situation, and can be considered as actual pressure that a person encounters rather than group-norms.

Video gaming is an increasingly social activity (Cole & Griffiths, 2007; Jansz & Martens, 2005). Research has reported that social interaction, especially within online games, may be an important motivator for people to initially play video games and subsequently maintain a long-term interest in the activity (Cole & Griffiths, 2007; Yee, 2006). Games also function as a way to make new friends (Klimmt, Schmid, & Orthmann, 2009) and to consolidate social relationships through shared gameplay (Griffiths, Davies, & Chappell, 2004; Klimmt et al., 2009). Thus, it was expected that social influences would have a significant impact on gaming time and PGU.
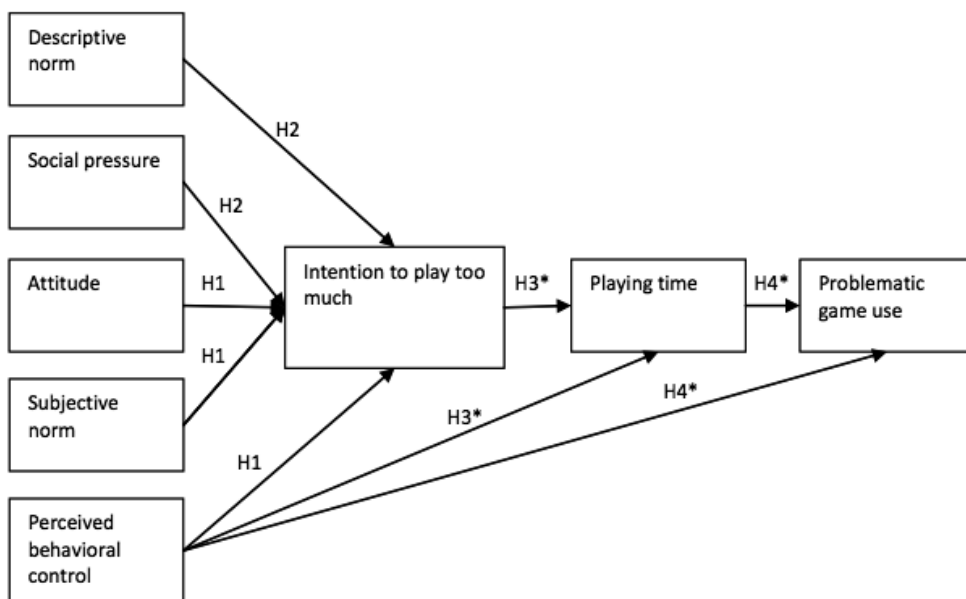

Figure 5.1. The hypothesized TPB model of problematic video game play.
Note. *Hypotheses were tested at Time 1 (H3a/H4a) and Time 1 and 2 (H4a/H4b)

The aim of this study was to examine PGU using an extended TPB model. Therefore, the cognitive behavioral dimensions of our model referred to excessive game use rather than game use in general. Since an objective criterion of excessive game use is lacking, we choose a relative criterion to operationalize excessive game use. Excessive gaming was defined according to the self-perception that one spends too much time on gaming. Figure 5.1 presents a summary of the proposed model. Playing time was also included in the model as a mediating variable. Although high levels of gaming activity have been shown to not necessarily lead to PGU (Griffiths, 2010), research evidence does suggest that playing time and PGU are significantly positively correlated (Haagsma et al., 2012; Lemmens et al,

2011). The following hypotheses were proposed:

H1. Intention will be related to Attitude, Subjective Norm and PBC.

H2. Descriptive Norm and Social Pressure will be related to Intention (2a). Both constructs will explain a significant amount of the variance in Intention after controlling for the TBP predictors (2b).

H3. Intention and PBC will be significantly related to video gaming activity (3a) and predict video gaming activity six months later (3b).

H4. PBC and video gaming activity and will be related to problematic game use (4a) and PBC will predict problematic game use six months later, both directly and indirectly, mediated by video gaming activity at follow-up (4b).

5.2   Method

Respondents

An initial sample of 810 Dutch adolescents and young adults (72.6% male) from pre-vocational and senior vocational schools took part in this study. They were aged 12 to 22 years, and their mean age was 15.7 years (SD = 1.7). This project was part of a larger research study on the health and well-being of adolescents. Inclusion criterion for the present study was current regular (i.e., weekly) video gaming activity. Participants' mean playing time was 17.2 hours per week (SD = 20.5). At six-month follow up (Time 2), complete data were obtained for 288 respondents (69.1% male). Mean video gaming time per week in this group was 17.5 hours (SD = 20.6) at Time 1, and 11.3 hours (SD = 17.9) at Time 2.

Procedure

This study was conducted in collaboration with the Brijder Addiction Care Group, one of the largest addiction care organizations in the Netherlands. Brijder is located in the Western regions of the country. Pre-vocational and senior vocational schools in the working area of Brijder were selected to participate in this study. In the pre-vocational schools, the 9th to

12th classes were invited to participate; in the senior vocational schools all classes were invited to participate. The schools were initially invited by telephone or email. A follow-up invitation letter gave a short explanation of the aim of the study, background information about PGU, the relevance of the study, and instructions for participation. An information letter and consent form was also provided for all parental authorities. Nine schools participated, including four pre-vocational schools and five senior vocational schools.

Data were primarily collected using an anonymous online questionnaire. The first wave of data collection was conducted in September and October 2010. In total, 1,488 adolescents (50.6% male) aged 12 to 22 years participated in Wave 1 (Time 1), of which 810 (54.4%) respondents were classified as video game players. Wave 2 (Time 2) of data collection was conducted in March and April 2011. A total of 967 participants (53.6% male, attrition rate: 35%) responded. After screening data to eliminate cases with missing identification codes and/or missing data, 288 respondents remained with complete data on both waves. Independent sample t-tests showed that of the initial 810 respondents who, the 522 respondents who did not complete the second wave of the study had lower scores on descriptive norm (M = 1.87, SD = .96), t (808) = 2.33, $p <$ .05, than the 288 respondents who remained with complete data on both waves of the study (M = 2.02, SD = 1.07).

Measures

Theory of Planned Behavior (TPB) Questionnaire.

This 13-item questionnaire was based on research on the TPB (Ajzen & Madden, 1986; Rivis & Sheeran, 2003). This questionnaire was used to assess six components of the TPB: Attitude, Subjective Norm, PBC, Descriptive Norm, Social Pressure and Intention. Items were reworded so that the target behavior referred to excessive video gaming. Because the focus of this study was on problematic game use and not game use in general, the psychosocial variables were operationalized to measure cognitions regarding to risk full game use instead of game use in general. Risk full game use was defined as `spending too much time on gaming', in such a way that other activities suffer from this behavior. The constructs were operationalized as direct measures rather than belief-based measures, as direct measures tend to be more valid (Ajzen, 1991; Ajzen & Fishbein, 1980). Attitude was measured by two items (e.g., ``What do you think about spending too much time on gaming?''). Subjective norm was measured by three items (e.g., ``My classmates think that I should not spend too much time on gaming''). Perceived behavioral control (PBC) was

measured by one item (i.e., ``For me, not spending too much time on gaming is difficult''. Descriptive norm was measured by three items (e.g., ``How many of your classmates spend too much time on gaming?''). Social pressure was measured by three items (e.g., ``How often do you have the feeling that your classmates want you to continue playing games?''). Intention was measured by three items (e.g., ``I intend to spend too much time on gaming the next month''). Each subscale was scored using a 5-point Likert scale, employing response categories such as `totally agree' to `totally disagree' or an appropriate equivalent. The internal consistency for each subscale ranged from good to excellent (α = .82 to .96)

Playing time.

Video gaming activity in the preceding six month period was measured by asking on how many week days (Monday to Thursday) and weekend days (Friday to Sunday) video games were typically played. Video game genre (e.g., MMORPG's, shooters, racing, RPG) was also assessed. Participants were asked to report the amount of time (hours and minutes) they tended to play a video game on an average weekday and an average weekend day. Total playing time on week days and weekend days were calculated separately, and then summed to assess the average total weekly playing time.

Game Addiction Scale (GAS).

The Dutch version of the Game Addiction Scale (Lemmens, Valkenburg, & Peter, 2009), was used to assess problematic game use (PGU). This scale includes 7 items modeled on the criteria for pathological gambling in the Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV) (American Psychiatric Association [APA], 1994). This scale includes one item for each of the seven underlying criteria of pathological gaming: `During the last six months how often…' (1) Salience: ``Did you spend all day thinking about playing a game?'' (2) Tolerance: ``Did you start spending increasing amounts of time on games?'' (3) Mood modification: ``Have you played games to forget about real life?'' (4) Relapse: ``Have others unsuccessfully tried to reduce your game use?'' (5) Withdrawal: ``Did you felt bad when you were unable to play?'' (6) Conflict: ``Did you have fights with others (e.g., family, friends) over your time spent on games?'' (7) Problems: ``Have you neglected other important activities (e.g., school or work) to play games?'' Each statement is scored on a 5-point scale (1 = `never', 2 = `rarely', 3 = `sometimes', 4 = `often', 5 = `very often'). The scale has good internal consistency (α = .84) and has demonstrated good convergent and criterion validity (Lemmens et al., 2009; 2011). Consistent with Lemmens

(2009), problematic game use was indicated by meeting all of the criteria.

Statistical analysis

Independent-samples t-test and one-way ANOVA were used to examine differences between subgroups (i.e. gender, age) in regard to the TPB variables, playing time and PGU. Bivariate correlations were used to examine relations between TPB variables, playing time and PGU. Structural equation modeling was employed to test the hypotheses. First, a cross-sectional model was tested as an initial test of the hypotheses in the overall sample (N = 810) to test H1, H2, H3a and H4a. Second, a predictive model was tested to test H3b and H4b in the sample who completed both waves of the study (n = 288).

5.3   Results

Correlations between TPB variables, intention to play excessively, playing time and PGU

Of the 810 respondents who played games, 2% (n = 16) was classified as problematic video-gamers. Boys (M = 20.4 hours, SD = 21.6) spent significantly more time on gaming each week than girls (M = 8.6 hours, SD = 15.7; t (527.65) = 8.60, $p <$ .001). Boys also reported significantly higher PGU scores (t (512.77) = 9.82, $p >$ .001, $p >$ .05), with a mean score of 1.85 (SD = .71) as compared to a mean score of 1.39 (SD = .54) among girls. There were no significant differences in terms of age and education on playing time or PGU. Table 5.1 presents a summary of the bivariate correlations between the TPB variables, playing time and PGU, for the overall sample at Time 1.

Structural Equation Modeling was used to test the hypotheses H1, H2, H3a and H4a. Attitude, Subjective Norm and PBC were included as predictors of Intention. In a second and third step, Descriptive Norm and Social Pressure were added, in order to examine the additional influence of Descriptive Norm and Social Pressure. Figure 5.2 presents a graphical representation of the results of the final model.

The initial model showed a poor fit (χ^2 (112) = 1091.41, χ^2/df = 9.75, SRMR = .12, CFI = .87, TLI = .84, RMSEA = .10 (90% Confidence Interval (CI): .10, .11)). Post hoc modification indices suggested an improved fit by correlating the error terms of PGU 1 with PGU 4, PGU

Table 5.1. Correlations between psychosocial variables, playing time, and problematic game use (*N* = 810)

Time 1	1	2	3	4	5	6	7
1.Attitude							
2. Subjective norm	.06						
3. PBC	-.24*	-.14*					
4. Descriptive norm	.25*	.28*	-.30*				
5. Social pressure	.20*	.43*	-.24*	.59*			
6. Intention	.18*	.03	-.29*	.26*	.19*		
7. Playing time	.29*	.16*	-.35*	.32*	.30*	.30*	
8. PGU	.39*	.17*	-.45*	.40*	.38*	.28*	.47*

Note. *Significant at the .05 level.

1 with PGU 5 and PGU 1 with PGU 7. The respecified model generated an adequate fit, (χ^2 (109) = 568.52, χ^2/df = 5.23, SRMR = .10, CFI = .94, TLI = .93, RMSEA = .07, (CI: .07, .08)). The results showed that the TPB variables explained 9% of the variance in Intention. Attitude and PBC emerged as significant predictors whereas Subjective Norm was not significant. Therefore, hypothesis 1 was partially supported. PBC and Intention had a significant influence on playing time, and PBC and playing time had a significant influence on PGU. The addition of Social Pressure increased the amount of variance explained in Intention to 11% (χ^2 (156) = 682.76, χ^2/df = 4.38, SRMR = .10, CFI = .94, TLI = .93, RMSEA = .07 (CI: .06, .07)). After entering Social Pressure, the beta weights for Subjective Norm were significant. The addition of Descriptive Norm increased the amount of variance explained in Intention to 13% (χ^2 (211) = 932.94, χ^2/df = 4.42, SRMR = .11, CFI = .93, TLI = .92, RMSEA = .07 (CI: .06, .07)). After entering Descriptive Norm, the beta weights for Attitude and Social Pressure were no longer significant. Therefore, hypothesis 2 was partially supported, as Descriptive Norm added explained variance in Intention, after controlling for the TPB constructs. The explained variance of playing time and PGU did not increase. Overall, demographics and the TPB variables explained 13% of variance in Intention scores, with Subjective Norm, PBC and Descriptive Norm as significant variables. PBC and Intention had a significant influence on playing time, supporting hypothesis 3a. PBC and playing time had a significant influence on PGU, supporting hypothesis 4a.
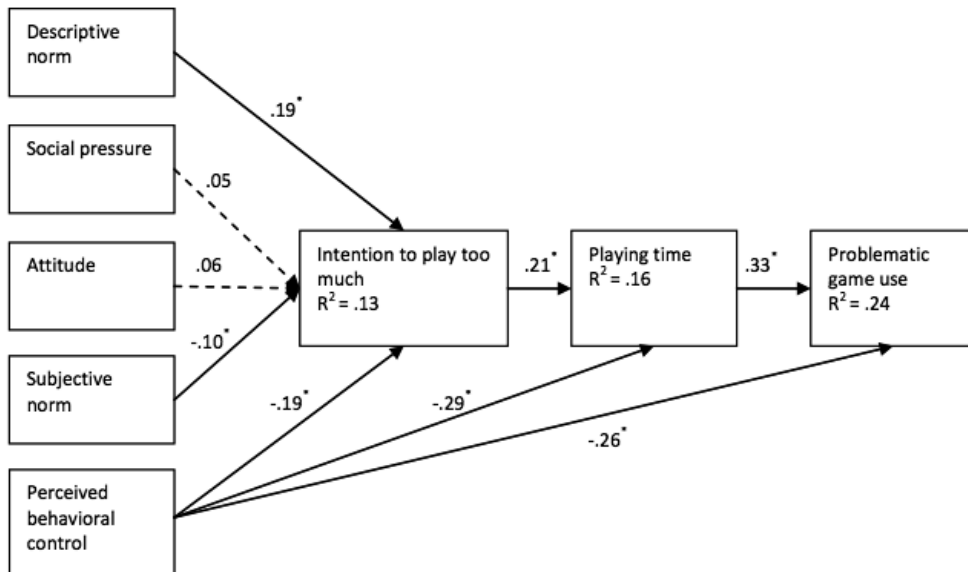
Figure 5.2. Results of the structural equation modeling at Time 1.
Note. *Significant at the .05 level.

Testing the hypothesized TPB model using longitudinal data

Table 5.2 presents a summary of demographic and video-gaming variables at Time 1 and 2 of the 288 respondents who completed two waves of the studies. Repeated measures ANOVAs were conducted to assess within-group differences on these factors. Significant gender differences were identified, with males spending more time on video-gaming F (1, 283) = 29.35, $p < .05$, and reporting higher levels of PGU than females at Time 1 and Time 2, F (1, 283) = 23.02, $p < .05$. According to age and education type there were no significant differences on gaming time and PGU.

Structural Equation Modeling examined the longitudinal relationship between psychosocial variables at Time 1, and playing time and PGU at Time 2. Figure 5.3 presents a diagrammatic representation of the results of the final model. Gender was included as a control variable.

The hypothesized model showed an adequate fit (χ^2 (214) = 654.33, χ^2/df = 3.06, SRMR = .09, CFI = .89, TLI = .87, RMSEA = .09 (CI: .08, .09)). The TPB variables explained 12% of the variance in Intention. Attitude and PBC emerged as significant predictors. Intention and PBC had a significant direct effect on playing. Hence, hypothesis 3b was supported. PBC

Table 5.2. Demographics, gaming time and score on problematic game use (n = 288)

| | | | Time 1 | | | | Time 2 | | | |
| | | | Gaming time (hours/week) | | PGU | | Gaming time (hours/week) | | PGU | |
Variable	N	%	M	SD	M	SD	M	SD	M	SD
Gender										
Boys	199	69.1	21.9	22.1	1.88	.71	14.7	19.7	1.51	.61
Girls	89	30.9	7.6	11.9	1.41	.59	3.6	9.3	1.22	.53
Age										
13-15	172	59.7	16.4	19.4	1.76	.72	10.4	16.9	1.41	.58
16-18	93	32.3	18.5	21.3	1.68	.68	12.3	17.0	1.40	.60
> 19	23	8.0	22.5	25.7	1.80	.79	14.0	26.7	1.55	.77
Education										
Pre-vocational education	189	65.6	16.7	20.0	1.77	.72	10.2	16.4	1.44	.61
Senior vocational education	99	34.4	19.0	21.7	1.67	.68	13.3	20.3	1.39	.58
Total	288	100	17.5	20.6	1.74	.71	11.3	17.8	1.42	.60

and playing time at follow up directly affected PGU, supporting hypothesis 4b. Other significant relationships between psychosocial variables and Intention emerged than in the initial sample; Attitude and PBC had a significant direct effect on Intention, but Subjective Norm and Descriptive Norm did not emerge as significant predictors of Intention. Attitude, PBC and Intention explained 6% of the variances in playing time six months later. Attitude, PBC and Intention explained 19% of the variances in PGU six months later, after controlling for playing time at follow-up.

5.4 Discussion

This study tested the utility of the Theory of Planned Behavior (TPB) model in explaining video gaming activity and problematic video-game use (PGU) among Dutch young people. The results showed that the model demonstrated a good overall fit and explained a significant portion of the variance in respondents' intention to engage in problematic video-gaming. Specifically, subjective norm, descriptive norm and PBC were significantly related to intention and explained a total of 13% of the variance in video-gamers' intention
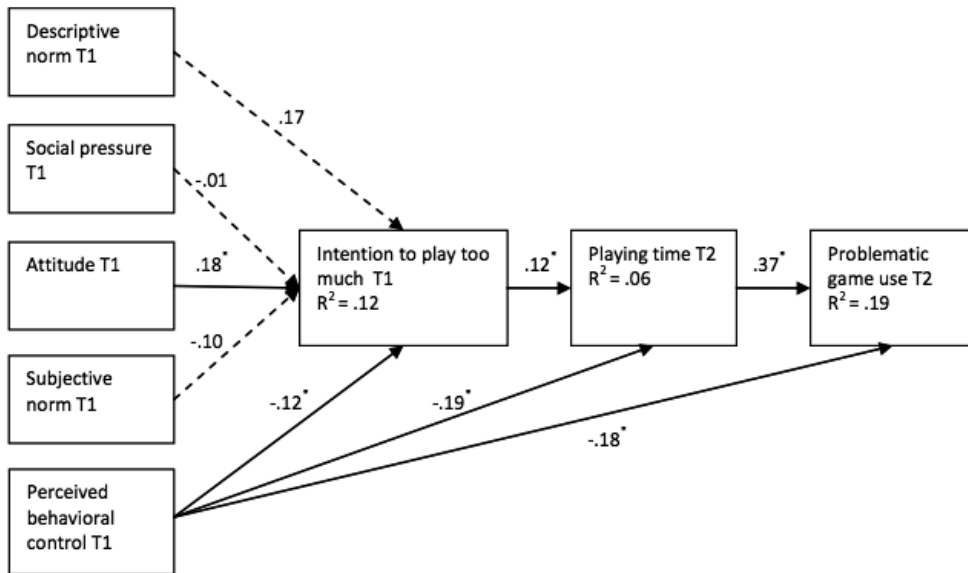
Figure 5.3. Results of the structural equation modeling including psychosocial variables at Time 1, and playing time and PGU at Time 2.
Note. *Significant at the .05 level at least.

scores. At six-month follow-up, the TPB model had a moderate fit. Attitude, PBC, and intention at baseline had a significant influence on PGU, after controlling for video gaming time at follow-up. PBC also had a direct effect on PGU. Perceived behavioral control emerged as the most significant predictor of PGU over time. Overall, the baseline psychosocial variables, including playing time at follow-up accounted for 19% in variance of PGU at a six month follow-up. Thus, although the overall TPB model appears to be useful in explaining PGU generally, PBC emerged as the most significant predictor of PGU over time.

