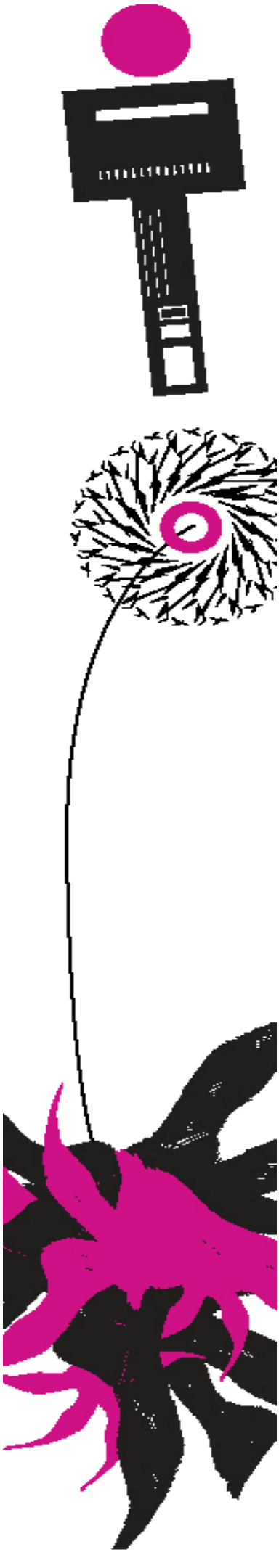

Master thesis in Health Psychology

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MMOGs and problematic gaming behavior: Does Gaming Type moderate psychosocial constructs?

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Keywords: Problematic gaming behavior, MMOG, online gaming, moderation, loneliness, preference for online social interaction

Abstract

Background: Videogames are a popular pastime for adolescents. Above all online games, especially those called Massively Multiplayer Online Games [MMOGs], are highly popular among adolescents. This type of game is characterized by high social interaction of players acting together in a virtual world. Research indicates that this type of game is strongly linked to problematic gaming and negative effects of gaming.

Objective: The objective of this longitudinal study is to figure out the role the Gaming Type [GT] plays in developing problematic gaming behavior [PGB] and negative outcomes of gaming. Therefor, cognitive behavioral model was taken as theoretical basis.

Method: Dutch adolescents aged 13 to 22 were asked to fill in an online questionnaire at baseline (T1) and 6-month follow-up (T2). They were approached via their schools located in western areas of the Netherlands. Most important components measured were GT, POSI (preference for online social interaction) and loneliness as predictors at baseline and PGB and negative outcomes as outcome variables at the 6-month follow-up. Moderation-analysis was performed with GT as dichotomous variable (MMOG vs. non-MMOG) to investigate whether GT has impact on the relationship between the two predictor variables (POSI and loneliness) at baseline and PGB and negative outcomes at 6-month follow-up.

Results: Major finding of this study is that for the two GTs different variables seem to predict negative consequences of gaming. For the non-MMOG group results clearly indicate that loneliness is a risk factor for gamers to develop PGB and negative outcomes of gaming. This is indicated by moderation-analysis showing that non-MMOG gamers suffering from loneliness do score high on PGB and negative outcomes. Path-analysis does confirm these results. For the MMOG group results suggest that POSI may be a risk factor; but results are not clear in this case. However, this study gives important insights in the mechanisms of developing PGB and negative outcomes of gaming due to the GT played.

Background

Since the early 1990s videogames have become a popular pastime, replacing traditional playing and interactional activities (Frölich, Döpfner, & Lehmkuhl, 2009). While some studies are directed at examining positive effects of playing these videogames (e.g. Primack et al., 2012; Shi & Mao, 2011) most research focuses on detecting negative effects of playing videogames. There is already some evidence of some negative effects like a relationship with increased aggression (Anderson & Dill, 2000; Bartholow, Bushman, & Sestir, 2006; Frölich, et al., 2009).

Problematic gaming behavior and negative outcomes of gaming

Videogaming can become such a time consuming activity that it comes at the expense of other activities. Researchers already found the potential of games to develop addictive patterns of gaming behavior (Frölich et al., 2009; Griffiths, Kuss, & King, 2012; Grüsser, Thalemann, & Griffiths, 2007). In research the phenomenon of intensely playing games is named differently, e.g. *pathological gaming* (Ferguson, Coulson, & Barnett, 2011) *or online gaming addiction* (Kuss, Louws, & Wiers, 2012; Young, 2009). In this study the term *problematic gaming behavior* [PGB] is used because there is still no consensus in the field whether PGB can be seen as a pathological problem.

PGB is associated with problems like poorer grades, poorer relationships with parents (Gentile et al., 2011), lower self-esteem, lower satisfaction with daily life (Ko, Yen, Chen, Chen, & Yen, 2005), and PGB seems to affect social contacts negatively (Ng & Wiemer-Hastings, 2005; Young, 2009). A meta-analysis of Ferguson et al. (2011) found co-morbidities of small to moderate size between pathological gaming and mental health, academic and social problems. Research about the frequency of PGB found a prevalence of 3.1% to 8.9%, varying with the type of measurement (Ferguson et al., 2011). Haagsma, Pieterse, and Peters (2012) found a prevalence of PGB of 3.3% among Dutch young adolescents and young Dutch adults (14-29 years). Another study found that 3% of online gamers show PGB, which represents 1.5% of all children aged 13-16 years in the Netherlands (Van Rooij, Schoenmakers, Vermulst, Van Den Eijnden, & Van De Mheen, 2011).

Further research found that gaming shows a persistent addiction over time and in contrast to a hypothesis of Desai, Krishnan-Sarins, Cavallo, and Potenza (2010), Gentile et al. (2011) found that PGB is not just a symptom of other problems: youths who had become pathological gamers showed later increased depression, anxiety and social phobia. Respondents who stopped with excessive gaming showed a decrease in such problems. So this longitudinal study successfully shows that gaming predicts mental health disorders, rather than simply being correlated with them. Gentile et al. (2011) also found personal characteristics and habits that act as risk factors for developing PGB. These include being impulsive, having lower social competence and empathy as well as poorer emotional regulation skills.

To this day, research on this topic is difficult, due to lack of consensus on a clear definition or measurement of PGB. Due to a meta-analysis of Furgeson et al. (2011) PGB can be either interpreted as *pathological gaming*, in which the DSM (Diagnostic and Statistical Manual of Mental Disorders) symptoms for pathological gambling are reworded to measure the gaming construct, or can be operationalized as an *interference with daily activities*. Both definitions lead to different types of measurement, resulting in different prevalence rates. While the pathological gaming approach sees PGB as *categorical*, the interference approach can be used to see PGB as a *continuum* - from mild to heavy levels (Furgeson et al., 2011). PGB is still not included as a mental disorder in the DSM-5 of the American Psychological Association [APA] which is published in May 2013. Thus consensus is lacking with regard to whether PGB is pathological and requires therapeutic treatment.

Gaming Types

Since the internet gets more and more distributed, above all online games enjoy great popularity (Seifert & Jöckel, 2009). The first online game was developed in 1970. In the following years online games became more complex culminating in the game *World of Warcraft* [WoW] which was published in 2005 by Blizzard Entertainment. This game had reached a community of about 12 million players in 2010 (Blizzard, 2010). Also WoW is one of the best known games belonging to the type of *Massively Multiplayer Online Role Playing Game* [MMORPG]. In this type of game, the user needs to develop a character, called *avatar*, to act in a virtual world. Because the game works via an online connection, different users around the world can collaborate to achieve higher levels and goals. An important characteristic of MMORPGs is the fact that the game cannot be completed which aims to keep the user playing the game (Van Rooij et al., 2011). According to Smahel, Sevcikova, Blinka, and Vesela (2009) there are three reasons of playing MMORPGs, namely (1) making achievements, (2) interacting with other players, and (3) rising the avatar to higher levels.