The most important predictors of PGU in the cross-sectional model were descriptive norm, subjective norm and lack of perceived behavioral control. Respondents who perceived that more significant others play video games excessively and perceived lower expectations from others to play excessively, were more likely to report an intention to play excessively. However, when considering excessive video gaming over time (i.e., using Time 1 and 2 data), the most significant factors in predicting PGU were positive attitudes towards excessive gaming and lack of perceived behavioral control. Respondents who reported a more positive attitude towards excessive gaming were more likely to report an intention to spend excessive time on gaming. Furthermore, lower perceived behavioral control (i.e., the

ability of a person to self-regulate their video-gaming behavior) predicted playing time and PGU. This was consistent with the broader literature on addiction, which has reported that impaired control or deficient self-regulation is the distinguishing feature of an addictive behavior (Fillmore, 2003; O'Connor & Dickerson, 2003).

In comparison to past empirical research on addictive behaviors, the total variance explained by the TPB model was relatively low despite its statistical significance. In Wu and Tang's (2011) study of gamblers, the TPB model explained 56% of the variance in gambling intention among individuals who had gamble experience in their lifetime. Similarly, Pelling and White (2009) reported that TPB predictors explained 68% of the variance in intention to engage in online social networking use (e.g., Facebook, MySpace, etc.) among both users and non-users. An explanation is that in this study, intention was defined as an intention to play video games for an excessive period of time rather than a more generalized type of intention to play video games. These results suggest that most respondents may not purposefully intend (i.e., make an *ad hoc* decision) to play video games excessively. Rather, excessive video gaming may occur as a consequence of initiating a video-gaming session, and be maintained by various social (e.g., pressure from others to continue gaming) and cognitive (e.g., thinking ``just one more level'') factors over the course of the gaming session. If playing excessively is less goal-oriented or rational, it is difficult to predict or explain this kind of behavior using a model that relies on an assumption of rational forethought. Nevertheless, these data suggest that, at least for some video-gamers excessive video-gaming may occur with preplanning and awareness of the intention to engage in excessive play.

Furthermore, differences in the definition of the `target behavior' and the operationalization of the TPB constructs could have accounted for the relatively lower variance explained in the present study. There was inconsistency between the TPB variables and playing time as dependent variable. Playing time was not negatively formulated and may have been less biased by social desirability than the TPB variables. This may have led to the low explained variance in the analysis of playing time. However, this does not explain the low variance in intention scores, as the operationalization of the TPB variables (i.e., attitude, social norm) and intention were compatible. Thus, a bias due to negative formulation would be similar in both the TPB variables and intention. A similar problem occurred in the analysis with problematic game behavior as dependent variable. The definition of the `target behavior' (problematic game behavior) was not entirely compatible to the operationalization of the TPB constructs. More specifically, the

dependent variable problematic game behavior was assessed with a game addiction scale. We assumed that the subjective experience of spending too much time on gaming will reflect problematic game behavior. However, it is possible that an intention to spend too much time on gaming does not necessarily lead to problems. Although the scale used to measure problematic game behavior does not specifically assess whether respondents spend too much time on gaming, it does include behavioral criteria that are related to spending too much time on gaming (e.g., ``Did you have fights with others (e.g., family, friends) over your time spent on games?''). Therefore, operationalizing problematic game behavior as spending too much time on gaming seems a valid choice.

Subjective norm had a small but significant influence on intention in the initial sample. Respondents who held socially constructed expectations about not engaging in excessive gaming demonstrated lower scores on intention to engage in excessive gaming. However, when examined longitudinally, the subjective norm factor was not a significant predictor of gaming intention. This finding was consistent with Armitage and Conner (2001), who reported that subjective norm was a weak predictor of behavioral intentions. Similarly, social pressure to engage in excessive gaming was a significant predictor of gaming intention at Time 1 (before including descriptive norm in the model), but was a weak longitudinal predictor. This result was consistent with research on Internet addiction (Esen & Gündoğdu, 2010) as well as smoking behavior (De Vries et al., 1995). Taken together, these results suggest that social factors (e.g., norms, expectations, and pressure from others) may play a minor role in the development of excessive video-gaming, but may be less important in terms of explain long-term maintenance of excessive gaming.

Although the extended TPB model employed in this study demonstrated a good overall fit, the relatively low explained variance in PGU score may suggest that additional factors underlie PGU. Extant studies on media use suggest, for example, that habit strength may be an important factor (LaRose & Eastin, 2004; Lee & LaRose, 2007), given that individuals who tend to play longer than they intend often do so repeatedly. LaRose (2010) considered media habits, including excessive behavior, as being an automatic process. It is possible that, for some gamers, the habit strength plays an important role in excessive game use, or mediates the influences of psychosocial variables and intention. Verplanken and Aarts (1999) proposed that, once behavioral patterns are formed and behavior has become habitual, intention becomes a less relevant predictor of behavior. In past studies of repetitive behaviors, habit strength was found to be a significant predictor of behavior (De Bruijn, Kremers, Singh, Van den Putte, & Van Mechelen, 2009). As such, it may be that,

once a habit is established, explanatory models of behavior based on reasoned action, such as the TPB model, are less useful in explaining excessive behavior.

Implications

The results may have some practical implications with regard to the treatment of problem video-gaming among young people. Perceived behavioral control was found to be the most important factor in predicting problem video-gaming behavior. Clinicians who work with clients presenting with excessive gaming may use this information in several ways. First, assessing a client's perceived lack of control over gaming (e.g., ``How much control do you feel you currently have over your gaming behavior?'') may be a simple but useful measure of assessing therapeutic change, and may assist in evaluating risk of future problem play. Behavioral control may also be useful information to include in the client's case formulation. Working collaboratively with a client to identify and rate situations or times of the day that affect behavioral control may be useful in developing a shared understanding of triggers and antecedents of problem gaming behavior. Lower behavioral control may be associated with specific `risky' situations, (e.g., times of the day when there are no structured activities, solitary or unsupervised time, or time before bed). The clinician may therefore target interventions for these situations. Additional treatment strategies could be aimed at helping the client to rebuild self-control. First, psycho-education on how addiction operates (e.g., client learning about the nature of urges and withdrawal, and how they can be triggered by gaming-related cues) could be provided, and then employing behavioral experiments involving exposure to addictive cues may be used to gradually develop self-control and foster the belief that behavior can be volitionally altered. Increased control may also aid in developing control over other areas of functioning, such as socializing, exercise, and meals and sleep times (King, Delfabbro, Griffiths, & Gradisar, 2012).

Limitations

This study had several limitations that warrant caution in interpreting the results. In this study, intention was defined as an intention to play for an excessive period of time rather than a more general intention to play video games. Excessive game use was operationalized as the self-perceptions of spending too much time on gaming. Spending too much time on gaming was defined as a situation in which playing time interferes with other important activities. In Pelling and White's (2009) study of social networking use the target behavior

was also defined as excessive use, however, they used an objective criterion (i.e., four or more unique visits per day). Due to a lack of consensus in the literature on what level of gaming behavior should be considered as hazardous or problematic (e.g., hours spend), a subjective criterion of risky behavior was chosen, instead of an objective criterion. This approach may have been sensitive to several biases (e.g., social desirability, unawareness). For instance, although some gamers may be aware of their excessive gaming patterns, they may be hesitant to admit it. It is possible that questions about performing undesirable behavior are susceptible to social desirability biases. Nevertheless, it is expected that excessive gamers will score more positive (e.g., report a more positive attitude towards excessive gaming) than normal gamers. An implication for future research is to determine an objectified criterion for problematic game behavior. However, a cut-off point of a certain amount of time that is spent on gaming which is considered as risk full may be difficult to establish. Furthermore, although playing time and PGU are significantly correlated, playing time may not be a good predictor of PGU (Charlton & Danforth, 2007; Griffiths, 2010). Another limitation is that although there are few longitudinal studies in the area of problematic gaming and this study is strong in this regard, this study only had two observations. Although prospective analyses can be conducted to some extent by measuring two points in time, intermediate changes in any of the constructs were not accounted for. A final limitation is that some of the classes which participated in Wave 1 were not able to participate in Wave 2, although they agreed participating during both waves. Therefore, the attrition rate in this study was relatively high. Reasons given were mainly other priorities such as students' final exams, internships, and courses during the period of the second wave, difficulties with scheduling and dropping out of students.

Conclusion

With this growing use and accessibility of video-gaming technologies, excessive video gaming is an increasingly relevant clinical phenomenon. However, to date there have been few research efforts to examine problem video-gaming using longitudinal research designs. This study provided empirical support for the Theory of Planned Behavior in explaining long-term excessive video gaming behavior. The results showed that, longitudinally, perceived behavioral control and positive attitudes to excessive gaming were the most important predictors of gaming intention. Further studies of excessive video gaming should examine these predictors in a broader demographic sample, and account for gaming-related factors (e.g., types of game playing, context of gaming), and habit strength.

Additionally, it may be worthwhile to consider the potential role of co-morbid impulse control disorders (e.g., Internet addiction, problem gambling, etc.) and other psychopathologies (e.g., depression and anxiety), and specifically whether these factors predispose or increase risk of excessive gaming. There also remain a need for further longitudinal studies to gain a better understanding of the course and severity of problematic video gaming among young people.

Acknowledgements

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Chapter 6

A cognitive-behavioral model of problematic online gaming in adolescents aged 12 to 22 years.

Abstract

The aim of this study was to apply the cognitive behavioral model of problematic Internet use to the context of online game use to obtain a better understanding of problematic use of online games and its negative consequences. In total, 597 online game playing adolescents aged 12 to 22 years participated in this study. Results showed that the cognitive behavioral model of problematic Internet use can also be used in the context of online game use. More specifically, preference for online social interaction, mood regulation and deficient self-regulation appeared to play an important role in predicting negative outcomes from problematic online game use. Together, these cognitions and behaviors explained 79% of the variance of negative outcomes scores. These findings can be used to develop strategies that aim at reducing problematic online game behavior and its negative consequences.

6.1   Introduction

In recent years, a growing literature has sought to better understand problematic online gaming. In fact, according to Lemmens, Valkenburg, and Peter (2009) ``gaming addiction is currently one of the most discussed psychosocial aspects associated with playing computer and videogames'' (p. 77). To date, there has been much interest in problematic online gaming, but there is little agreement about how to conceptualize or measure it. Researchers have employed a variety of different terms to describe the psychological, social, and behavioral problems related to online gaming. Some of the most commonly used terms include gaming addiction (Lemmens et al., 2009; Van Rooij, Schoenmakers, Vermulst, Van den Eijnden, & Van de Mheen, 2011) problematic game use (Seay & Kraut, 2007; Tejeiro Salguero & Morán, 2002), problematic gaming behavior (Griffiths & Davies, 2005) and pathological gaming (Gentile et al., 2011; Johansson & Götestam, 2004). Most researchers consider problematic game use to be a behavioral addiction similar to pathological gambling and apply the DSM symptoms for pathological gambling derived from the Diagnostic and Statistical Manual of Mental Disorders-fourth edition (DSM-IV; APA, 2000) (Gentile et al., 2011; Lemmens, Valkenburg, & Peter, 2011). Besides this categorical approach in which game addiction is an `all or nothing phenomenon', there is also support for a continuum approach (Kuss & Griffiths, 2012). From this perspective, problematic gaming involves a continuum from mild issues to problematic behavior. This approach was suggested in earlier studies, in which media addictions are considered as lying on one extreme of a continuum of unregulated media use, that extends from normal behavior to extremely problematic behavior (LaRose, Lin, & Eastin, 2003; Lee & LaRose, 2007). Despite the conceptual ambiguity, there is a clear interest among scholars in this area to better understand this phenomenon. As the following paragraphs explain, the current study applied research on problematic Internet use (PIU) to the unique context of online gaming.

The study reported below approaches the issue of problematic online gaming from a continuum perspective rather than a categorical perspective, so that it can address a wide segment of the population. Compared to people who might be classified as gaming addicts, it is likely that more people have problems with their gaming that are less severe. For example, Mentzoni et al. (2011) identified a group of gamers that, although they were not considered to be addicted, showed problematic game use and could be considered as an at-risk group for developing addictive gaming patterns. In order to make this study more inclusive and applicable to a wider population, we focused on trying to better understand

problematic online game use.

As noted above, research on PIU may be especially usefully for better understanding problematic online gaming. In particular, the cognitive-behavioral model of problematic Internet use (Caplan, 2002; Caplan, 2010; Davis, 2001) suggests a number of variables that may be salient to online gaming. The study reported here adapted the cognitive behavioral model of PIU as a conceptual framework for understanding problematic online gaming. The paper also modified the Generalized Problematic Internet Use Scale 2 (Caplan, 2010) to develop the Problematic Online Game Use Scale (POGUS) and used a two-step approach to test the theoretical and measurement models.

The Cognitive Behavioral Model

Caplan's research has identified several cognitive and behavioral components of PIU that are correlated with both negative outcomes and with psychosocial problems (Caplan, 2010). The theory proposes that PIU involves deficient self-regulation (LaRose et al., 2003) and manifests both cognitive and behavioral symptoms. Although the diagnostic criteria derived from the DSM also reflects several cognitive and behavioral aspects, studies using this approach do not explain how PIU might be related to psychosocial wellbeing and why Internet use is problematic for some individuals. The cognitive behavioral model of PIU provides components and descriptions of key causal processes involved in PIU. From this perspective, PIU is not viewed as a behavioral addiction, but rather as a pattern of internet-related cognitions and behaviors that result in negative outcomes in one's personal and professional life. The theory also proposes that people who exhibit psychosocial problems (i.e., depression, loneliness, social anxiety, and deficient social skills) are more likely than others to also experience thoughts and behaviors associated with PIU. The components of PIU include a preference for online social interaction (over face to face conversation), using the Internet to regulate one's mood, cognitive preoccupation with the Internet, and compulsive Internet use. Below we explain each of these components in detail and hypothesize how they may be applied to the context of online gaming. The next section explains the model and its potential application to online gaming in more detail.

Preference for online social interaction (POSI).

In most research on problematic online game use, preference for online social interaction (POSI) is not taken into account. However, POSI may be an important aspect of problematic

online game behavior. Many online games involve social interaction, and the reported cases of problematic game behavior increased since the introduction of this social aspect in video games (Griffiths & Davies, 2005). Caplan (2003; 2005; 2007) suggests that individuals who have lower psychosocial wellbeing may perceive online social interaction as a safer (i.e., less risky, more effective) way to interact with others, compared to face to face interaction. It is also suggested that online gamers who experience feelings of loneliness and less self-esteem may find an outlet in online games because online games offer the possibility to interact with others online instead of in real life (Charlton & Danforth, 2007; Lemmens et al., 2011; Van Rooij et al., 2011). Thus, it is likely that POSI is related to problematic online gaming behavior. Recent research offers more support for this claim. Liu and Peng (2009) studied players of massively multiplayer online games and demonstrated that a preference for a virtual life was positively related with psychological dependency on playing massively multiplayer online games. In fact, preference for virtual life explained 26% of the variance in dependency on massively multiplayer online games. In that study, the authors defined preference for virtual life as ``one's cognitions or beliefs that one will perform better, feel better about oneself, and perceive to be better treated by others in the online virtual game world than in offline or real life'' [Liu & Peng, 2009, p. 1307]. Although a preference for virtual life is not entirely the same as POSI, they are clearly related constructs.

Mood regulation.

The motivation to use the Internet for mood regulation is a cognitive symptom of problematic Internet use in general (Caplan, 2002; 2007) and a predictor of negative outcomes (Caplan, 2003). In addition, LaRose et al. (2003) found that using the Internet to relieve feelings of depression, defined as self-reactive incentives, can lead to deficient self-regulation. In the context of video games these self-reactive incentives also played a role, individuals may spend more time on playing games because their video games can relieve boredom, lessen loneliness, or provide an escape (Lee & LaRose, 2007).

Deficient self-regulation.

LaRose et al. (2003) defined deficient self-regulation as a state in which conscious self-control is relatively diminished. They suggested that internet dependency could be redefined as a deficit in self-regulation regarding Internet usage. More recently, Caplan (2010) made a distinction between cognitive and behavioral aspects of deficient self-regulation in PIU. Cognitive aspects include a preoccupation (i.e., obsessive or

uncontrollable thinking). On the other hand, the behavioral manifestation of deficient self-regulation includes compulsive behavior and use of the Internet. Lee and LaRose (2007) found that deficient self-regulation also appears to be an important factor in game usage. Furthermore, Seay and Kraut (2007) found that deficient self-regulation was the most important predictor of negative consequences of gaming. A study by Liu and Peng (2009) showed that deficient self-regulation was associated with negative consequences of playing massively multiplayer online games.

In the current study, we investigated whether cognitions and behavior that are associated with negative outcomes of internet use are also useful for predicting negative outcomes associated with online game use. Problematic game use is a significant issue with adolescents and young adults in particular (Haagsma, Pieterse, & Peter, 2012), therefore in this study respondents aged 12 to 22 years were included. Based on the description of the cognitive and behavioral components of PIU above, we developed a series of hypotheses predicting how they might apply to online gaming rather than Internet use in general. The following section presents the hypotheses tested in the current study along with a diagram of the conceptual model (Figure 6.1).
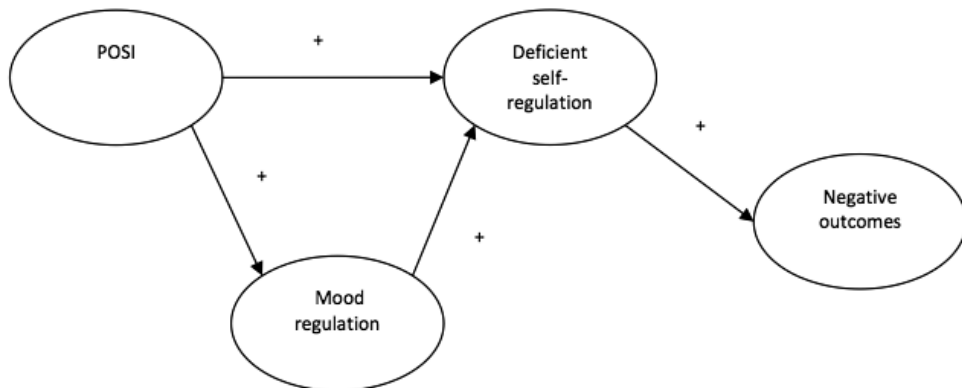

Figure 6.1. Hypothesized model.

Hypotheses

Based on the rational presented above, the current study reported sought to test the flowing hypotheses.

H1. Preference for online social interaction has a direct positive effect on using online games for mood regulation.

H2. Preference for online social interaction has a direct positive effect on deficient self-regulation of online game use.

H3. Using games for mood regulation has a direct positive effect on deficient self-regulation of online game use.

H4. Deficient self-regulation has a direct positive effect on negative outcomes arising from one's online game use.

H5. POSI has an indirect positive effect on deficient self-regulation, mediated by mood regulation.

H6. POSI has an indirect positive effect on negative outcomes, mediated by deficient self-regulation.

H7. Mood regulation has an indirect positive effect on negative outcomes, mediated by deficient self-regulation.

6.2 Method

Participants

In September 2010, 15 schools (secondary education and senior secondary vocational education) in the western regions of the Netherlands were approached for participation in this study. Nine schools were willing to participate, of which 1524 Dutch adolescents participated in a survey. This study was part of a larger project on problematic game behavior and psychosocial wellbeing. Data were primarily collected using an anonymous online questionnaire. The questionnaire included several measures to address game behavior, game related cognitions, psychosocial wellbeing, and personality. One part of the questionnaire consisted of The Problematic Online Game Use Scale, which is described below. Participants completed the entire questionnaire during school hours in 30 minutes. Participation was voluntary and anonymous. Participants filled in the questionnaire

individually; they were not allowed to discuss their answers with their classmates. After removing missing data, only the 597 adolescents who played online games (77% male and 23% female) were included in our analyses. Their age ranged from 12 to 22 years (M = 15.9 years, Median = 16, SD = 1.70).

Measures

The Problematic Online Game Use Scale (POGUS).

Problematic online gaming was measured with a modified version of the Generalized Problematic Internet Use Scale 2. The Generalized Problematic Internet Use Scale 2 (2010) measures the four components of PIU reviewed earlier in this paper; preference for online social interaction, negative outcomes, mood regulation and deficient self-regulation (which consists of 2 subscales; cognitive preoccupation and compulsive use, each with 3 items). In this study the original items of the Generalized Problematic Internet Use Scale 2 were rewritten to apply to the context of online game use. The POSI scale was left unchanged. Table 6.1 presents the rephrased items for each problematic game use subscale. The order of the questions presented in Table 6.1 is the same as in the questionnaire; the three items of each subscale were presented together. Participants were asked to rate the extent they agreed with each of the 15 items on a 5-point Likert scale, ranging from '1' (''totally disagree``) to '5' (''totally agree``). The individual POGUS sub-scales were all reliable, $\alpha >$ .70 (see Table 6.1). The overall reliability of the POGUS was α = .91 (M = 1.63, SD = .66).

Table 6.1. Descriptive statistics, factor loadings, squared multiple correlations, and Cronbach's α for the observed indicators of the Problematic Online Game Use Scale

Subscale (Cronbach's α)	M (SD)	β	R^2
Preference for online social interaction (POSI) (α = .87)			
1. I prefer online social interaction over face-to-face communication	1.48 (.88)	.74	.81
2. Online social interaction is more comfortable for me than face-to-face interaction	1.51 (.91)	.86	.74
3. I prefer communicating with people online rather than face-to-face	1.47 (.88)	.90	.55
Mood regulation (α = .89)			.16
1. I have played video games to cheer myself up when I felt lonely	1.73 (1.11)	.81	.68
2. I have played video games to make myself feel better when I was down	1.84 (1.18)	.93	.87
3. I have played video games to make myself feel better when I was upset	1.94 (1.24)	.82	.66
Cognitive preoccupation (α = .81)			.94
1. When I haven't been playing games for some time, I become preoccupied with	1.56 (.90)	.84	.74
2. I would feel bad if I was unable to play games	2.03 (1.21)	.67	.45
3. I think obsessively about playing games when I am not playing	1.42 (.76)	.86	.70
Compulsive game use (α = .87)			.81
1. I have difficulty controlling the amount of time I spend on gaming	1.83 (1.10)	.80	.73
2. I find it difficult to control my game use	1.60 (.93)	.85	.71
3. When I'm not playing games, I have hard time trying to resist the urge to play	1.53 (.87)	.86	.64
Negative outcomes (α = .76)			.79
1. My game use has made it difficult for me to manage my life	1.34 (.71)	.88	.58
2. I have missed other activities because of my game use	1.74 (1.03)	.63	.39
3. My game use has created problems for me in my life	1.36 (.79)	.76	.77

Note. The R^2 of a latent dependent predictor is the percentage of the variance in the latent dependent variable accounted for by the latent independent variable. The R^2 of an observed indicator is the estimate percentage variance explained in that variable. In other words, the error variance of a variable is approximately 1 minus the percentage of the variance of the variable itself.

Data analysis

Following Caplan (2010), a two-step modeling approach (Anderson & Gerbing, 1988) was performed to validate the POGUS. Structural equation analysis with maximum likelihood estimation was used to test the hypothesized model of problematic online game use. Following the recommendation of Holbert and Stephenson (2002), this study used a variety of indices of model fit. The chi-square estimate with degrees of freedom is still the most commonly used means by which to make comparisons across models (Hoyle & Panter, 1995). The ratio between chi-square and degrees of freedom should not exceed five for models with a good fit (Bentler, 1989). Additionally, the standardized root mean squared residual (SRMR) as a second absolute fit statistic (Hu & Bentler, 1999) in combination with the Tucker-Lewis index (TLI) as incremental index and the root mean squared error of approximation [RMSEA; Browne & Cudeck, 1993) are reported. Hu and Bentler (1999) recommend using a cutoff value close to .95 for TLI in combination with a cutoff value close to .09 for SRMR to evaluate model fit and the RMSEA close to .06 or less. The Fornell and Larcker (1991) discriminant validity criterion was used to test discriminant validity. The Fornell and Larcker criterion is satisfied when a construct is more closely related to its own indicators than to other constructs.

Table 6.2. Matrix of the observed variables of the POGUS (N = 597)

Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14
(1) Compulsive use 1														
(2) Compulsive use 2	72**													
(3) Compulsive use 3	66**	71**												
(4) Mood regulation 1	34**	33**	31**											
(5) Mood regulation 2	37**	33**	34**	76**										
(6) Mood regulation 3	36**	30**	29**	66**	77**									
(7) Negative outcomes 1	50**	60**	66**	36**	34**	32**								
(8) Negative outcomes 2	52**	53**	52**	28**	32**	29**	50**							
(9) Negative outcomes 3	37**	46**	54**	29**	27**	28**	70**	46**						
(10) POSI 1	31**	36**	36**	31**	32**	28**	38**	22**	32**					
(11) POSI 2	29**	34**	30**	35**	32**	26**	35**	21**	28**	63**				
(12) POSI 3	28**	29**	31**	33**	31**	27**	38**	22**	30**	67**	78**			
(13) Cognitive preoccupation 1	56**	60**	64**	41**	43**	39**	58**	49**	52**	37**	29**	35**		
(14) Cognitive preoccupation 2	55**	54**	51**	35**	40**	37**	41**	49**	37**	31**	28**	29**	64**	
(15) Cognitive preoccupation 3	57**	62**	69**	38**	36**	36**	71**	47**	57**	38**	35**	41**	73**	51**

Note. **Significant at the .01 level.

6.3   Results

Testing the measurement model with a higher-order confirmatory analysis

Using a second-order confirmatory factor analysis, the measurement model estimated the extent to which the observed items loaded onto their respective latent variables. All latent constructs but no observed error variances were allowed to co-vary with one another. Deficient self-regulation was specified as a second-order factor, which consists of two first-order factors, cognitive preoccupation and compulsive game use. The other POGUS sub-scales were specified as first-order factors. The correlation matrix of the observed variables is shown in Table 6.2. The Fornell and Larcker (1991) discriminant validity criterion was not fully satisfied for the negative outcomes construct and the cognitive preoccupation construct. Item 2 of the negative outcomes construct was also closely related with the items of the compulsive use construct. Item 3 of the cognitive preoccupation construct was also closely related to the items of the compulsive use construct and the items of the negative outcomes construct. This might reflect less discriminate validity of the construct concerned. Although there is theoretically a clear distinction between negative outcomes, cognitive preoccupation, and compulsive use, the three constructs are strongly related concepts, and it is therefore feasible that these measures have something specific in common. Figure 6.2 presents the estimated standardized beta coefficients along with the model fit statistics for the measurement model. The results indicate a moderate fit, χ^2 (82) = 386.70, CFI = .95, χ^2/df = 4.72, SRMR = .05, TLI = .93, RMSEA = 0.79 (90% confidence interval [CI]: .07, .09).
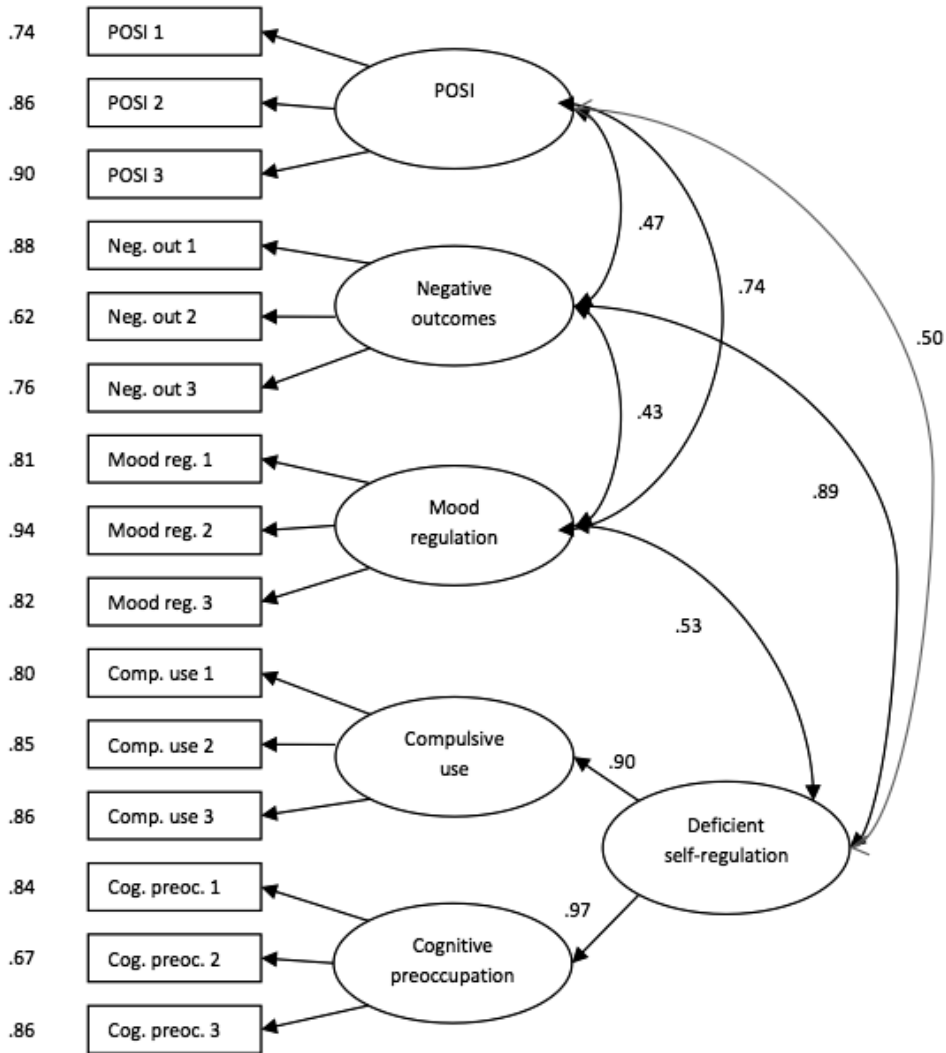
Figure 6.2. Confirmatory factor analysis of POGUS.

Test the structural model

The results obtained from testing the validity of a causal structure of the hypothesized model showed an adequate fit, $\chi^2(84) = 390.68$, CFI = .95, $\chi^2/df = 4.65$, SRMR = .05, TLI = .92, RMSEA = 0.8 (CI: .07, .09). Table 6.1 summarizes the mean and standard deviation, Cronbach's α, the factor loading (β), and the squared multiple correlation (R^2) of the

observed indicators. Squared multiple correlations provide information about the variance accounted for by the complete set of variables and showed that mood regulation was accounted for 16%, deficient self-regulation was accounted for 37%, and negative outcomes was accounted for 79% (see Table 6.1).
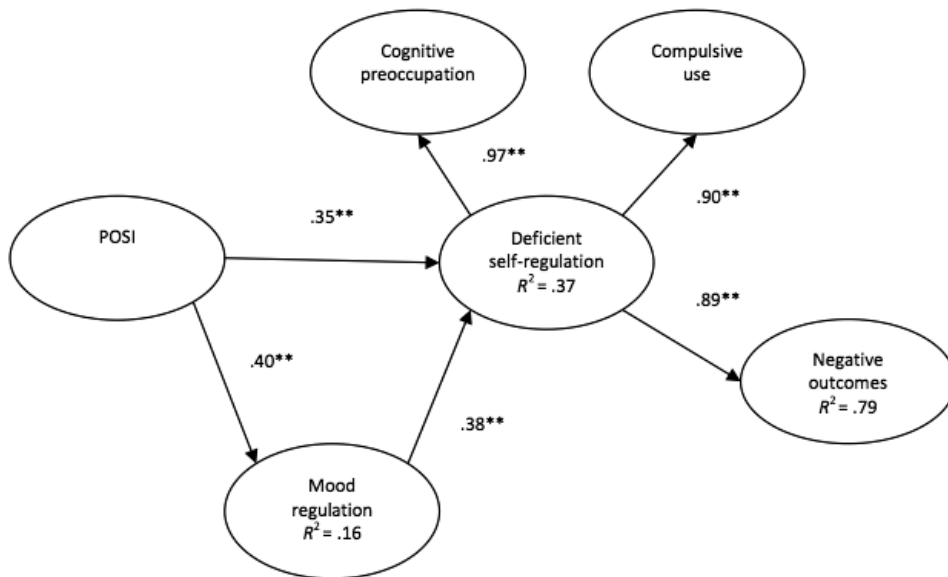
Figure 6.3. Standardized estimates for the structural model.
Note. **Significant at the .01 level.

Direct effects

The results were consistent with the hypothesis presented in Figure 6.1. H1 was supported; participants' level of POSI had a significant direct effect on mood regulation. Also H2 was supported; participants' level of POSI had a significant direct effect on their level of deficient self-regulation. Furthermore, the results supported H3; the degree of using games for mood regulation had a significant direct effect on deficient self-regulation. Finally, H4 was supported; level of deficient self-regulation had a significant direct effect on negative outcomes related to online game use.

Indirect effects

H5 was supported; there was a significant indirect effect of POSI on deficient self-regulation (β = .15), which was mediated by mood regulation. The data also supported H6; there was

a significant indirect effect of POSI on negative outcomes (β = .31), which was mediated by deficient self-regulation. Furthermore, the data supported H7; there was a significant indirect effect of mood regulation on negative outcomes (β = .34), which was mediated by deficient self-regulation.

6.4 Discussion

Overall, there was an adequate fit between the data and our hypothesized model, suggesting that the cognitive behavioral model of PIU can also be used in the context of online game use. More specifically, POSI, mood regulation and deficient self-regulation appeared to play an important role in predicting negative outcomes from problematic online game use. Together, these cognitions and behaviors explained 79% of the variance of negative outcomes scores.

Preference for online interaction emerged as an important factor in the development of deficient self-regulation of online game use, both directly and indirectly, via mood regulation. This is consistent with Caplans' findings (2010) in the case of PIU. As earlier research has demonstrated, individuals who have interpersonal problems such as loneliness and low social competence have greater levels of POSI (Caplan, 2003). Earlier studies also reported that gamers with lower psychosocial wellbeing are more vulnerable to engage in problematic game use (Caplan, Williams, & Yee, 2009; Lemmens et al., 2011). It is suggested that these psychosocially vulnerable gamers prefer online social interaction within the game world instead of face-to-face contact because online games offer a save way to socialize with others (Charlton & Danforth, 2007). Taken together, the results of our study and these earlier findings indicate that gamers might play online games for online social interaction because they have interpersonal problems such as feelings of loneliness. Given that the present study was an initial exploration of the cognitive behavioral models usefulness for explaining problematic gaming, further studies should explore the role that psychosocial problems such as social competence and loneliness play in the etiology of problematic gaming.

Consistent with earlier studies on Internet use, results from the current study indicated that mood regulation also predicted deficient self-regulation and the experience of negative outcomes related to online game use. LaRose et al. (2003) also found that using the internet to regulate one's own inner state can lead to a decrease in self-regulation. Following Caplan (2010) we predicted that mood regulation would mediate the association

between POSI and deficient self-regulation. In this study, deficient self-regulation was an important factor that predicted if individuals experienced negative outcomes from their online game use. This finding provides support for the self-regulation account (LaRose et al., 2003) of problematic online game use and is consistent with earlier studies which reported a negative relationship between one's self-control ability and problematic online gaming (Liu & Peng, 2009; Seay & Kraut, 2007).

Some differences were found regarding the strength of the relationships in this study and in the model for internet use in general (Caplan, 2010). As discussed above, POSI had a significant effect on deficient self-regulation, although in this study the effect was smaller than in the context of general problematic Internet use (Caplan, 2010). Thus, deficient self-regulation of online game use was explained less by POSI than deficient self-regulation of problematic Internet use. Although a preference for online social interaction also leads to compulsive use in the context of online gaming, other variables are probably more important in the development of deficient self-regulation than POSI. Perhaps for Internet use in general and social media in particular, social interaction plays a more dominant role than within the context of online gaming. Furthermore, in the current study mood regulation was explained less by POSI than in the context of general internet use. LaRose et al. (2003) found that feelings of depression leads to more use of the Internet for mood regulation, which in turns leads to deficient self-regulation. The current study's findings suggests that this underlying process might also be present in online game use; therefore further research should focus on which other variables, besides POSI, influence mood regulation. Compared to Caplan's [10] study of PIU, variance in scores on deficient self-regulation of online gaming was explained less by POSI and mood regulation. Our current results may suggest that there are other factors which also have a strong influence on deficient self-regulation in the context of online game use. For example, LaRose et al. (2003) found that depression scores had a direct influence on deficient self-regulation of internet use; this could also be the case in the context of online gaming. Although gaming behavior is different from internet use in general, the demographic characteristics of the samples in both studies were not comparable. It is possible that the differences found in this study can be attributed to the fact that in this study only adolescents were included. However, a recent study showed that of several internet applications, online gaming was most strongly associated with problematic Internet use (Van Rooij, Schoenmakers, Van den Eijnden, & Van de Mheen, 2010). Furthermore, earlier studies showed that online games have unique characteristics that are not present in other internet applications, such as reward features and narrative elements, which contribute to problematic involvement in

video games (King, Delfabbro, & Griffiths, 2011). This suggests that online gaming is inherently different from internet use in general. Nevertheless, future studies should examine both problematic Internet use and problematic online game use among comparable samples to confirm this hypothesis.

As mentioned before, it is assumable that POSI predicts deficient self-regulation among online gamers who lack in social skills, but this might be different for problematic gamers who have other interpersonal problems that are not associated with social interaction. For instance, Liu and Peng (2009) found that, although lower offline social skills were related with a preference for a virtual life, loneliness and depression had no influence on a preference for a virtual life. Thus, it may be the case that, for online gamers, deficient self-regulation and mood regulation may exist independently of POSI.

Indeed, the literature indicated that other variables have an influence on mood regulation and deficient self-regulation. Lee & LaRose (2007) found that in the context of video games, flow state and optimal balance are likely to promote the loss of self-control. These experiences that are directly related to playing the game should also be considered in future studies on underlying mechanisms of deficient self-regulation. Earlier research showed that gamers who use online games for immersion or escape are more likely to experience negative outcomes (Caplan et al., 2009; Yee, 2006). Although motivations appeared to explain little variance in problematic use (Caplan et al., 2009), it could be interesting to examine how motives for play influence deficient self-regulation.

Lee & LaRose (2007) proposed the model of media attendance to explain media use, which show some similarities with the cognitive behavioral model tested in this study. In the model of media attendance, self-regulation also plays an important role in developing problematic patterns of media use. Self-reactive incentives, comparable with mood regulation, lead to a decrease in self-regulation. In the model of media attendance, these self-reactive incentives and deficient self-regulation both influence habit strength, which in turn leads to more media consumption. Habit strength may also be included in the cognitive behavioral model to improve the model.

Another issue that should be taken into consideration is that the strength of the associations between POSI, mood regulation, deficient self-regulation and negative outcomes probably is different depending on the type of online game genre. For example, in most MMORPG's, social interaction is necessary to play the game. Liu and Peng (2009) found that a preference for a virtual life, which is closely related to POSI, was an important

predictor of psychological dependency on playing massively multiplayer online games. Thus, POSI may play a large role in the development of deficient self-regulation in these types of games, while in games in which social interaction is less important, other variables may be of more influence. For example, mood regulation may play a more important role and could be influenced by other cognitions than POSI, such as the motivation to escape from real life. Further examination of the role that POSI plays within different genres might improve the model.

Implications

The findings of the current study may add to the body of knowledge needed to develop strategies that aim at reducing problematic online game behavior and its negative consequences among adolescents. Given the important role that POSI plays in the development of deficient self-regulation of game use, such strategies might include enhancement of social skills or strengthening social relationships to improve social interaction in real life. Among gamers who use games for mood regulation, learning other coping methods to deal with feelings of loneliness or depression could be helpful. Furthermore, reinforcement of self-regulation regarding game use can be achieved by using behavioral strategies that aim at reducing obsessive thoughts about playing online games, strengthening the belief that one can volitionally alter their behavior, and rebuilding actual behavioral control. For example, this may include identify and rate situations that affect behavioral control to get an understanding of triggers of problem gaming behavior.

Deficient self-regulation of game use is an important factor in developing negative outcomes of game use. POSI and mood regulation appeared to be cognitions that contribute to the development of deficient self-regulation. Practitioners who work with individuals who experience negative outcomes of gaming may use this information in several ways. Assessing perceived lack of self-regulation over gaming may be a simple but useful screening measure to evaluate risk of future problem play. POSI and mood regulation might also be used as additive indicators to explore an individual's behavior.

The scale validated in this study can be used as an indicator of problematic online game use. As suggested before, problematic game use can vary from mild problems to negative outcomes that are more severe. Therefore, we recommend using a continuum approach rather than a categorical approach. The problematic online game use scale focusses to a greater extent on the interfering nature of gaming with daily life, this approach seems to be

stronger than the pathological gambling approach because it probably reduces over identification (Ferguson, Coulson, & Barnett, 2011). Furthermore, the components of the scale were designed based on theory and subjected to confirmatory analysis. This method may lead to a better measurement and understanding of problematic online game use, rather than rewording gambling criteria.

Limitations and directions for future research

The sample used in this study only included adolescents, so results are not representative for the whole population. Furthermore, the sample is weighted to males, three quarter of the respondents were male. Yet, as adolescents generally play games more frequently than adults (Griffiths, Davies, & Chappel, 2004) and are considered to be especially vulnerable to problematic game behavior (Griffiths & Wood, 2000), in particular male adolescents (Griffiths & Davies, 2005; Lemmens et al., 2011), this is an important group to investigate. Nevertheless, playing online games is not exclusively an activity for adolescents; there are also a large number of adults who play online games (Haagsma et al., 2012). Another limitation is that the analyses are based on self-reports which involves the risk of inaccurate answers, social desirability or other types of bias.

It is impossible to determine causality in this study because a cross sectional design was used instead of a longitudinal design. Although this approach has been frequently used by previous online gaming studies, the ability of the findings to predict causality is limited. Future studies could design longitudinal studies to provide evidence for the causal assumptions that are made in this study.