The popular MMORPG WoW falls under a larger category of games, called MMOGs – *Massively Multiplayer Online Games.* All these types of games are played in a virtual community where a variety of gamers can play at the same time (Nagygyörgy et al., 2013). Gamers of MMOGs can communicate and cooperate in the game and also build relationships with other users (Griffiths, Davies, & Chapell, 2003). According to White (2008) there were a total of subscriptions of about 47 million for MMOGs in 2008. No data for the Netherlands only could be found. Next to MMORPGs three other types of games fall under this category, namely MMOFPS (*Multiplayer Online First-Person Shooter*) games, MMORTS (*Multiplayer Online Real-Time Strategy*) games (Ghuman & Griffiths, 2012) and *Racing MMOGs*. In MMOFPS games the users can compete individually or in teams. Because these are shooting games, reaction time and attention skills are important to play MMOFPS games (Nagygyörgy et al., 2013). An example of this type of game is "*Battlefield*" a game developed by Electronic Arts in which the gamer builds the career of a soldier while progressing and upgrading capabilities using new equipment and combat expertise to take to the battlefield (MMOBOMB, 2013[a]). And according to Rice (2006) in MMORTS games the users have to coordinate teams in the virtual world to gain e.g. a higher status and develop specialty areas. In the MMORTS "*The Settlers*", published and developed by Ubisoft, the gamers take the role of a king and need to expand the kingdom while protecting the empire from enemies. Therefore gamers need to manage gathering materials, exploring new regions and defending the kingdom (MMBOMB, 2013[b]). An example of a Racing MMOG is the game "*Need for Speed World"* by Electronic Arts where users can race against other players. Gamers can climb the ranking and can level up their customized cars (MMOBOMB, 2013[c]). And as already mentioned above, in MMORPGs the gamers create their own character to play the game and interact with others to develop skills and reach higher levels. According to Caplan (2009) and Griffiths, Davies, and Chappell (2004) social interactions and relationships in the game are the central features of playing MMOGs and can even be more important than actually playing the game. These interactions throughout the game occur through instant messaging from person-to-person, group-wide text channels and via voice systems (Williams, Caplan, & Xiong, 2007).

Next to the category of MMOGs, there are other types of videogames which can be divided into two global categories. (1) Online games without the multiplayer-component like "flash games" as "*Tetris"* or "*Bubble Game"* (Spele.nl) or Facebook games as *"FarmVille".* And (2) offline games like the Singleplayer Role-Playing-Game "*Oblivion"* or the Singleplayer racing game "*Burnout"*. In this study the two other categories will be summarized into the non-MMOG group and will be compared to the MMOG group.

Much research focuses on MMOGs, because the characteristics of this type of game, like the endless nature, seem to put the player at higher risk to develop PGB than players who do play other types of videogames (Kuss, 2012). For example, research found links of MMORPGs to addiction (Peters & Malesky, 2008) and negative physiological effects like seizure (Chuang, 2006). An fMRI-based research by Ko et al. (2009) even found that craving to play the game in MMORPG gamers resembles drug dependent cravings. Moreover, research by Longman, O´Connor, and Obst (2009) identified 10% of WoW gamers who play an average of 63 hours per week. And this high-use group seemed to suffer from negative psychological symptoms, like depression, stress, and anxiety.

Research on this topic is needed because of the high popularity of MMOGs and the high risk of such games for PGB and its negative (psychological) effects. This and the fact that PGB is a persistent problem which is not solely a symptom of other mental problems but predicts lower mental states longitudinally (Gentile et al., 2011) justifies a closer investigation of MMOGs, PGB as well as risk factors for and negative consequences of gaming.

The Cognitive Behavioral Model and PGB

Davis (2001) introduced the cognitive behavioral model to the research field of the more general problematic use of the internet. In light of the cognitive behavioral model the problematic use of the internet is a combination of internet-related cognitions and behaviors which result in negative outcomes for the user, both in personal and professional life (Haagsma, Caplan, Peters, & Pieterse, 2012). Research of Caplan deals with testing general *Problematic Internet Use* [PIU] in the context of the cognitive behavioral model. He found that both cognitive and behavioral components of PIU are correlated with negative outcomes and psychosocial problems (Caplan, 2010).

Caplans´ model (2010) contains three components which predict negative outcomes of PIU. First, POSI, the *preference for online social interaction*, has a predictive role in his model. This component is described below. The second variable is *mood regulation.* When the internet or online games are used to relieve feelings like loneliness this is called mood regulation. La Rose, Lin, and Eastin (2003) found that using the internet to relieve depression can lead to the third variable of the model, which is *deficient self-regulation*. LaRose et al. (2003) define this construct as “a state in which conscious self-control is relatively diminished” (p. 232) and which can be an indicator of (media) addiction.