Although using games for mood regulation can lead to deficient self-regulation, it is unclear to what extend playing games to relieve one's inner state can actually be effective for some individuals. For example, it may be the case that for a lonely person mood regulation leads to deficient self-regulation and in turn to negative outcomes, but that it has less negative consequences for individuals who experience low or no loneliness. Possible interactions between psychosocial wellbeing, mood regulation and deficient self-regulation should be taken into account.

The purpose of this study was to investigate the cognitive behavioral model in the context of online game use to give a better understanding of problematic online gaming. The cognitive and behavioral components of this model appeared to be important in explaining

negative outcomes of online game use. Thus, POSI, mood regulation and deficient-self regulation play important roles in problematic online game use. This study provides both a theory-based measure and more insight in the relations between the components of the problematic online game use scale, and thus in the underlying mechanisms of problematic game use. Furthermore, some differences with problematic internet use in general were found. To improve the model, future studies should investigate if the predictive value of POSI, mood regulation, and deficient self-regulation and the relations between these components vary between several game genres, and if certain game genres are more related to negative outcomes than others. Furthermore, it is important to gain more prospectively insight in the relations between psychosocial wellbeing, POSI, mood regulation and deficient self-regulation.

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Chapter 7

Problematic online game use and psychosocial wellbeing: A two-wave study

This chapter is based on:

Haagsma, M. C., Peters, O., & Pieterse, M. E. Problematic online game use and psychosocial wellbeing: A two-wave study. *Submitted*

Abstract

The aim of this study was to explore reciprocal relationships between psychosocial wellbeing and problematic game behavior. A two-wave study among 164 online game playing adolescents was conducted to advance and test the cognitive behavioral model of problematic Internet use in the context of online game use. Structural equation modeling was used to test the predictive value of the determinants of the cognitive behavioral model, and relationships with psychosocial wellbeing. Results show that online gamers who lack social skills and felt lonely were more likely to prefer online social interaction over face-to-face communication. Furthermore, preference for online social interaction (POSI) seems to explain why psychosocial vulnerable gamers use online games to regulate their mood. Preferring online social interaction and using online games for mood regulation did not lead to a loss of self-control over gaming over time. A longitudinal relation between deficient self-regulation and negative outcomes of game use was also not confirmed. This study showed that negative outcomes of online game use leads to lower social competence and more loneliness, indicating a reciprocal relation between psychosocial wellbeing and problematic online game use.

7.1 Introduction

In recent years, there has been an increasing amount of research on the relationship between psychosocial well-being and video game use (Liu & Peng, 2009; Mentzoni et al., 2011). Several studies suggest that uncontrolled game use has negative effects on psychosocial wellbeing, such as loneliness and social anxiety (Lo, Wang, & Fang, 2005). On the other hand, it is also argued that psychosocial problems are causing problematic gaming patterns (Caplan, Williams, & Yee, 2009). Recent evidence suggests that decreased psychosocial well-being is both a cause and a consequence of problematic game behavior (Gentile et al., 2011; Lemmens, Valkenburg, & Peter, 2011). Lemmens et al. (2011) proposed that individuals who are lonely or socially incompetent may experience social interaction in online games as a good alternative for the offline interactions they are longing for. However, prolonged excessive playing may result in loneliness due to neglecting real life friendships (Griffiths & Davies, 2005). Although there is some evidence for a reciprocal relationship between psychosocial wellbeing and problematic game behavior, a comprehensive theoretical framework that explains the mechanisms involved is still lacking. Some of the mechanisms that may be at work here were explored in a two-wave prospective empirical study.

The Cognitive-Behavioral model

Online gaming may to some extend be comparable to internet use in general. From research on internet use several constructs may be derived that play a role in the development of problematic internet use, and that may explain how psychosocial wellbeing is related to this behavior. According to Davis' (2001) cognitive-behavioral theory of generalized problematic internet use, individuals who experience feelings of loneliness and depression develop maladaptive cognitions and use internet to relieve their psychosocial problems. This leads to difficulties with controlling their Internet use and subsequently negative personal and professional consequences. From this perspective, problematic Internet use is considered as a pattern of Internet related cognitions and behaviors that result in negative life outcomes. Caplan (2010) updated and tested this cognitive-behavioral model of generalized problematic Internet use, in which a preference for online social interaction and using the Internet for mood regulation, predicted deficient self-regulation of Internet use. Deficient self-regulation predicted negative outcomes of Internet use. This model was used as a conceptual framework for understanding

problematic online gaming. The key constructs are discussed in the next section.

Preference for online social interaction (POSI).

One of the key constructs is a preference for online social interaction (POSI). POSI is a cognitive individual difference characterized by beliefs that one is safer, more confident and more comfortable with online interactions and relationships than with traditional face-to-face interactions. Several studies showed that individuals, who experience psychosocial problems such as loneliness, have a preference for online communication instead to face-to-face communication (Caplan, 2007; Kim, LaRose, & Peng, 2009). In the context of Internet use in general, Caplan (2003; 2005) and Kim et al. (2009) found that both loneliness and deficient social skills were related to POSI. It is argued that POSI mediated the relationship between loneliness and negative outcomes of Internet use (Caplan, 2003; 2005). Literature on excessive gaming suggests that in particular online games that have a strong social component are related to negative outcomes (Ng & Wiemer-Hastings, 2005). It is also suggested that online gamers who suffer from psychosocial problems may find relieve in online games because they offer the possibility to interact with others online and form relationships instead of real life (Lemmens et al., 2011). Hence, it is likely that POSI plays a role in the development of problematic online game use.

Mood Regulation.

Previous studies on Internet use in general showed that the motivation to use the Internet for mood regulation is a cognitive symptom of problematic Internet use (Caplan, 2002; 2003; 2010; LaRose, Lin, & Eastin, 2003). In the context of game playing, Lee and LaRose (2007) found that playing games to alleviate boredom or loneliness contributes to spending more time on gaming, and subsequently to the loss of self-control over this behavioral pattern.

Deficient self-regulation.

Deficient self-regulation is defined as a state in which conscious self-control is relatively diminished. LaRose et al. (2003) suggested that deficient self-regulation is the most important mechanism in internet dependency and that so called `Internet addictions' should be redefined as a deficit in self-regulation regarding Internet usage. Depression was directly related to both mood regulation and deficient self-regulation (La Rose et al., 2003). Other studies found that deficient self-regulation was also related to game use (Lee &

LaRose, 2007) and negative consequences of gaming (Liu & Peng, 2009; Seay & Kraut, 2007).

More recently, Caplan (2010) made a distinction between cognitive and behavioral aspects of deficient self-regulation in problematic Internet use (PIU). Cognitive aspects include a preoccupation (i.e., obsessive or uncontrollable thinking), whereas the behavioral manifestation of deficient self-regulation includes compulsive use.

Negative outcomes

Many studies on problematic game use involve how to theoretically and operationally define problematic game use. The most popular approach is the application of the DSM-IV (APA, 2000) criteria that are used to define pathological gambling (Gentile et al., 2011; Lemmens, Valkenburg, & Peter, 2009). Ferguson, Coulson, and Barnett (2011) concluded in their recent meta-analysis that focusing on the interfering nature of gaming on other important life activities is a stronger approach than problematic gambling analogies or time spend on gaming. In the cognitive-behavioral model of problematic internet use, POSI, mood regulation and deficient self-regulation result in difficulties with managing one's offline life. This theory may also explain underlying mechanisms of negative consequences of game use.

Figure 7.1 represents the hypothesized conceptual model proposed by the literature and tested in the current study. The next section elaborates on the model and describes the hypotheses which were proposed and tested in the current study.

Hypothesis

The above literature suggests that POSI, mood regulation and deficient self-regulation are important determinants of problematic Internet use. Furthermore, relations between psychosocial wellbeing, POSI, and mood regulation were found. Mood regulation and deficient self-regulation are also shown to contribute to excessive video gaming and negative outcomes associated with this behavior.

However, as these studies employed a cross-sectional rather than a longitudinal design, causality was not determined. Therefore, the current study proposed the following hypotheses in order to test these relations *prospectively*:

H1. Preference for online social interaction (POSI) is a direct positive predictor of using online games for mood regulation.

H2. Preference for online social interaction (POSI) is a direct positive predictor of deficient self-regulation over game behavior.

H3. Using online games for mood regulation is a direct positive predictor of deficient self-regulation over game behavior.

H4. Deficient self-regulation over game behavior is a direct positive predictor of negative outcomes from game use.

H5. Social competence is a direct negative predictor of a preference for online social interaction (POSI). As described in the introduction, problematic game behavior also seems to contribute to lower psychosocial wellbeing. To test the reciprocal nature of the association between social competence and gaming related problems, the following hypothesis was proposed:

H6. Negative outcomes from game use are a direct negative predictor of social competence.

H7. Loneliness is a direct positive predictor of a preference for online social interaction (POSI). To test the reciprocal nature of the association between loneliness and gaming related problems, the following hypothesis was proposed:

H8. Negative outcomes from game use are a direct positive predictor of loneliness.

H9. Depression is a direct positive predictor of using online games for mood regulation.

H10. Depression is a direct positive predictor of deficient self-regulation over game behavior. To test the reciprocal nature of the association between depression and gaming related problems, the following hypothesis was proposed:

H11. Negative outcomes from game use are a direct positive predictor of depression.
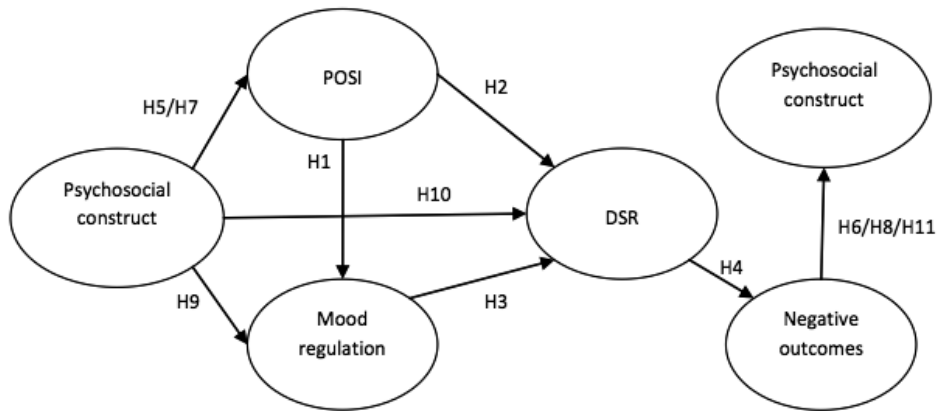
Figure 7.1. Hypothesized model of problematic online game use.

Note. POSI = preference for online social interaction; DSR = deficient self-regulation

7.2 Method

Participants

The sample in this study consisted of 164 game playing adolescents and young adults (83.5% male) from pre-vocational and senior vocational schools. They were aged 13 to 22 years, and their mean age was 15.8 years (SD = 1.8). This study was part of a larger research project on the health and well-being of adolescents. Inclusion criterion for the present study was self-reported current regular video gaming activity at both waves of the study. Participants' mean video gaming time was 22.2 hours per week (SD = 21.6) in the first wave (Time 1) and 16.3 hours per week (SD = 18.9) at 6-month follow up (Time 2).

Procedure

This study was conducted in collaboration with the Brijder Addiction Care Group, one of the largest addiction care organizations in the Netherlands that is located in the Western regions of the country. Pre-vocational and senior vocational schools in the working area of Brijder were selected to participate in this study. In the pre-vocational schools, the 9th to 12th graders were invited to participate; in the senior vocational schools all grades were invited to participate. The schools were initially invited by telephone or email. An

information letter and consent form was also provided for all parental authorities. Nine schools participated, consisting of four pre-vocational schools and five senior vocational schools.

Data were primarily collected using an online questionnaire. The first wave of data collection was conducted in September and October 2010. In total, 1,488 adolescents (50.6% male) aged 12 to 22 years participated in Wave 1 (Time 1), of which 810 respondents (54.4%) were classified as video game players. Wave 2 (Time 2) of data collection was conducted in March and April 2011. A total of 967 participants of the initial sample responded (53.6% male; attrition rate: 35%), of which 473 respondents (48.9%) were classified as video game players. The high attrition rate is mainly attributable to entire grades dropping out due to internal scheduling problems on schools. Only respondents who participated in both waves and who played games at both waves were included. After screening data to eliminate cases with missing identification codes and/or missing data, a longitudinal subsample of 164 respondents remained with complete data on both waves.

Measures

Problematic Online Game Use Scale.

The Generalized Problematic Internet Use Scale 2 (Caplan, 2010) measures the four components of PIU reviewed earlier in this paper; preference for online social interaction, negative outcomes, mood regulation and deficient self-regulation (which consists of 2 subscales; cognitive preoccupation and compulsive use, each with 3 items). In this study the original items of the Generalized Problematic Internet Use Scale 2 were rephrased to apply to the context of online game use. The POSI scale was left unchanged. Table 7.1 presents the rephrased items for each construct. Response categories ranged from 1 'totally disagree' to 5 'totally agree'. The individual POGUS sub-scales were all reliable, $\alpha >$ .70, with the exception of negative outcomes at T1, with α = .68 (see Table 7.1).

Table 7.1. Descriptive statistics, factor loadings, squared multiple correlations, and Cronbach's α for the observed indicators of the components of the Problematic Online Game Use Scale, social competence, loneliness and depression at T1 and T2.

Subscale (Cronbach's α at T1 and T2)	M (SD)		β		R^2	
	T1	T2	T1	T2	T1	T2
Preference for online social interaction (POSI) (α = .86/.96)	1.69 (.93)	1.49 (.91)				
1. I prefer online social interaction over face-to-face communication	1.66 (1.02)	1.48 (.95)	.66	.93	.43	.86
2. Online social interaction is more comfortable for me than face-to-face interaction	1.72 (1.08)	1.51 (.94)	.90	.90	.81	.80
3. I prefer communicating with people online rather than face-to-face	1.68 (1.05)	1.47 (.94)	.91	.99	.82	.99
Mood regulation (α = .91/.95)	2.10 (1.21)	1.78 (1.06)				
1. I have played video games to cheer myself up when I felt lonely	2.00 (1.27)	1.77 (1.09)	.85	.94	.73	.89
2. I have played video games to make myself feel better when I was down	2.13 (1.33)	1.78 (1.12)	.95	.99	.89	.99
3. I have played video games to make myself feel better when I was upset	2.17 (1.36)	1.78 (1.14)	.83	.85	.69	.73
Cognitive preoccupation (α = .83/.84)	1.89 (.93)	1.65 (.83)				
1. When I haven't been playing games for some time, I become preoccupied with	1.79 (1.04)	1.54 (.86)	.84	.86	.71	.73
2. I would feel bad if I was unable to play games	2.30 (1.24)	1.95 (1.19)	.70	.70	.49	.50
3. I think obsessively about playing games when I am not playing	1.59 (.90)	1.45 (.79)	.89	.91	.79	.83
Compulsive game use (α = .88/.92)	1.91 (.97)	1.62 (.89)				
1. I have difficulty controlling the amount of time I spend on gaming	2.16 (1.21)	1.68 (1.04)	.84	.91	.71	.83
2. I find it difficult to control my game use	1.85 (1.06)	1.60 (.90)	.89	.96	.80	.93
3. When I'm not playing games, I have hard time trying to resist the urge to play	1.73 (.98)	1.56 (.92)	.82	.82	.67	.67
Negative outcomes (α = .69/.89)	1.60 (.70)	1.55 (.87)				
1. My game use has made it difficult for me to manage my life	1.41 (.75)	1.45 (.83)	.87	.94	.76	.89
2. I have missed other activities because of my game use	1.95 (1.10)	1.75 (1.12)	.51	.77	.26	.60

	Mean (SD)	Mean (SD)				
3. My game use has created problems for me in my life	1.43 (.81)	1.45 (.90)	.70	.91	.49	.83
Social Competence (α = .84/.92)	3.17 (.84)	3.10 (1.11)				
1. Starting a conversation with a stranger (Initiation of relationships/interactions)	3.29 (1.08)	3.16 (1.30)	.92	.93	.84	.84
2. Expressing my feelings to someone else (Supportiveness)	3.18 (1.00)	3.03 (1.22)	.61	.81	.87	.37
3. Introducing myself to someone I have not met before (Assertiveness)	3.49 (1.04)	3.30 (1.24)	.87	.93	.65	.76
4. Talking to someone about something I feel ashamed of (Ability to self-disclose)	2.71 (.95)	2.80 (1.18)	.60	.78	.87	.36
Loneliness (α = .84/.85)	1.89 (.71)	2.01 (.73)				
1. There is no one I can turn to	1.84 (1.02)	1.90 (1.15)	.59	.62	.34	.39
2. I feel alone	1.72 (.92)	1.70 (.94)	.91	.92	.83	.84
3. No one really knows me well	1.77 (1.06)	1.81 (1.14)	.71	.73	.50	.54
4. I feel isolated from others	1.74 (.94)	1.71 (.99)	.87	.80	.76	.65
5. There are people who really understand me (excluded from further analysis)						
Depression (α = .87/.87) *During the past 12 months, how often have you…*	2.24 (.85)	2.19 (.73)				
1. felt too tired to do things	2.68 (1.08)	2.57 (1.14)	.59	.59	.34	.35
2. felt unhappy, sad, or depressed	2.01 (.93)	2.13 (1.09)	.84	.85	.71	.72
3. had trouble going to sleep or staying asleep	2.33 (1.22)	2.24 (1.15)	.68	.64	.47	.41
4. felt hopeless about the future	1.80 (1.11)	1.79 (1.08)	.80	.79	.64	.62
5. felt nervous or tense	2.24 (1.08)	2.20 (1.00)	.72	.73	.52	.54
6. worried too much about things	2.40 (1.17)	2.22 (1.12)	.72	.78	.51	.61

Note. The R^2 of a latent dependent predictor is the percentage of the variance in the latent dependent variable accounted for by the latent independent variable. The R^2 of an observed indicator is the estimate percentage variance explained in that variable. In other words, the error variance of a variable is approximately 1 minus the percentage of the variance of the variable itself.

Psychosocial wellbeing.

Psychosocial wellbeing was assessed with several items to measure social competence, loneliness and depression. Table 7.1 presents the items for each psychosocial construct. The items to measure social competence were based on earlier scales measuring social skills and interpersonal competence among adolescents (Burhmeister, Wittenberg, & Reis, 1988; Inderbitzen & Foster, 1992). Loneliness was measured by selecting the five items with the highest item-total correlations from the 20-item UCLA Loneliness Scale (Russel, 1996) (α = .69/.62). Item 5 (``There are people who really understand me'') was removed because the reliability was below aspiration level ($\alpha > .70$). The remaining four items showed a good reliability (α = .84/.85). Depression was measured using a Dutch translation (Engels, Finkenauer, Meeus, & Dekovic, 2001) of the 5-item Depressive Mood List (Kandel & Davies, 1982). Each scale was scored using a 5-point Likert scale, employing response categories such as 'totally agree' to 'totally disagree' or an appropriate equivalent. The correlation matrix of the mean scores of the components of the POGUS and the psychosocial measures on both waves is shown in Table 7.2.

Data analysis

Structural equation analysis with maximum likelihood estimation was used to test the hypothesized model of problematic online game use. Following the recommendation of Holbert and Stephenson, 2002, this study used a variety of indices of model fit. The chi-square estimate with degrees of freedom is still the most commonly used means by which to make comparisons across models (Hoyle & Panter, 1995). The ratio between chi-square and degrees of freedom should not exceed three for models with a good fit (Ullman, 2001). Additionally, the standardized root mean squared residual (SRMR) as a second absolute fit statistic (Hu & Bentler, 1999) in combination with the Tucker-Lewis index (TLI) as incremental index and the root mean squared error of approximation (RMSEA; Browne & Cudeck, 1993) are reported. Hu and Bentler (1999) recommend using a cutoff value close to .95 for TLI in combination with a cutoff value close to .09 for SRMR to evaluate model fit and the RMSEA close to .06 or less. Kenny and McCoach (2003) demonstrated that the TLI does not function well with correctly specified models that include a large number of variables. As this is the case in this study, Kenny and McCoach suggest to simultaneously examine the RMSEA and the TLI in models with large number of variables. If the TLI and CFI seem slightly lower than hoped, but the RMSEA seems a bit better, then there may be no real cause for concern. However, if a model with large

numbers of variables has poor RMSEA and poor TLI value, which would seem to be a sign of a truly poor fitting model. The Fornell and Larcker (1981) discriminant validity criterion was used to test discriminant validity. The Fornell and Larcker criterion is satisfied when a construct is more closely related to its own indicators than to other constructs.

Table 7.2. Matrix of the components of the POGUS, social competence, loneliness and depression at T1 and T2 ($N = 164$)

Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
(1) POSI T1															
(2) POSI T2	.42**														
(3) Mood regulation T1	.39**	.24**													
(4) Mood regulation T2	.35**	.41**	.46**												
(5) Cognitive preoccupation T1	.44**	.19**	.45**	.34**											
(6) Cognitive preoccupation T2	.30**	.41**	.32**	.60**	.39**										
(7) Compulsive use T1	.40**	.14	.46**	.34**	.80**	.37**									
(8) Compulsive use T2	.28**	.30**	.32**	.50**	.42**	.76**	.50**								
(9) Negative outcomes T1	.35**	.24**	.38**	.29**	.62**	.20**	.66**	.34**							
(10) Negative outcomes T2	.24**	.25**	.29**	.45**	.40**	.66**	.41**	.80**	.38**						
(11) Social Competence T1	-.25**	-.20**	-.09	-.09	-.05	-.26**	.01	-.12	-.07	-.13					
(12) Social Competence T2	-.22**	.01	-.06	.02	-.19*	-.01	-.12	-.05	-.22**	-.08	.39**				
(13) Loneliness T1	.33**	.22**	.26**	.14	.35**	.09	.32**	.05	.39**	.10	-.23**	-.21**			
(14) Loneliness T2	.18**	.20**	.14	.18*	.18*	.21**	.21**	.26**	.28**	.31**	-.08	-.08	.37**		
(15) Depression T1	.21**	.20**	.31**	.06	.28**	.12	.26*	.04	.27**	.08	-.12	-.03	.55**	.31**	
(16) Depression T2	.12	.23**	.13	.27**	.15	.24**	.21**	.19*	.23**	.26**	-.09	.18*	.24**	.47**	.37**

Note. *Significant at the .05 level; **Significant at the .01 level.

7.3   Results

Differences between both waves

Mean scores on the variables are shown in Table 7.1. Repeated measures were used to test if there were differences in scores on the variables between waves. The results showed that three constructs, POSI (F (1, 163) 6.84, $p < $ .05), mood regulation (F (1,163) 12.17, $p < $ .05), and deficient self-regulation (F (1,163) 15.71, $p < $ .05) decreased significantly from T1 to T2. This means that respondents had less preference for online social interaction, played less to regulate their mood and experienced more control over their game behavior six months later. There were no differences regarding negative outcomes scores between both waves, F (1,163) .46, $p > $ .05. The results showed that there were no differences regarding loneliness scores (F (1,163) .37, $p > $ .05), social competence scores (F (1,163) 1.24, $p > $ .05) and depression scores (F (1,163) .52, $p > $ .05) between both waves.

Testing relationships between POGUS variables

To test hypotheses 1, 2, 3 and 4 structural equation modeling was used. A preference for online social interaction (POSI) was hypothesized to predict mood regulation (H1), and predict deficient self-regulation (H2). Mood regulation is proposed to predict deficient self-regulation (H3), which in turn should predict negative outcomes (H4). The initial model showed a poor fit (χ^2 (383) = 885.21, χ^2/df = 2.31, SRMR = .07, TLI = .88, RMSEA = .09 (90% Confidence Interval [CI]: .08, .10). Post hoc modification indices suggested an improved fit by correlating the error terms of cognitive preoccupation 1 T2 with compulsive use 3 T2. The respecified model (see Figure 7.2) generated an adequate fit, (χ^2 (382) = 848.55, χ^2/df = 2.22, SRMR = .07, TLI = .89, RMSEA = .09, (CI: .08, .09). POSI T1 had a direct significant effect on mood regulation T2 (β = .25), supporting H1. POSI T1 and mood regulation T1 had no significant effect on deficient self-regulation T2, thus H2 and H3 were not supported. Similarly, H4 was not supported as deficient self-regulation T1 had no predictive effect on negative outcomes T2.
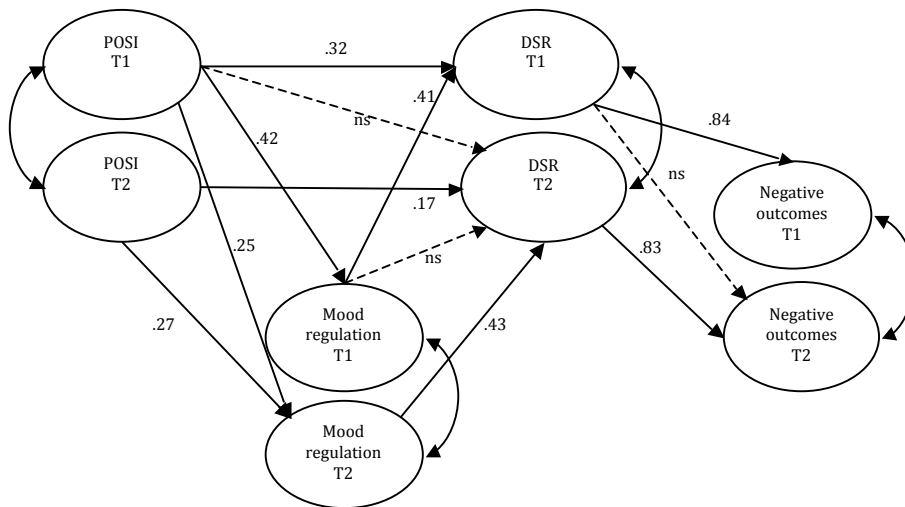
Figure 7.2. Standardized estimates for the model of problematic online game use.
Note. POSI = preference for online social interaction; DSR = deficient self-regulation; significant at the .05 level.

Testing relationship between PGU variables and psychosocial outcome measures

Social competence.

H5 proposed that social competence negatively predicts POSI. The initial model showed an average fit, χ^2 (638) = 1338.01, χ^2/df = 2.10, SRMR = .07, TLI = .87, RMSEA = .08 (CI: .09, .09). Post hoc modification indices suggested an improved fit by correlating the error terms of cognitive preoccupation 1 T2 with compulsive use 3 T2 and the error terms of compulsive use 3 T2 with negative outcomes T2. The respecified model (see Figure 7.3) generated an adequate fit, χ^2 (636) = 1263.80, χ^2/df = 1.99, SRMR = .07, TLI = .88, RMSEA = .08 (CI: .07, .08). Social competence T1 had a direct significant effect on POSI T2 (β = -.30), supporting H5.

H6 proposed that negative outcomes from game use negatively predict social competence. The initial model showed an average fit, χ^2 (638) = 1352.33, χ^2/df = 2.12, SRMR = .08, TLI = .86, RMSEA = .08 (CI: .08, .09). Post hoc modification indices suggested an improved fit by correlating the error terms of cognitive preoccupation 1 T2 with compulsive use 3 T2 and

Figure 7.3. Standardized estimates for the model of problematic online game use and social competence.

Note. POSI = preference for online social interaction; DSR = deficient self-regulation; SC = social competence; significant at the .05 level.

the error terms of compulsive use 3 T2 with negative outcomes T2. The respecified model (see Figure 7.4) generated an adequate fit, χ^2 (636) = 1278.42, χ^2/df = 2.01, SRMR = .08, TLI = .88, RMSEA = .08 (CI: .07, .09). Negative outcomes T1 had a direct significant effect on social competence T2 (β = -.30), supporting H6.

Loneliness

H7 proposed that loneliness predicts POSI. The initial model showed an average fit, χ^2 (638) = 1346.35, χ^2/df = 2.06, SRMR = .09, TLI = .86, RMSEA = .08 (CI: .08, .09). Post hoc modification indices suggested an improved fit by correlating the error terms of cognitive preoccupation 1 T2 with compulsive use 3 T2, compulsive use 3 T2 with negative outcomes T2, and loneliness 1 T2 with loneliness 3 T2. The respecified model (see Figure 7.5) generated an adequate fit, χ^2 (635) = 1240.28, χ^2/df = 1.95, SRMR = .09, TLI = .88, RMSEA = .08 (CI: .07, .08). Loneliness T1 had a direct significant effect on POSI T2 (β = .24), supporting H7.

H8 proposed that negative outcomes from game use predict loneliness. The initial model showed an average fit, χ^2 (638) = 1335.09, χ^2/df = 2.09, SRMR = .08, TLI = .87, RMSEA = .08
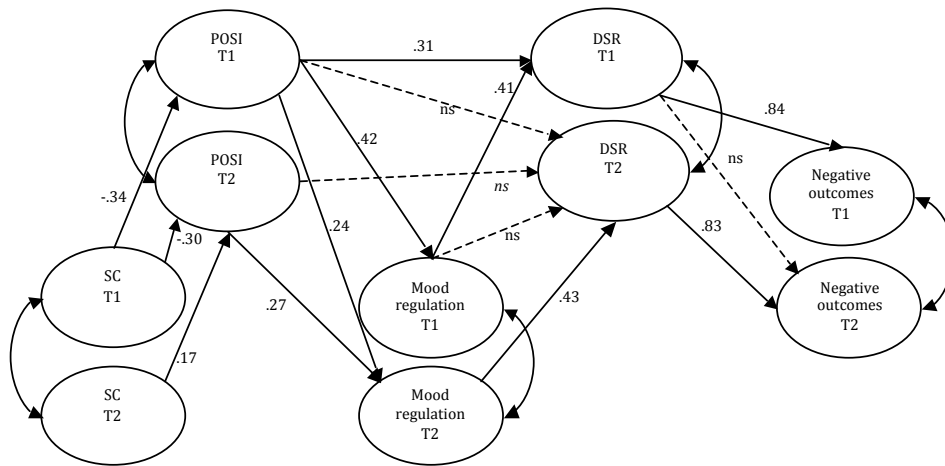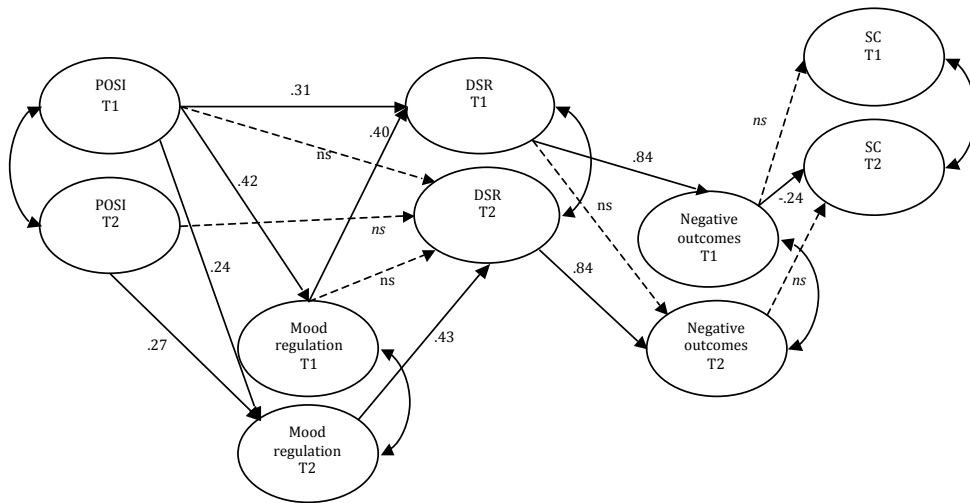
Figure 7.4. Standardized estimates for the model of problematic online game use and social competence.

Note. POSI = preference for online social interaction; DSR = deficient self-regulation; SC = social competence; significant at the .05 level.

(CI: .08, .09). Post hoc modification indices suggested an improved fit by correlating the error terms of cognitive preoccupation 1 T2 with compulsive use 3 T2, compulsive use 3 T2 with negative outcomes T2 and loneliness 1 T2 with loneliness 3 T2. The respecified model (see Figure 7.6) generated an adequate fit, χ^2 (635) = 1228.46, χ^2/df = 1.94, SRMR = .08, TLI = .88, RMSEA = .08 (CI: .07, .08). Negative outcomes T1 had a direct significant effect on loneliness T2 (β = .19), supporting H8.

Depression

H9 proposed that depression directly predicts mood regulation and H10 proposed that depression directly predicts deficient self-regulation (see Figure 7.7). The initial model showed a poor fit, χ^2 (794) = 1604.11, χ^2/df = 2.03, SRMR = .09, TLI = .85, RMSEA = .08 (CI: .07, .09). Post hoc modification indices suggested an improved fit by correlating the error terms of cognitive preoccupation 1 T2 with compulsive use 3 T2, compulsive use 3 T2 with negative outcomes T2, and depression 2 T2 with depression 5 T2. The respecified model generated an adequate fit, χ^2 (788) = 1474.04, χ^2/df = 1.87, SRMR = .09, TLI = .87, RMSEA = .07 (CI: .07, .08). Depression T1 had no significant effect on mood regulation T2 and
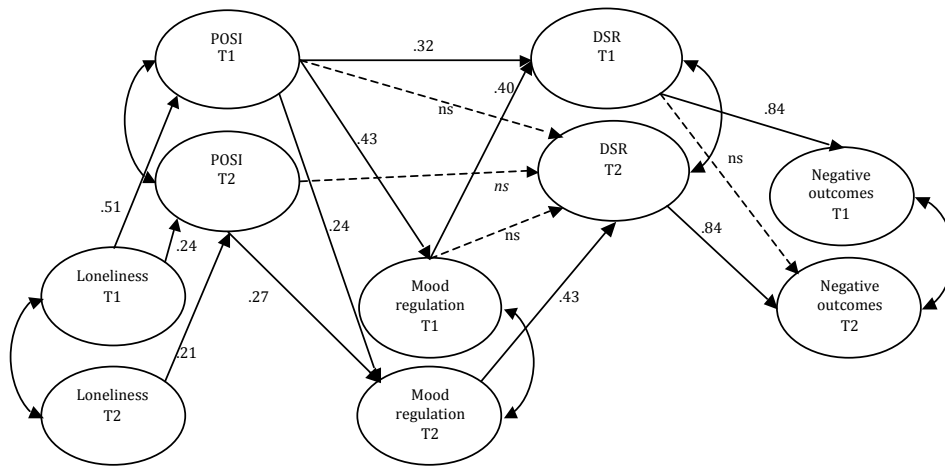
Figure 7.5. Standardized estimates for the model of problematic online game use and loneliness.

Note. POSI = preference for online social interaction; DSR = deficient self-regulation; significant at the .05 level.

deficient self-regulation T2. H9 and H10 were not supported.

H11 proposed that negative outcomes from game use predict depression. The initial model showed an average fit, χ^2 (794) = 1605.76, χ^2/df = 2.02, SRMR = .08, TLI = .85, RMSEA = .08 (CI: .07, .09). Post hoc modification indices suggested an improved fit by correlating the error terms of cognitive preoccupation 1 T2 with compulsive use 3 T2, compulsive use 3 T2 with negative outcomes T2, and depression 2 T2 with depression 5 T2. The respecified model (see Figure 7.8) generated an adequate fit, χ^2 (791) = 1496.44, χ^2/df = 1.89, SRMR = .08, TLI = .87, RMSEA = .07 (CI: .07, .08). Negative outcomes T1 had no significant effect on depression T2, H11 was not supported.

7.4 Discussion

This study advanced and tested the cognitive behavioral model of generalized problematic Internet use in the context of online game use. The aim of this study was to examine causal relations between the constructs of the model of problematic online game use and relations with psychosocial wellbeing over time over time.
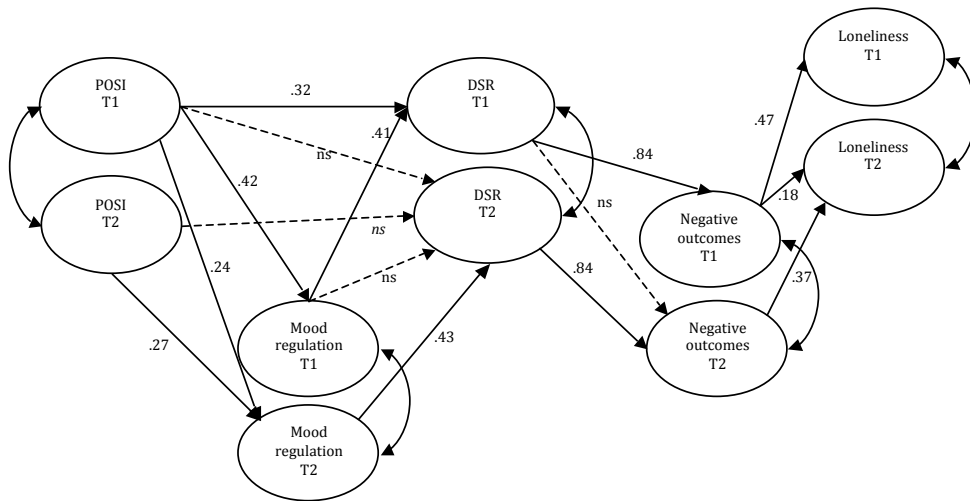
Figure 7.6. Standardized estimates for the model of problematic online game use and lone-
liness.

Note. POSI = preference for online social interaction; DSR = deficient self-regulation; signifi-
cant at the .05 level.

Overall, the findings provide some support for the hypothesized cognitive behavioral model
of problematic online game use. More specifically, psychosocial wellbeing, POSI, mood
regulation and deficient self-regulation appeared to play an important role in predicting
negative outcomes from problematic online game use. Loneliness and social competence
both predicted POSI, suggesting that individuals who exhibit interpersonal problems may
prefer online social interaction. POSI in turn, was found to affect the motivation to use
online games for mood regulation. However, the results suggest that POSI and mood
regulation only have an influence on deficient self-regulation over shorter time periods.
Moreover, deficient self-regulation was not significantly predictor of negative outcomes
arising from one's online game use. Negative outcomes of online game use also influenced
social competence and loneliness, confirming a reciprocal relation between problematic
online game use and psychosocial wellbeing.

In general, this study confirmed that a preference for online social interaction makes young
gamers vulnerable to the use of gaming for mood regulation. Respondents, who preferred
online interaction instead of communication in real life, were more likely to use games to
regulate their mood over longer time periods. Apparently, while young people would

Figure 7.7. Standardized estimates for the model of problematic online game use and depression.

Note. POSI = preference for online social interaction; DSR = deficient self-regulation; significant at the .05 level.

normally turn to their friends in face-to-face contacts to share their bad moods and seek for comfort, these young gamers find relieve in an online social environment which offers a good way to relieve negative feelings.

Lower social skills predicted a higher preference for social interaction six months later. Possibly, this implies that young people who are socially less skilled discover that online gaming provides an easy way of interacting with others. Loneliness also predicted a higher preference for online social interaction. These relationships between psychosocial wellbeing and POSI were found both cross-sectional as longitudinal. This confirms earlier findings (Caplan, 2003; 2005; Kim et al., 2009) and shows that lack of social skills and feelings of loneliness plays an important role in developing a preference for communication online. Taken together, the results of our study show that gamers play online games for online social interaction because they have lower social skills and experience feelings of loneliness. As recent studies found that lower social skills and loneliness predicted problematic game behavior (Gentile et al., 2011; Lemmens et al., 2011), the findings from our study suggest that POSI may be a mechanism through which psychosocially vulnerable gamers develop problematic gaming patterns.
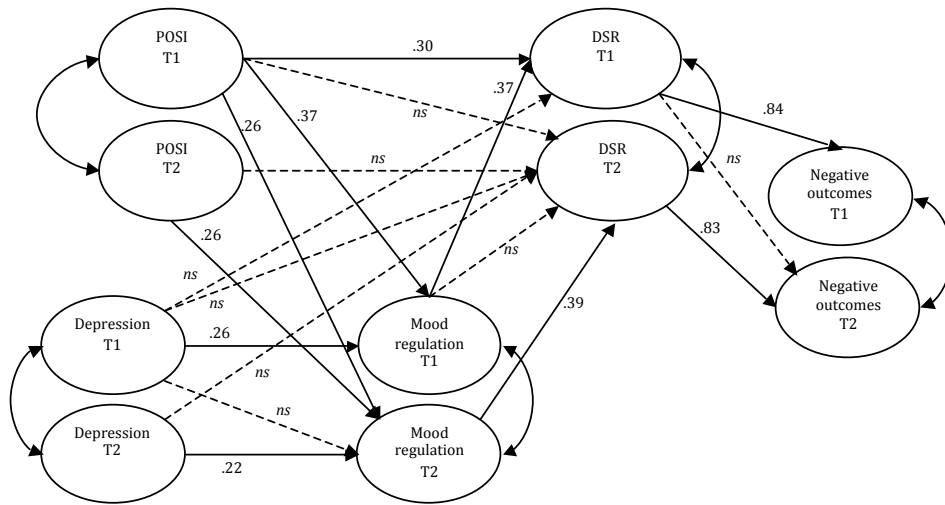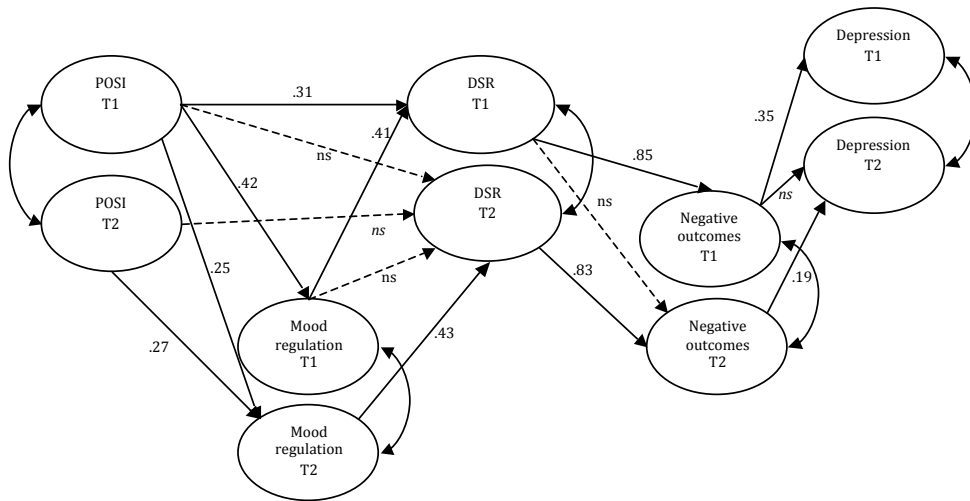
Figure 7.8. Standardized estimates for the model of problematic online game use and depression.

Note. POSI = preference for online social interaction; DSR = deficient self-regulation; significant at the .05 level.

The risk of developing problematic gaming by young people may be amplified by the relative homogeneity of other gamers they encounter in online games. Not only do they share the interest and talent for a particular game, but they may feel affiliated in other aspects as well. Based on the outcomes of this study, it seems not unlikely that a socially less able, lonely and depressed adolescent becomes acquainted with peers sharing similar characteristics.

Preferring online interaction and playing games for mood regulation influenced deficient self-control cross-sectionally, however, a longitudinal relation was not found in this study. Thus, gamers who prefer online interaction and play for mood regulation are likely to experience loss of control over gaming but it does not necessarily lead to loss of self-control over time. Other variables might be more important in development of deficient self-regulation. It is possible that a main effect between these variables was too weak because other unknown co-variates also influence deficient self-regulation. POSI and mood regulation could have positive effects over shorter time periods, and possibly lead to loss of self-control within certain individuals. For example, among individuals who are already low on psychosocial wellbeing, these interactions should be examined in future studies.

Although deficient self-regulation seems to influence negative outcomes cross-sectionally, a longitudinal relation was not found in this study. It may be the case that gamers who experience that their gaming is out of their control and report negative outcomes from gaming, become aware of the fact that their gaming is interfering with other important activities Thus, when uncontrolled gaming is accompanied by negative outcomes, a gamer becomes aware of his harmful behavior and may become motivated to change this bad habit. This implies that it may be relatively easy to regain self-control over game behavior and that problematic game behavior can be reduced without professional help.

Deficient self-regulation consisted of two constructs, cognitive preoccupation and compulsive use. The error terms of the first item of the cognitive preoccupation subscale and the third item of the compulsive use subscale were correlated in each model. Theoretically, this makes sense, as both items involve a situation of abstinence from gaming. Future studies should further clarify the relationship between cognitive preoccupation and compulsive use.

Negative outcomes predicted social competence and loneliness, supporting earlier findings that the relationship between psychosocial wellbeing and problematic game use is reciprocal (Lemmens et al., 2011). This may reflect a cyclic relation, when one of both is affected negatively, a downward spiral may set in.

Depression had no significant predictive influence on mood regulation and deficient self-regulation. In the context of Internet use, LaRose et al. (2003) did found a significant relation between depression and deficient self-regulation cross-sectionally. Caplan (2003) however, concluded that depression had little influence on the process of development of problematic Internet use. It is possible that loneliness and social competence are theoretically more salient predictors of problematic online game use because online gaming offers an environment in which less social skilled individuals experience less perceived social risk. Depression can also arise from circumstances that are not related to one's social life, and therefore may be less related to social competence and a preference for online social interaction. The social environment in online games may be the main reason why individuals use games for mood regulation. In our study a significant influence of negative outcomes from gaming on depression was also not found, whereas Gentile et al. (2011) did found that problematic game behavior predicted depression.

Implications

Although this study did not confirm all longitudinal hypothesized relationships, the findings of the current study may have some practical implications with regard to development of prevention and treatment for adolescents who experience problems related to their online game use.

Individuals with interpersonal problems were more likely to develop a preference for online communication. Although from testing the model it seems that preferring online social interaction does not necessarily lead to loss of self-control, it did explain why individuals use online games to regulate their mood. Furthermore, POSI was significantly related to deficient self-regulation and negative outcomes of game use. Therefore, interventions that aim at preventing problematic online game use among lonely and less social skilled gamers may include assignments that help these individuals strengthening their offline social skills. For example, by practicing face to face conversations and engaging in real life social settings.

The cyclic relation between psychosocial wellbeing and problematic game use may offer some benefits with regard to treatment methods. Interventions aiming at preventing and reducing problematic game use can focus on both psychosocial wellbeing (i.e., enhancing social skills) and game behavior itself (i.e., regaining self-control over game use). On the one hand, strengthening psychosocial wellbeing may in turn reduce problematic game behavior. On the other hand, reducing maladaptive cognitions associated with problematic game use (i.e., cognitive preoccupation) may also reduce interpersonal difficulties.

Limitations

A limitation of this study is the generalizability of the results towards other online gamers. The sample investigated in this study only included adolescents, furthermore, male gamers were overrepresented. However, male adolescents generally play games more frequently and experience more problematic game behavior than their female peers and adults (Griffiths & Davies, 2005; Lemmens et al., 2011). Therefore, the sample in this study did represent a small, but highly relevant group of the general population. Of course, future studies should test the cognitive behavioral model of problematic online game use within a more diverse sample.

Reciprocal relationships between psychosocial variables and problematic online game use were addressed in this study. Besides the significant influence that negative outcomes have on psychosocial wellbeing, it is also possible that other determinants of the cognitive behavioral model have an influence on psychosocial wellbeing. For example, a preference for online interaction may further reduce perceptions about one's social skills. Future research may further clarify these causal relationships in more detail.

Another limitation is that differentiation between several online game genres was not accounted for in this study. Associations between psychosocial wellbeing, POSI, mood regulation, deficient self-regulation, and negative outcomes may be different depending on the type of online game genre. For example, in many MMORPG's social interaction is required to advance in the game. It is possible that lonely individuals are drawn to these type of online games in particular as the online game world offer a rich social environment.

The purpose of this study was to explore reciprocal relationships between psychosocial wellbeing and problematic game behavior in a two-wave prospective empirical study. The cognitive behavioral model of problematic internet use was used as theoretical framework. This study advanced and tested the cognitive behavioral model in the context of online game use. Gamers who lack social skills and were lonely were more likely to prefer online social interaction over face-to-face communication. Furthermore, a preference for online social interaction seems to explain why psychosocial vulnerable gamers use online games to regulate their mood. However, the results also indicated that POSI and mood regulation does not necessarily lead to loss of self-control over gaming, and in turn to negative consequences of game use. Negative outcomes of online game use leaded to lower social competence and more loneliness. Depression appears to have less influence on the development of problematic online game use. Although not all causal assumptions made in earlier studies were confirmed in this study, the results contribute to a better understanding of mechanisms of problematic online game behavior.

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Chapter 8

General discussion

8.1   General discussion

This chapter begins with a summary of the main findings of the studies described in this thesis. Next, the theoretical implications of the specific studies are discussed and integrated, followed by the limitations and some suggestions for future research. Finally, the practical implications and a general conclusion are provided.

8.2   Summary of the main findings

Prevalence

Chapter 2 addressed video gaming habits and the prevalence of problematic video gamers in the Netherlands. A representative sample of Dutch adolescents and adults was surveyed about their video gaming behavior. To our knowledge this is the first study that used a nationwide representative sample of adolescents and adults in the Netherlands. The nationwide design allows for an estimation of prevalence of gamers and problematic gamers in the general Dutch population. Playing games is a wide-spread and popular activity among the Dutch population. For the large majority, gaming appears to be a harmless activity. However, a small group of gamers (2.7%) can be considered as problematic gamers (meet all the criteria). Additionally, 3.4% of the gamers could be considered as an at risk-group (meet four out of seven criteria). Online gamers (e.g., MMORPG's) spend more time on gaming and reported more symptoms of problematic gaming than gamers who played browser games (small games played via the Internet), offline casual games (e.g., card games) or offline games (e.g., offline shooters). Young men reported higher scores on problematic gaming. Interestingly, almost half of the identified problematic gamers were women over 30 years of age. Although male adolescents may be considered as a risk group of developing problematic gaming patterns, future studies should also address older populations as a potential risk group. This is also relevant because the first generations of adolescents that grew up with highly advanced games are now reaching their 30s. Moreover, this group of older problematic gamers is expected to increase in number in the coming decades, given the fact that the entire present adolescent generation is growing up with videogames.

Psychological determinants

Chapter 3 explored game related experiences and cognitions in the development of problematic game behavior through qualitative interviews. Participants were 21 male gamers between 17 and 28 years of age who experienced game related behavior problems at the time of the study or in the past. The aim of this study was to contribute to a more dynamic understanding of the complexity of excessive gaming in general and the way in which changes in cognitions interact with behavioral trajectories in particular. Gamers appear to have multiple motives and expectancies that all play a role in this process of increasing gaming time and these motives may change over time during this process. It seems that a combination of these gaming motives can lead to an increase in gaming time. Social aspects such as social pressure, online social interaction, and friendships in online games seem to work as an intensifier for other motives such as reward and mood regulation.

Chapter 4 extended and validated the model of media attendance (LaRose & Eastin, 2004) in the context of video game behavior. Drawing on the social cognitive theory of self-regulation (Bandura, 1991), this model proposes that unregulated media usage ranges from normal media patterns to extremely problematic behavior. This model may also be useful in explaining problematic game behavior. Expected outcomes of behavior are expected to influence future use, both directly and indirectly via habit strength. Deficient self-regulation influences habit strength and use, and can lead to problematic patterns of use. Prior experience influences media use indirectly, via habit strength and self-efficacy expectancies with regard to game use. These socio-cognitive mechanisms of self-regulation of game behavior were explored among gamers which were part of a representative sample of adolescents and adults in the Netherlands. The results suggest that deficient self-regulation was significantly related to both the experiencing of problematic game behavior and habit strength. Although stronger gaming habits were associated with more game use, time spent on gaming was weakly related to problematic game behavior. Habit strength was not directly related to problematic game use. Taken together, the results suggest that deficient self-regulation is the most important factor within these constructs that explains problematic game behavior among a heterogeneous sample.

Chapter 5 examines problematic game behavior using the theory of planned behavior (TPB; Ajzen, 1991) both in a cross-sectional and prospective design among a sample of Dutch adolescents and young adults. Building on previous research, the TPB model was extended

with descriptive norm and social pressure. The cross-sectional results showed that the TPB predictors, including subjective norm, perceived behavioral control and descriptive norm, accounted for 13% of the variance in video gaming intention. The amount of explained variance is low in comparison with other studies which applied the TPB to other health-related behaviors (Armitage & Conner, 2001). When considering excessive video gaming over time (i.e., using Time 1 and 2 data), the most significant factors in predicting problematic game use were positive attitudes towards excessive gaming and low perceived behavioral control. Although the TPB variables and playing time accounted for a significant amount of variance in problematic game behavior scores at baseline (24%), the TPB model was less useful in predicting gaming behavior and problematic gaming six months later.

Chapter 6 advanced and tested the cognitive-behavioral model of problematic Internet use (Caplan, 2010) using a cross-sectional design. The aim of this study was to apply the cognitive behavioral model of problematic Internet use to the context of online game use to obtain a better understanding of problematic use of online games and its negative consequences among Dutch adolescents and young adults. The results confirmed the validity of this model in the context of online game use. More specifically, a preference for online social interaction and playing games for mood regulation were significantly related to deficient self-regulation, which in turn was strongly associated with negative outcomes scores. These results suggest that the preference for online communication, using games for mood regulation, and lack of self-control over game behavior, play important roles in the development of negative outcomes in relation to problematic online gaming. Together, these cognitions and behaviors explained 79% of the variance in the negative outcomes scores.

Chapter 7 attempted to answer how psychosocial wellbeing might be related to problematic online gaming. Causal relations between indicators of psychosocial wellbeing and problematic online gaming were examined in a two-wave study among Dutch adolescents and young adults. Moreover, reciprocal relations between psychosocial wellbeing and negative outcomes of online gaming were examined. The cognitive-behavioral theory of problematic Internet use proposes that individuals with psychosocial problems (i.e., low social competence) develop maladaptive cognitions and behaviors which in turn lead to negative outcomes of Internet use. Results from Chapter 6 showed that this model is also valid in the context of problematic online game use. A number of studies have demonstrated that problematic gamers have various psychological and social problems. Assuming that psychosocially vulnerable online gamers might develop

problematic gaming patterns due to the possible benefits that online games offer (i.e., online social interaction, mood regulation), this theory of Internet-related behavior may also be useful in the context of online gaming behavior. The results show that gamers who reported having deficient social skills and feelings of loneliness were more likely to prefer online communication. This study also showed that negative outcomes of online game use leads to lower social competence and more loneliness, indicating a reciprocal relation between psychosocial wellbeing and problematic online game use. A preference for online social interaction was a predictive measure for using online games for mood regulation over time. Thus, this study confirmed the assumptions made in earlier studies that a preference for online interaction may explain why psychosocial vulnerable gamers use online games for mood regulation. However, the longitudinal influence of both preference for online social interaction and mood regulation on deficient self-regulation were not confirmed. Furthermore, being deficient in self-regulation over gaming did not directly lead to negative outcomes six months later.

8.3   Theoretical implications

In the following paragraph the theoretical implications of the specific studies are discussed and integrated. First, some general issues regarding the three models are briefly discussed. Second, the theoretical implications that emerged in the studies are integrated and discussed.

The Theory of Planned Behavior

Although the theory of planned behavior (TPB) appeared to be useful to some extent in the context of problematic game behavior, the amount of explained variance (13%) in intention was low, despite the cross-sectional design. In general, studies that apply the TPB to examine risk full health behavior found considerably higher explained variance. For example, the TPB variables accounted for 56% of the variance in gambling intention (Wu & Tang, 2012), and 68% of the variance in intention to social networking use (Pelling & White, 2009). Moreover, the TPB variables accounted for a relatively low amount of explained variance in playing time and problematic gaming scores (Chapter 5).

These results suggest that most gamers may not purposefully intend to play video games excessively. Instead, they may intend to initiate a gaming session volitionally, but then the

social and cognitive factors that occur during the course of this gaming session may lead to unintentional prolonged excessive gaming. If playing excessively is less goal-oriented or rational, it is difficult to predict or explain this kind of behavior using a model that relies on an assumption of rational forethought. On the other hand, it is likely that gamers are aware of the fact that their playing frequency may interfere with their daily lives. In particular being a member of a guild, which is a social group in a game (e.g., World of Warcraft) with a hierarchical leadership structure, can be considerably time-consuming. Guild members have to work together as a team in order to solve joint missions and reach common goals. In the late stages, the guilds have to complete ``end game'' areas. This requires three to four hour time commitments for the mission itself and before that a lot of time must be spent in preparation (Ducheneaut, Yee, & Moore, 2006). Thus, it is expected that gamers who joined a guild within a game will engage in prolonged gaming sessions, perhaps not volitionally but rather as a reaction to implicit social influences. Support for this assumption has come from research on health risk behavior among adolescents and young adults, which applied the prototype/willingness model (Gibbons, Gerrard, Blanton, & Russel, 1998). From this perspective, some behaviors are neither rational nor intentional, but rather a reaction to risk-conductive social circumstances. Future studies may benefit from exploring determinants such as behavioral willingness as well.

A methodological explanation for these results may be the operationalization of the TPB variables. The cognitive constructs of the TPB model used in this thesis referred to excessive game use rather than game use in general. Excessive game use was operationalized as the self-perceptions of spending too much time on gaming. Spending too much time on gaming was defined as a situation in which playing time interferes with other important activities. Due to a lack of consensus in the literature on what level of gaming behavior should be considered as hazardous or problematic, a subjective criterion of risky behavior was chosen, instead of an objective criterion. In studies on other health risk behaviors, for example alcohol abuse, an objective criterion is usually available. Drinking more than five drinks on an occasion (binge drinking) is generally considered as a criterion for hazardous alcohol use in adolescents, as it is related to other health risk behaviors (Miller, Naimi, Brewer, & Jones, 2007) and increases the risk of progression to more frequent and problematic use in later life (Agrawal et al., 2009).

The approach used in Chapter 5 may have been sensitive to several biases (i.e., social desirability, unawareness). For instance, although some gamers may be aware of their excessive gaming patterns, they may be hesitant to admit it. Asking about a behavior that is

negatively formulated (too much) may have led to such socially desirable responses. This does not explain the low variance in intention scores, as the operationalization of the TPB variables (i.e., attitude, social norm) and intention were compatible. Thus, a bias due to negative formulation would be similar in both the TPB variables and intention. However, there was inconsistency between the TPB variables and playing time as dependent variable. Playing time was not negatively formulated and may have been less biased by social desirability than the TPB variables. This may have led to the low explained variance in the analysis of playing time.

A similar problem occurred in the analysis with problematic game behavior as dependent variable. The definition of the `target behavior' (problematic game behavior) was not entirely compatible to the operationalization of the TPB constructs. More specifically, the dependent variable problematic game behavior was assessed with a game addiction scale. We assumed that the subjective experience of spending too much time on gaming will reflect problematic game behavior. However, it is possible that an intention to spend too much time on gaming does not necessarily lead to problems. Although the scale used to measure problematic game behavior does not specifically assess whether respondents spend too much time on gaming, it does include behavioral criteria that are related to spending too much time on gaming (i.e., 'Did you have fights with others (e.g., family, friends) over your time spent on games?')). Therefore, operationalizing problematic game behavior as spending too much time on gaming seems a valid choice.

An implication for future research is to determine an objectified criterion for problematic game behavior. However, a cut-off point of a certain amount of time that is spent on gaming which is considered as risk full may be difficult to establish.

Some of the TPB variables, for instance social pressure and attitude, were more strongly related to playing time than to intention (Chapter 5). Hence, it is possible that social factors and attitude have a direct influence on behavior rather than being mediated by intention. Thus, in future studies that use a longitudinal design, it may be worth to test both direct and indirect relations between TPB variables and (problematic) game behavior.

Playing games for mood regulation

Both the model of media attendance and the cognitive behavioral model emphasize the role of using games for mood regulation in the development of problematic game behavior.

This suggests that the function that gaming fulfills leads to loss of self-control, rather than the intensity of gaming itself. Playing games for mood regulation may be considered as a form of negative reinforcement (alleviating negative emotions). From this perspective, playing games to cope with negative emotions can be considered as avoidance coping. In the broader literature, avoidance coping is also related to several other health risk behaviors, such as gambling (McCormick, 1994), binge eating (Soukop, Beiler, & Terrel, 1998) and alcohol abuse (Hasking & Oei, 2007). It is suggested that this avoidance is a common mechanism which underlies many problem behaviors (Cooper, Wood, Orcutt, & Albino, 2003). On the other hand, in the case of playing games, this form of avoidance coping may not be necessarily maladaptive. Rather, it depends on what is being avoided. For instance, gamers may benefit from the immersive game environment in order to relax and temporarily escape from everyday stress (Wood, Griffiths, & Parke, 2007). Thus, like any other recreational activity, playing games to relieve one's inner state may actually be effective for some individuals. On the other hand, playing games to avoid psychosocial problems such as feelings loneliness may be considered maladaptive. Especially among individuals who suffer from psychosocial problems, playing games as avoidance coping may become problematic.

In the model of media attendance, motivations to use media are operationalized as expectations on the benefits of media use. One of these expectations addresses the motivation to engage in a particular to regulate psychological states. LaRose and Eastin (2004) defined these outcome expectations as self-reactive outcomes. Using media to regulate internal states triggers the intensity of media use which eventually may lead to excessive patterns of media use. This includes, among others, relieving feelings of boredom (LaRose & Eastin, 2004). In the extended model of media attendance (Chapter 4) escapism outcomes were included as a distinct category. Self-reactive and escapism outcomes both reflect the motivation to play games to manage a negative psychological state. Whereas self-reactive outcomes were operationalized as the motivation to play games to pass time, escapism outcomes were operationalized as the motivation to play games because the game world has no boundaries (Chapter 4). It is likely that escapism plays an important role in game behavior, given the immersive nature of many games. From the broader literature on gaming motivation, playing games to escape and to pass time were also identified as two different motivations (Barnett et al., 1997; Jansz & Marten, 2005). Escapism outcomes appeared to be more strongly related to deficient self-regulation than self-reactive outcomes (Chapter 4). This suggests that playing games to escape to the game world may be more strongly related to loss of self-control over gaming than playing games to pass

time. Future studies could further improve the categorization of these gaming expectations, and explore how they are related to problematic game behavior. Results from the in-depth interviews (Chapter 3) suggest that these gaming expectations may change over time within an individual. For example, positive motives may gradually shift to negative motives.

In the cognitive-behavioral model, the motivation to use the Internet to regulate psychological states is also taken into account, and is defined as mood regulation (Chapter 6 and 7). Although the terminology is different, clearly, the mood regulation construct shares similarities to the self-reactive outcomes and the escapism outcomes constructs described in the model of media attendance. According to the theory, it is assumed that psychosocially vulnerable individuals develop maladaptive cognitions such as going online for mood regulation (Caplan, 2010). Thus, although playing games as avoidant coping may be beneficial, among psychosocial vulnerable gamers who use games to avoid psychosocial problems, this may lead to negative outcomes. Results from the cognitive-behavioral model also suggest that mood regulation plays an important role in the development of problematic game behavior (Chapter 6 and 7).

The role of self-control over game behavior

The role of self-control over game behavior was addressed in all three of the theoretical models presented in this thesis. The findings from the three models indicated that self-control plays a central role in the development of problematic game behavior, supporting earlier findings (LaRose, Lin, & Eastin, 2003; Liu & Peng, 2009).

Deficient self-regulation and problematic game use appeared to be closely related constructs (Chapter 4). LaRose et al. (2003) suggested that media addiction is synonym to deficient self-regulation, which can be experienced in varying degrees both between persons as within a person and may eventually lead to a real problem. The operationalization of deficient self-regulation proposed by LaRose et al. (2003) was based on operational definitions of internet addiction used in prior research. Some of the criteria used to measure deficient self-regulation in the model of media attendance were to some extent similar to the criteria from the game addiction scale, which of course partly explains the high explained variance in problematic game behavior (Chapter 4). However, the game addiction scale also included criteria such as tolerance and withdrawal symptoms, which were not included in the deficient self-regulation measure. Thus, although closely related, they are measuring different constructs. A question that arises from these results is

whether deficient self-regulation can be considered as a determinant of problematic game behavior, or that it is a component of problematic game behavior. Future studies should distinguish deficient self-regulation and problematic game behavior more clearly, conceptually as well as empirically.

LaRose et al. (2003) argue that deficits in self-regulation over media use are problems within the individual's capability to correct. Results from the qualitative interviews seem to support this assumption; gamers reported several periods of excessive gaming, with episodes of reduction or abstinence in between (Chapter 3). Among most gamers these periods of excessive gaming were characterized by loss of self-control which led to interference with other activities. However, most of them were able to restore self-regulation over their game behavior, at least temporarily. Loss of self-regulation over gaming may have a temporal character in some cases because each game is an experience on its own, with its unique storyline, characters, and graphics. This is also reflected in the high variability in playing patterns reported in Chapter 3. For instance, most gamers reported that when they started playing a new game, their playing time increased until they finished the game. In these cases, when a game is finished this may lead to temporal forced abstinence until new content or a new game is released. Some games, though, such as World of Warcraft, are endless and cannot be completed. This might lead to habitual and automatic behavior because in order to progress in the game, the player is required to continue playing and keep up with the game. The social structure within this kind of online game may intensify this process of losing self-control by providing the gamer with experiences such as a sense of belonging and obligation to other team members (Chapter 3).

Playing time

The time spent on gaming had a moderate influence on problematic game behavior (Chapter 4). Furthermore, stronger gaming habits were related to greater game use but not directly to problematic game behavior. The findings in Chapter 4 suggest that both playing frequency and habitual gaming patterns are not necessarily associated with problematic behavior, whereas loss of self-control over gaming seems to be strongly related to problematic gaming. Thus the degree of self-control may be a better indicator of problems related to gaming than time spent on gaming. Earlier findings also suggested that playing time in itself may be an inadequate indicator of problematic game behavior (Charlton, 2002; Griffiths, 2010; Liu & Peng, 2009).

Definition of problematic game behavior

The studies which applied the model of media attendance, the theory of planned behavior, and the cognitive-behavioral model, differed in their approach of assessing problematic game behavior. The model of media attendance was extended with the construct problematic game behavior in order to examine the explanatory value of the variables of the model on problematic game behavior. This dependent variable, problematic game behavior, was measured using a game addiction scale based on the DSM-criteria. However, as was mentioned in the previous section, one of the problems of this approach is that some of the items in this scale also reflected some of the constructs of the model of media attendance itself. Thus, according to the model of media attendance some of the items from the game addiction scale are measuring constructs such as expected outcomes or deficient self-regulation, which are not necessarily indicators of problematic game behavior. This issue also relates to the distinction between engagement and problematic gaming, which was highlighted earlier by Charlton & Danforth (2007).

In the cognitive-behavioral model problematic game behavior is considered as a set of several specific cognitive and behavioral constructs associated with negative outcomes. These constructs are theory based, rather than based on existing clinical measures such as the DSM criteria for pathological gambling. The cognitions, behaviors and outcomes identified in the cognitive-behavioral model can be used as a measure to assess problematic game behavior.

Until now, there has been little guidance on the most valid approach to measure problematic game behavior. Ferguson, Coulson, and Barnett (2011) concluded that using an approach which focuses on interference with daily life reduces the overestimation of non-pathological gamers, and therefore may have greater validity and utility when assessing problematic game behavior. This approach was used in the last two studies which focused on the negative outcomes of gaming (Chapter 6 and 7). By identifying specific cognitions and behaviors that are related to negative outcomes of game use, one may provide a better understanding of problematic game behavior. However, the results from the studies in this thesis do not indicate which approach may be stronger.

8.4 Limitations

Several limitations of this thesis need to be considered. Although Chapter 2 provides some interesting information on gaming habits and the prevalence of problematic gaming among the Dutch population, this study is cross-sectional in design. Therefore, the results did not provide any information with regard to the persistence of problematic game behavior. The cross-sectional design also limited the support for the longitudinal assumption of the hypothesized relationships in the model of media attendance (Chapter 4). However, structural equation modeling does allow researchers to determine whether or not data support hypothesized causal associations. The results of the model of media attendance tests substantially supported to the hypothesized model.

With regard to the reported longitudinal analysis in Chapter 5 and 7, the measurement interval of six months might be relatively long. Adolescence is a transitional period in which emotional, social, and psychological changes take place over short time periods (Casey, Duhoux, & Cohen, 2010). It is possible that the constructs that were examined in these studies vary over shorter time periods. Another issue was the two-wave design, which is known to have several limitations (Ployhart & Vandenberg, 2010). For example, one cannot assess whether an observed change was steady or delayed, or whether it stabilized and then changed again, just by using two measurements (Singer & Willett, 2003).

Furthermore, the attrition rate was relatively high because of entire classes dropping out due to internal scheduling problems at schools. As a result, the number of participants with complete data in the longitudinal cohort was rather small. In Chapter 6 the longitudinal sample was different from the initial sample with regard to several characteristics; therefore, the results may have been different within the initial sample. Future studies should use a more solid longitudinal design with shorter measurement intervals and multiple waves in order to gain a better insight into the process of the development of problematic game behavior.

Although Chapter 6 and 7 focused on online gamers, further differentiation between game genres or type of gamers was not addressed in this study. The strength of the associations between the theoretical constructs examined in Chapter 4 - 7 may be different depending on the type of game genre. Each game genre is characterized by game features. Certain features were found to play a significant role in influencing problematic game behavior (King, Delfabbro, & Griffiths, 2010). Social interaction is a necessary aspect in MMORPG's,

while it plays a less central role in other online games genres. Therefore, in certain game genres, a preference for online interaction may play a larger role in the development of problematic gaming patterns. With regard to the expected outcomes which were examined in Chapter 5, it is likely that different game genres have a different expected outcomes profile. Using MMORPG's as an example, these types of games engage social and status incentives to a much greater degree than offline games. Thus, various game genres activate other types of expected outcomes differentially. This could have differential effects on deficient self-regulation, habit strength and playing frequency. From the qualitative interviews in Chapter 3 it can also be concluded that gamers have different motivations for each game, which they play alternatively. Future studies should take these differences into account and should distinguish one type of game from others.

Another limitation was the inconsistency between studies with regard to the operationalization of several constructs. For instance, the concept of problematic gaming was not consistent throughout all the studies in this thesis. To estimate prevalence of problematic gaming, a game addiction scale (Lemmens, Valkenburg, & Peter, 2009) was applied. This scale was also used in Chapter 4 and 5 to examine the determinants that precede problematic game behavior. The game addiction scale is based on symptoms that are also used to assess pathological gambling. In Chapter 6 and 7, problematic game behavior was perceived as a set of cognitions and behaviors that result in negative outcomes. This set of cognitions and behaviors can also be used as a measurement instrument to assess problematic use. Rather than rewording gambling criteria, the components of this measure were based on theory and subjected to confirmatory analysis.

With the exception of Chapter 3, all the studies presented in this thesis are based on self-reports which involve the risk of inaccurate answers, self-presentation, social desirability, or other types of bias. King, Delfabbro, and Griffiths (2009) state that participants might misreport their video game playing activities due to a lack of awareness. Another example is that excessive players may find it difficult to have an objective perspective on the potentially negative consequences of their gaming habits. This may have particularly caused bias with regard to the outcome measures used to assess problematic game behavior. For example, this may have led to underestimation of prevalence of problematic gaming or weaker associations between predictors and the outcome variable.

A final limitation is that a variety of variables that may precede problematic game behavior were not accounted for in the studies presented here. For example, personality traits such as sensation seeking (Mehroof & Griffiths, 2010) and impulsivity (Gentile et al., 2011) were

also identified as risk factors in earlier studies. Also, besides focusing on explicit cognitions, it may be fruitful to examine implicit cognitions as well. Whereas explicit cognitions are amenable to introspection and deliberate decision-making processes, implicit cognitions refer to memory associations which influence behavior in a more automatic, unconscious way. The broader literature on problem substance use provides evidence for the predictive value of implicit cognitions, for example in alcohol use (McCarthy & Thompsen, 2006). A recent study also showed that implicit cognition may be associated with uncontrolled use of online games (Yen et al., 2011). Given the fact that problem gamers continue their excessive game use despite the awareness that it may be harmful, focusing on explicit cognitions may be insufficient to understand problematic game behavior. Future studies should examine further the role of implicit cognitions in the development of problematic game behavior.

8.5   Practical implications

The findings of the studies in this thesis suggest that gaming intensity may not be an independent predictor of problematic game behavior, in contrast to factors such as self-control and mood regulation. This indicates that simply reducing the amount of time may not be an effective solution to prevent or recover from problematic game use. It may be useful to develop other coping strategies among gamers who use games for mood regulation. Furthermore, reinforcement of self-regulation regarding game use could be achieved by using behavioral strategies aimed at reducing obsessive thoughts about playing games, strengthening the belief that one can volitionally alter ones behavior, and rebuild actual behavioral control using evidence based techniques such as self-monitoring and goal setting. Similar, for diagnostic purposes, the degree of self-control over game behavior may also be used as an indicator to assess problematic game behavior.

The findings provided in this thesis support the role of the preference for online interaction in the specific context of playing online games (Chapter 6 and 7). A preference for online interaction over face to face communication may explain why certain gamers, i.e., those with deficient social skills, develop other maladaptive cognitions such as playing games for mood regulation. In these cases, enhancing offline social skills and building offline relationships with others may help to rely less on the online game world for interpersonal interactions. However, the lack of a significant causal effect of preference for online social interaction on deficient self-regulation in our data suggests that preference for online social interaction may not necessarily lead to negative consequences for all individuals. In fact,

Ducheneaut and Moore (2005) suggest that by participating in online game worlds, players may build up self-confidence when interacting with others that could carry over into real life. Yee (2004) also found that online games can improve one's social skills. Thus, from this perspective, the online game world is a relatively safe environment to experiment with approaching others and proposing a joint activity, thus initiating personal communication. Especially in the case of certain groups (e.g., individuals diagnosed with an autism disorder) these possible benefits of social interaction during online games should be considered in both future studies and interventions aimed at enhancing social skills.

This thesis showed that gaming can cause serious problems for at least a small group of gamers. Furthermore, a growing number of individuals with game related problems seek treatment and admit themselves to regular addiction care centers in the Netherlands (Haagsma, Pieterse, & Peters, 2010). Until now, this group is very small and it is perceivable that other individuals may experience relatively short periods of excessive gaming and are able to resolve their problems without professional help. Another explanation for the low number of problematic gamers within addiction care centers may be that it is unclear where they can find help. When specific interventions are developed and offered, it is possible that demand for treatment will increase. Also, considering the developments in the gaming industry it is conceivable that the prevalence of problematic gaming will increase in the future. Therefore, policymakers and health care organizations should invest in interventions that aim at preventing and reducing problematic game behavior. Some preliminary steps in this direction have already been taken in the form of the development of an online prevention program (Haagsma, Pieterse, & Peters, 2011).

8.6   Conclusion

The studies presented in this thesis have contributed to the current knowledge of problematic gaming in several ways. Information on video game habits and problematic gaming among the Dutch population has been provided. Next, game related experiences and cognitions were explored in the development of problematic game behavior through in-depth interviews. This thesis also highlights the importance of examining psychological and cognitive determinants using comprehensive theoretical frameworks. The provided theory of planned behavior, the model of media attendance, and the cognitive behavioral theory, appeared useful for this purpose to some extent. According to the model of media attendance and the cognitive-behavioral model, if game behavior is considered to be a

problem, it may be largely dependent on the degree of self-control that individuals have over their own game behavior. Moreover, game related experiences and cognitions such as gaming for mood regulation and social pressure may also play a role. If people come to rely on the game world for coping with negative feelings and their social relations, this could eventually lead to problems. Psychosocial wellbeing appeared to play a role in the development of these maladaptive cognitions. Thus, the reasons why people play games seem to be an integral part of the explanation of problematic game behavior. This thesis did not specifically focus on reaching a definition or criteria for when game behavior can be considered to be a problem. Rather, the studies presented in this thesis tried to examine game related cognitions and problems among a broader population.

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Summary in Dutch (Samenvatting)

Samenvatting

Videogames zijn de afgelopen 30 jaar steeds populairder geworden en maken voor veel mensen onderdeel uit van hun dagelijks leven. Technologische ontwikkelingen hebben ertoe geleid dat games sterk zijn gegroeid sinds hun introductie. Games worden steeds geavanceerder en complexer, met realistischere graphics en verhaallijnen. Door de komst van het internet werd het mogelijk voor gamers om samen te kunnen gamen en communiceren. Tegenwoordig heeft bijna ieder game platform de mogelijkheid om verbinding te maken met internet, waarbij soms gebruik wordt gemaakt van een online game service zoals Microsoft's Xbox live. Naast het samen kunnen gamen bieden deze online game netwerken ook de mogelijkheid om met vrienden te chatten en om games en trailers te downloaden. Games worden ook in toenemende mate geïntegreerd in andere online applicaties, zoals sociale games die gespeeld kunnen worden binnen bestaande sociale netwerksites. De manier waarop games worden gespeeld is ook veranderd, zo worden mobiele telefoons en tablets gebruikt als game platform. Sommige games gebruiken lichaamsbeweging en handgebaren van de speler om het spel te besturen in plaats van een traditionele controller. Bewegingscontrolesystemen, zoals Microsoft's Kinect, zijn in staat om de ruimtelijke bewegingen van een speler te registreren door middel van sensoren. Andere nieuwe systemen gebruiken bijvoorbeeld alternatieve controllers zoals Nintendo's Wii Fit package. Door deze recente ontwikkelingen is er een breed aanbod van videogames ontstaan. Deze games richten zich op verschillende groepen in de bevolking, er zijn bijvoorbeeld spellen die zijn ontwikkeld speciaal voor hele jonge kinderen of vrouwen, of games die met het hele gezin gespeeld kunnen worden. Met de steeds veranderende technologie is te verwachten dat videogames zich ook steeds zullen blijven ontwikkelen.

Ondanks de voordelen die videogames kunnen bieden, heeft de toenemende populariteit van games ook geleid tot zorgen over mogelijke negatieve gevolgen voor sommige gamers. Veel onderzoek naar negatieve effecten van videogames richt zich op uitkomsten zoals agressief gedrag, desensitisatie voor geweld en afname in pro-sociaal gedrag. Ook worden games in verband gebracht met ongewenste fysieke gezondheidsuitkomsten zoals verminderde activiteit en obesitas. Verder is er ook toenemend bewijs dat sommige gamers gamegewoonten vertonen die ten koste gaan van hun dagelijks functioneren. De

focus van dit proefschrift ligt op excessief gamegedrag en negatieve uitkomsten hiervan op het leven van een persoon. Overmatig gamen kan tot serieuze problemen leiden in het leven van een gamer, zo kan het bijvoorbeeld ten koste gaan van werk of schoolprestaties, sociale relaties en andere vrijetijdsactiviteiten. Het wordt door de meeste onderzoekers algemeen geaccepteerd dat sommige gamers het risico lopen om problematische speelpatronen te gaan ontwikkelen. Hierbij wordt aangenomen dat het vertonen van problematische gamepatronen vergelijkbaar is met een gedragsverslaving zoals pathologisch gokken. In dit proefschrift wordt de term `problematisch gamegedrag' gebruikt in brede zin, om te verwijzen naar gamegedrag dat gekenmerkt wordt door een gebrek aan zelfcontrole over gamegedrag en door negatieve uitkomsten zoals psychologische, sociale en school- en werk gerelateerde problemen.

Het doel van dit proefschrift is om meer inzicht te krijgen in problematisch gamegedrag en om bij te dragen aan de ontwikkeling van kennis over dit onderwerp. Het eerste punt dat onder de aandacht wordt gebracht is de grootte van het probleem. In Nederland wordt de prevalentie van problematisch gamen geschat op 2.7% onder adolescenten tussen de 12 en 17 jaar. Onder adolescenten tussen de 13 en 16 jaar die online gamen, werd een prevalentie gevonden van 3%. Ondanks dat deze studies een onderzoeksgroep gebruikten die landelijk representatief is, werden alleen jongeren onderzocht. Het eerste doel van dit proefschrift is om informatie te bieden over gamegewoonten en problematisch gamen onder een representatieve steekproef van de Nederlandse bevolking.

Het diagnostisch en statistisch handboek voor mentale stoornissen (DSM-IV), één van de meest gebruikte psychiatrische handboeken, draagt momenteel geen diagnose voor `pathologisch gamen'. Het zal ook niet worden opgenomen in de aankomende vijfde editie welke uitkomt in mei 2013. Tot nu toe is er geen overeenstemming onder wetenschappers betreffende een definitie voor problematisch gamegedrag. Terwijl sommige wetenschappers claimen dat problematisch gamen een uniek probleem is, stellen anderen dat het slechts `morele paniek' is of een uiting van andere onderliggende psychosociale problemen. Problematisch gamen wordt gedefinieerd en gemeten op verschillende manieren, wat resulteert in verschillen in schattingen van prevalentiecijfers.

Veel onderzoekers definiëren problematisch gamegedrag aan de hand van de criteria die ook gebruikt worden om pathologisch gokken te meten. Sommige wetenschappers stellen dat deze benadering niet geheel zonder problemen is. De aanname is dat symptomen van pathologisch gokken kunnen worden toegepast op andere pathologische gedragingen door het herformuleren van de items. Het is echter mogelijk dat sommige van deze

goksymptomen geen problematisch gedrag onder gamers weergeven. Sommige van deze items in de huidige schalen die gebruikt worden om problematisch gamen te meten zouden in feite kunnen verwijzen naar een sterke betrokkenheid met games, wat iets anders is dan problematisch gamegedrag. Dit zou kunnen leiden tot het identificeren van niet problematische gamers als probleemgamers, terwijl een hoge mate van gamegebruik ook een positieve ervaring zonder negatieve gevolgen kan zijn. Dus, het is belangrijk om problematisch gamegedrag te onderscheiden van gamegedrag dat niet problematisch is.

Ondanks dat deze benadering niet zonder problemen is, lijkt het gebruik van een maat gebaseerd op de criteria voor pathologisch gokken toch een redelijk startpunt. Andere benaderingen, waarbij bijvoorbeeld een sterkere focus ligt op negatieve uitkomsten, worden ook toegepast. Het gebruik van verschillende maten leidt tot onzekerheid over wat er precies gemeten wordt en als een gevolg hiervan is het lastig te bepalen of resultaten van verscheidene studies die verschillende maten gebruiken wel vergelijkbaar zijn. Het gebrek aan overeenstemming over een definitie en diagnostische criteria heeft ook consequenties voor de dagelijkse gezondheidszorg. In Nederland meldt zich een toenemend aantal gamers met gamegerelateerde problemen bij de verslavingszorg. Echter, er zijn geen richtlijnen voor het registreren van dergelijke cliënten, wat het moeilijk maakt om het exacte aantal mensen die zich aanmelden in te schatten. Toch wordt er in Nederland wel professionele hulp geboden binnen de verslavingszorg, wat meestal bestaat uit bestaande behandelprogramma's welke gebaseerd zijn op cognitieve gedragstherapie en motiverende gespreksvoering.

Ondanks een gebrek aan overeenstemming zijn de meeste onderzoekers het erover eens dat sommige gamers problematische gamepatronen vertonen die als pathologisch kunnen worden beschouwd. De gamers die geclassificeerd kunnen worden als pathologische gamers, is het aannemelijk dat er mensen zijn die gamegerelateerde problemen ervaren die minder ernstig zijn. Het is belangrijk om ook deze groep mensen te onderzoeken, aangezien ze mogelijk het risico lopen om verslavende gamepatronen te ontwikkelen. Om deze reden benaderen de studies in dit proefschrift problematisch gamegedrag vanuit een continuüm perspectief in plaats van een categorisch perspectief, zodat het een bredere populatie kan benaderen.

Voor het ontwikkelen van preventie- en behandelmethoden is het belangrijk om te onderzoeken welke factoren een rol spelen tijdens het proces van de ontwikkeling en het in stand houden van problematisch gamegedrag. Er zijn nog weinig studies gedaan die een gevestigd theoretisch kader gebruiken om de onderliggende mechanismen en voorspellers

van problematisch gamegedrag te verklaren. Het tweede doel in dit proefschrift is het testen van drie theoretische modellen in de context van problematisch gamegedrag, om te identificeren welke factoren bijdragen aan problematisch gamegedrag. De *Theory of Planned Behavior*, het *Model of Media Attendance*, en het *Cognitive Behavioral Model of Problematic Internet Use* werden toegepast om een beter begrip te krijgen van problematisch gamegedrag.

In hoofdstuk 2 werd gamegedrag en de prevalentie van problematische videogamers in Nederland onderzocht. Een representatieve steekproef van Nederlandse jongeren en volwassenen werd gevraagd naar hun gamegedrag. Uit de resultaten kwam naar voren dat het spelen van videogames een populaire activiteit is onder de gehele Nederlandse bevolking. Voor de meerderheid lijkt het spelen van games geen nadelige gevolgen te hebben. Echter, een kleine groep gamers (2.7%) kan worden beschouwd als problematische gamer (voldoen aan alle zeven criteria). Daarnaast kan 3.4% van de gamers worden beschouwd als een risicogroep (voldoen aan vier van de zeven criteria). Respondenten die online games (bijvoorbeeld MMORPG's) spelen besteden meer tijd aan gamen en rapporteerden meer symptomen van problematisch gamegedrag dan gamers die browsergames (kleine spelletjes gespeeld via het internet), offline casual games (bijvoorbeeld kaartspelletjes), of andere offline games (bijvoorbeeld offline schietspellen) spelen. Jonge mannen gaven aan meer tijd te besteden aan gamen en rapporteerden hogere scores op problematisch gamegedrag dan vrouwen en oudere mannen. Opmerkelijk is dat bijna de helft van de geïdentificeerde problematische gamers vrouwen boven de 30 jaar waren. Ondanks dat mannelijke adolescenten beschouwd kunnen worden als een risicogroep voor het ontwikkelen van problematisch gamegedrag, zal toekomstig onderzoek dus ook moeten kijken naar de oudere populaties als een potentiële risicogroep. Tevens is dit relevant omdat de eerste generaties adolescenten die opgroeiden met hoog geavanceerde games, en dus een mogelijke risicogroep vormen, op dit moment hun 30ste levensjaar bereiken. Verder is te verwachten dat deze groep oudere problematische gamers zal groeien, gezien het feit dat de volledige huidige generatie jongeren opgroeit met videogames.

In hoofdstuk 3 werden cognities en ervaringen die een rol spelen in de ontwikkeling van problematisch gamegedrag onderzocht door middel van kwalitatieve interviews. Deelnemers waren 21 mannelijke gamers in de leeftijd van 17 tot 28 jaar die aangaven gamegerelateerde problemen te ervaren ten tijde van het onderzoek, of deze situatie in het verleden hadden gekend. Het eerste doel van dit onderzoek was om een bijdrage te

leveren aan meer begrip over de complexiteit van excessief gamegedrag. Een tweede doel was om inzicht te krijgen in de manier waarop veranderingen in cognities samenhangen met ontwikkelingen in gamegedrag. Uit de resultaten kwam naar voren dat gamers sterk variërende speelpatronen hebben, zowel wat betreft hun speelintensiteit als onderliggende cognities, welke kunnen veranderen over relatief korte tijdsperioden. Veel respondenten gaven aan verschillende periodes van excessief gamen te hebben doorgemaakt, afgewisseld met perioden van minder of helemaal niet gamen. Verder bleek dat verschillende motieven om te gamen en verwachtingen over gamegedrag een rol spelen in de ontwikkeling van excessieve speelpatronen, waarbij zowel de frequentie als de lengte van gamesessies toenemen. Bovendien kunnen deze motieven en verwachtingen veranderen gedurende dit proces. De motieven en verwachtingen waren in te delen in drie hoofdcategorieën: beloning, stemmingsregulatie en de sociale aspecten van online gamen. Ervaringen zoals tijdsverlies en ontsnapping bleken ook bij te dragen aan langdurig gamen. Het lijkt erop dat een combinatie van deze motieven en verwachtingen kunnen leiden tot een toename in de hoeveelheid tijd die er aan gamen besteed wordt. Sociale aspecten in videogames zoals sociale druk, online sociale interactie en vriendschappen in online games werken als een versterker van andere motieven, zoals beloning en stemmingsregulatie.

In hoofdstuk 4 werd de validatie van het *model of media attendance* (LaRose & Eastin, 2004) in de context van video game gedrag beschreven. Dit model is gebaseerd op de sociaal cognitieve theorie van zelfregulatie (Bandura, 1991), en stelt dat ongereguleerd mediagebruik kan liggen tussen normale media patronen en extreem problematische patronen. Dit model zou ook bruikbaar kunnen zijn in het verklaren van problematisch gamegedrag. Factoren die een rol spelen in dit model zijn: uitkomstverwachtingen over gedrag, de mate waarin gedrag een gewoonte is geworden, eerdere ervaring met het gedrag, de mate van zelfcontrole over eigen gedrag en de mate waarin een persoon zichzelf in staat acht het gedrag uit te voeren. Volgens dit model hebben uitkomstverwachtingen over gedrag een invloed op toekomstig gebruik, zowel direct, als indirect via de mate waarin gedrag een gewoonte is geworden. Een gebrek aan zelfcontrole beïnvloedt de mate van gewoonte en speelfrequentie en kan leiden tot problematisch gebruikspatronen. Eerdere ervaring heeft een indirecte invloed op mediagebruik, via de mate van gewoonte en zelf-effectiviteit ten aanzien van het gamegebruik. Deze sociaal-cognitieve mechanismen werden onderzocht onder gamers die deel uitmaakten van een representatieve groep jongeren en volwassenen in Nederland. De resultaten laten zien dat een gebrek aan zelfcontrole significant samenhangt met zowel problematisch gamegedrag als mate van gewoonte. Ondanks dat sterkere gamegewoonten werden geassocieerd met een hogere

speeltijd, was speeltijd slechts zwak gerelateerd aan problematisch gamegedrag. Mate van gewoonte bleek niet direct samen te hangen met problematisch gamegedrag. Deze resultaten suggereren dat een gebrek aan zelfcontrole een van de meest belangrijke mechanismen is die problematisch gamegedrag verklaren, en niet zozeer de hoeveelheid tijd die besteed wordt aan gamen.

In hoofdstuk 5 werd problematisch gamegedrag onderzocht door middel van de *theory of planned behavior* (TPB; Ajzen, 1991) in zowel een cross-sectioneel als een prospectief design onder een groep Nederlandse jongeren en jongvolwassenen. Het TPB model werd uitgebreid met de determinanten descriptieve norm en sociale druk, deze komen vanuit de literatuur naar voren als belangrijke voorspellers van risicogedrag. De resultaten uit de cross-sectionele analyses laten zien dat de voorspellers van de TPB, waaronder subjectieve norm, waargenomen gedragscontrole, en descriptieve norm, 13% van de variantie in intentie tot het overmatig spelen van videogames verklaren. De hoeveelheid verklaarde variantie is laag in vergelijking met andere onderzoeken waarin de TPB werd toegepast in andere gezondheidsgerelateerde gedragingen (Armitage & Connor, 2001). Kijkende naar problematisch gamegedrag over een langere periode (data van tijd 1 en tijd 2), blijkt dat het hebben van een positieve houding ten aanzien van excessief gamen en een lage zelfcontrole over gamegedrag de meest significante factoren in het voorspellen van problematisch gamegedrag zijn. Ook al dragen de TPB variabelen en speeltijd bij aan een significante hoeveelheid van variantie in problematisch gamegebruik op baseline (24%), het TPB model was minder bruikbaar in het voorspellen van gamegedrag en problematisch gamen zes maanden later.

In hoofdstuk 6 werd het *cognitive behavioral model of problematic Internet use* (Caplan, 2010) aangepast en getest in een cross-sectioneel design. Volgens de theorie is problematisch internetgebruik geen gedragsverslaving, maar een patroon van internetgerelateerde cognities en uitingen die resulteren in negatieve uitkomsten in het leven van een persoon. Ook stelt de theorie dat met name mensen die psychosociale problemen ervaren geneigd zijn om deze gedachten en uitingen die samengaan met problematisch gebruik te ervaren. Het doel van dit onderzoek was om dit model toe te passen in de context van online gamegebruik en negatieve consequenties hiervan onder Nederlandse jongeren en jongvolwassenen. De resultaten bevestigen de validiteit van dit model in de context van online gamegebruik. Het hebben van een voorkeur voor online sociale interactie en het spelen van games om een negatieve stemming te reguleren zijn significant gerelateerd aan gebrekkige zelfcontrole over gamegedrag, welke sterk

gerelateerd is aan negatieve uitkomsten van online gamen. Deze resultaten suggereren dat gamers met een voorkeur voor online communicatie, en die games spelen voor stemmingsregulatie, een gebrek aan zelfcontrole over gamegedrag ontwikkelen, wat kan leiden tot negatieve uitkomsten van online gamen. Tezamen verklaren deze factoren 79% van de variantie in scores op negatieve uitkomsten van online gamegedrag.

In hoofdstuk 7 werd onderzocht hoe psychosociaal welzijn gerelateerd is aan problematisch online gamen. Oorzakelijke verbanden tussen indicatoren van psychosociaal welzijn en problematisch gamen werden onderzocht in een onderzoek met twee metingen onder Nederlandse jongeren en jongvolwassenen. Verder werden wederkerige relaties tussen psychosociaal welzijn en negatieve uitkomsten van online gamen onderzocht. Het *cognitive behavioral model of problematic Internet use* (Caplan, 2010) stelt dat individuen met psychosociale problemen (bijvoorbeeld lage sociale competentie), disfunctionele cognities en gedragingen ontwikkelen welke leiden tot negatieve uitkomsten van internetgebruik. De resultaten uit hoofdstuk 6 laten zien dat dit model ook valide is in de context van problematisch online gamegebruik. Meerdere studies hebben aangetoond dat problematische gamers verschillende psychologische en sociale problemen hebben. Ervan uitgaande dat psychosociaal kwetsbare gamers problematische gamepatronen kunnen ontwikkelen door de mogelijke voordelen die online games bieden (bijvoorbeeld online sociale interactie, stemmingsregulatie), zou deze theorie ook bruikbaar kunnen zijn in de context van online gamegedrag. De resultaten laten zien dat gamers die aangeven gebrek aan sociale vaardigheden te hebben en gevoelens van eenzaamheid ervaren, een sterkere voorkeur hadden voor online communicatie. Dit hoofdstuk laat ook zien dat negatieve uitkomsten van online gamegebruik leiden tot lagere sociale competentie en meer eenzaamheid, wat wijst op een wederkerige relatie tussen psychosociaal welzijn en problematisch online gamegebruik. Het hebben van een voorkeur voor online sociale interactie was een voorspellende maat voor het gebruik van online games voor stemmingsregulatie over tijd. Dus, dit hoofdstuk bevestigt de aanname gemaakt in eerder onderzoek dat een voorkeur voor online interactie zou kunnen verklaren waarom psychosociaal kwetsbare gamers online games gebruiken voor stemmingsregulatie. Echter, de longitudinale invloed van zowel een voorkeur voor online sociale interactie en stemmingsregulatie op een gebrek aan zelfcontrole werd niet bevestigd. Tevens, het hebben van gebrek aan zelfcontrole over gamen leidde niet tot negatieve uitkomsten zes maanden later.

In hoofdstuk 8 werden de resultaten van de vorige hoofdstukken samengevat en bediscussieerd. Als eerste werden de drie theoretische modellen besproken en daarna werden implicaties en aanbevelingen voor vervolgonderzoek gegeven.

Ondanks dat de *theory of planned behavior* bruikbaar was in de context van problematisch gamegedrag, was de verklaarde variantie (13%) in intentie laag. In het algemeen vinden studies die de TPB toepassen om risicogedrag te onderzoeken aanzienlijk hogere verklaarde variantie. Deze resultaten suggereren dat de meeste gamers niet bewust de intentie hebben om excessief te gamen, maar dat andere factoren die optreden tijdens een gamesessie leiden tot overmatig gamen. Als excessief gamen minder doelgericht of rationeel is, wordt het lastig om dit gedrag te verklaren vanuit een model dat uitgaat van de aanname van rationeel denken. Aan de andere kant is het aannemelijk dat gamers zich bewust zijn van het feit dat hun speelfrequentie in de knel zou kunnen komen met hun dagelijks leven. Met name als je aangesloten bent bij een guild, wat een sociale groep is in een spel (bijvoorbeeld World of Warcraft) met een hiërarchische structuur, kan dit aanzienlijk tijdrovend zijn. Leden van een guild moeten samenwerken als een team om gezamenlijke missies op te lossen en doelen te behalen. In de latere fasen moeten deze guilds zogeheten `end game' area's uitspelen. Dit kan drie tot vier uur tijd kosten voor de missie zelf, daarnaast komt er nog voorbereidingstijd bij. Dus het is te verwachten dat gamers die bij een guild horen lange gamesessies hebben, misschien niet vrijwillig maar als een reactie op impliciete sociale invloeden.

Zowel het *model of media attendance* als het *cognitive behavioral model of problematic Internet use* benadrukken de rol van het gebruiken van games voor stemmingsregulatie tijdens de ontwikkeling van problematisch gamegedrag. Dit suggereert dat de functie die gamen vervult leidt tot een gebrek aan zelfcontrole, en niet zozeer de hoeveelheid tijd die besteed wordt aan gamen. Het spelen van games om met negatieve emoties om te gaan kan worden beschouwd als vermijdende coping. In de bredere literatuur is vermijdende coping ook gerelateerd aan verschillende andere gezondheidsrisicogedragingen, zoals gokken, binge-eating, en alcoholmisbruik. Het wordt gesuggereerd dat deze vermijding een mechanisme is dat schuil gaat onder veel probleemgedrag. Aan de andere kant, in het geval van gamen hoeft deze vorm van vermijdende coping niet per se disfunctioneel te zijn. Het ligt eraan wat er vermeden wordt. Gamers zouden bijvoorbeeld kunnen profiteren van de gamewereld om te ontspannen en tijdelijk te ontsnappen van dagelijkse stress. Dus het spelen van games om de gemoedstoestand te verbeteren kan in sommige gevallen juist effectief zijn, zoals iedere andere recreatieve activiteit. Aan de andere kant kan het spelen

van games om psychosociale problemen zoals gevoelens van eenzaamheid te vermijden beschouwd worden als disfunctioneel. Met name onder individuen die lijden onder psychosociale problemen kan het spelen van games als vermijdende coping problematisch worden.

De rol van zelfcontrole over gamegedrag werd onderzocht in alle drie de theoretische modellen die gepresenteerd zijn in dit proefschrift. De bevindingen laten zien dat zelfcontrole een centrale rol speelt in de ontwikkeling van problematisch gamegedrag. Gebrekkige zelfcontrole en problematisch gamegedrag blijken sterk gerelateerde constructen te zijn. Het wordt gesuggereerd dat mediaverslaving synoniem is aan gebrekkige zelfcontrole, welke in variërende mate ervaren kan worden en eventueel kan leiden tot een echt probleem. De resultaten in dit proefschrift roepen de vraag op of gebrek aan zelfcontrole een determinant van of een onderdeel van problematisch gamegedrag is. Toekomstig onderzoek moet onderscheid maken tussen gebrekkige zelfcontrole en problematisch gamegedrag, zowel conceptueel als empirisch. Het wordt gesteld dat gebrek aan zelfcontrole over het mediagebruik een probleem is dat binnen de mogelijkheid van de persoon ligt om te veranderen. Resultaten van de kwalitatieve interviews lijken deze aanname te bevestigen. Gamers rapporteerden verscheidene perioden van excessief gamen, met episodes van vermindering of abstinentie er tussen in. Onder de meeste gamers werden deze perioden gekarakteriseerd door een gebrek aan zelfcontrole wat leidde tot problemen met andere activiteiten. Echter, de meesten van hen waren in staat om zelfregulatie over gamegedrag te hervatten, in ieder geval tijdelijk. Gebrek aan zelfcontrole over gamen zou een tijdelijk karakter kunnen hebben in sommige gevallen omdat iedere game een ervaring op zichzelf is met een eigen unieke verhaallijn en karakters. Dit wordt ook weergegeven in de hoge variabiliteit in speelpatronen gerapporteerd in hoofdstuk 3. Bijvoorbeeld, de meeste gamers rapporteerden dat wanneer ze een nieuwe game begonnen, hun speeltijd toenam totdat ze het spel uit hadden gespeeld. In het geval dat een game beëindigd is, kan dit leiden tot tijdelijke abstinentie tot een nieuwe game uitkomt. Sommige games zoals World of Warcraft kunnen niet uitgespeeld worden. Dit kan leiden tot gewoonte en automatisch gedrag omdat als men wil bijblijven in het spel, wordt vereist dat iemand door moet gaan met spelen. De sociale structuur binnen dit type spel kan het proces van het verliezen van zelfcontrole versterken doordat de gamer een gevoel van erbij horen en verantwoordelijkheid naar andere teamleden ervaart.

Een aantal praktische aanbevelingen kunnen worden gedaan. De bevindingen in dit proefschrift suggereren dat de hoeveelheid tijd die besteed wordt aan gamen wellicht niet een onafhankelijke voorspeller is van problematisch gamegedrag, in tegenstelling tot andere factoren zoals zelfcontrole en stemmingsregulatie. Dit geeft aan dat het simpel verminderen van de hoeveelheid speeltijd waarschijnlijk geen effectieve oplossing is om problematisch gamegedrag te voorkomen of te behandelen. Het kan zinvol zijn om andere copingstrategieën te ontwikkelen voor gamers die games spelen om hun stemming te reguleren. Ook kan zelfcontrole worden versterkt door het toepassen van gedragsstrategieën die gericht zijn op het verminderen van obsessieve gedachten over gamen, en het gebruik van technieken zoals zelfmonitoring en het stellen van doelen. Tevens kan de mate van zelfcontrole over gamen gebruikt worden als een indicator om problematisch gamegedrag te herkennen.

De bevindingen in dit proefschrift ondersteunen ook de rol die een voorkeur voor online sociale interactie speelt. Het hebben van een voorkeur voor online interactie in plaats van face-to-face communicatie kan verklaren waarom sommige gamers, bijvoorbeeld gamers die gebrekkige sociale vaardigheden hebben, andere disfunctionele cognities ontwikkelen zoals het spelen van games voor stemmingsregulatie. In deze gevallen zou het kunnen helpen om offline sociale vaardigheden te versterken en offline sociale relaties op te bouwen, zodat men niet meer afhankelijk is van de online gamewereld voor interpersoonlijke interacties. Anderzijds bleek dat het hebben van een voorkeur voor online sociale interactie niet noodzakelijk leidt tot negatieve gevolgen. Voor sommige gamers zou het dus ook een manier kunnen zijn om zelfvertrouwen op te bouwen en om sociale vaardigheden te versterken die overgedragen worden naar de realiteit. Vanuit dit perspectief is de online gamewereld een relatief veilige omgeving om te experimenteren met het benaderen van anderen en het voorstellen van gezamenlijke activiteiten, dus het initiëren van persoonlijke communicatie. Met name in het geval van bepaalde groepen (bijvoorbeeld individuen met een autisme spectrum stoornis) zouden deze mogelijke voordelen van sociale interactie tijdens online gamen meegenomen moeten worden in zowel toekomstig onderzoek als interventies die zich richten op het versterken van sociale vaardigheden.

Dit proefschrift benadrukt het belang van het onderzoeken van psychologische en cognitieve determinanten door het toepassen van theoretische modellen. Of gamegedrag als een probleem kan worden beschouwd lijkt voor een groot deel af te hangen van de mate van zelfcontrole die individuen hebben over hun gamegedrag. Tevens spelen

gamegerelateerde ervaringen en cognities zoals gamen voor stemmingsregulatie en sociale druk ook een rol. Als gamers op de gamewereld terugvallen om met negatieve gevoelens om te gaan en sociale relaties te onderhouden, kan dit uiteindelijk leiden tot problemen. Psychosociaal welzijn blijkt een rol te spelen in de ontwikkeling van deze disfunctionele cognities. Dus, de redenen waarom men games speelt blijkt een integraal onderdeel te zijn van de verklaring van problematisch gamegedrag.

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