Haagsma and colleagues (2012; submitted) used the research on PIU as basis to test PGB in online gaming among Dutch adolescents. The rationale behind that was that internet use in general may be comparable in some extend to online gaming; so constructs of PIU were used to explain the development of PGB and its relation with psychosocial wellbeing (Haagsma, Peters, & Pieterse, submitted). Haagsma et al. (2012) found some determinants of the model to be important predictors of PGB. These are POSI, mood regulation and deficient self-regulation. These determinants explained 79% of variance of negative outcomes cross-sectionally (Haagsma, Caplan, Peters, & Pieterse, 2012). This is in line with the findings of Caplan (2010) who found in his PIU research that POSI and mood-regulation predict deficient self-regulation of general internet use. And this deficient self-regulation predicted negative outcomes user experienced (Caplan, 2010).

The studies cited above were used to derive important variables for this research. For this study, which focuses on the GTs MMOG vs. non-MMOG, it seemed reasoned to use variables as predictors which were found to be important in PGB research and which can reflect one of the main differences between these two GTs, namely the social interaction component. Thus, POSI and loneliness were chosen as predictors and are described below.

POSI. This construct involves the preference of a game-user to interact with others online instead of in real-life face to face communication. This could be the case because these individuals have lower psychosocial wellbeing and find this way of communication safer and more effective (Caplan, 2003; 2005; 2007). According to Fioaravanti, Dèttore, and Casale (2012) POSI has become one of the central components of PGB research in recent years, having a rather strong association with PGB. A study of Liu and Peng (2009) found that a construct close to POSI, namely preference for a virtual life, is positively related with psychological dependency in MMOG players. So POSI may play an important role in PGB and its negative consequences by users of MMOGs because here online social interaction is an important component. According to Caplan (2010) POSI is a central component of problematic internet use that can explain why users show other indicators of problematic use. Another important component that can help explain PGB is loneliness, which is described below.

Loneliness. Based on their findings, Haagsma et al. (2012) hypothesize that gamers might play online games because they prefer online social interaction above face to face communication because they have interpersonal problems like feelings of loneliness. Caplan (2003) found that, among others, loneliness predicts POSI, with POSI predicting negative outcomes associated with problematic use of the internet. Also some other studies already found that individuals who feel lonely score high on POSI (Caplan, 2007; Kim, LaRose, & Peng, 2009). A two-wave study of Haagsma, Peters and Pieterse (submitted) focusing on online games and PGB among Dutch adolescents confirm these results. They found that gamers of online games who feel lonely and lack social competence score higher on POSI at the 6-month follow-up. Also POSI explains why psychosocial vulnerable gamers game online to regulate their mood. So, adolescents who prefer online interaction are more likely to use videogames to regulate their mood over a long time period. Apparently they can relieve their negative feelings in the online social environment. Also Haagsma et al. (submitted) found that negative outcomes of playing online games lead to lower social competence and higher loneliness scores. The authors conclude that their longitudinal study shows that gamers play online for online social interaction because they seem to have lower social skills and feel lonely.

Because of the research cited above it is hypothesized that MMOGs have higher potential to evoke PGB and negative outcomes. Depending on the type of game it seems likely that the relationships between the determinants get stronger or weaker. So, the aim of this study is to examine whether the described determinants are moderated by type of game played. Because MMOGs have some unique characteristics, it seems likely that the mechanisms of interest for this GT differ from that of non-MMOGs that lack e.g. the social interaction component typical to MMOGs. The following research question was studied:

Research Question*:*

Which role does the Gaming Type play in predicting problematic gaming behavior and negative outcomes by Dutch adolescent video gamers?

To answer the research question and based on the research cited above the following hypotheses were tested:

H1: Loneliness (T1) and POSI (T1) are positively correlated.

H2: POSI (T1) and loneliness (T1) are positive predictors of PGB (T2) and negative outcomes (T2).

H3: MMOG gamers score higher on POSI (T1) and loneliness (T1) than non-MMOG gamers.

H4: MMOG gamers score higher on PGB (T2) and negative outcomes (T2) than non-MMOG gamers.

H5: GT shows a significant interaction with loneliness (T1) on PGB (T2) and negative outcomes (T2).

H6: GT shows a significant interaction with POSI (T1) on PGB (T2) and negative outcomes (T2).

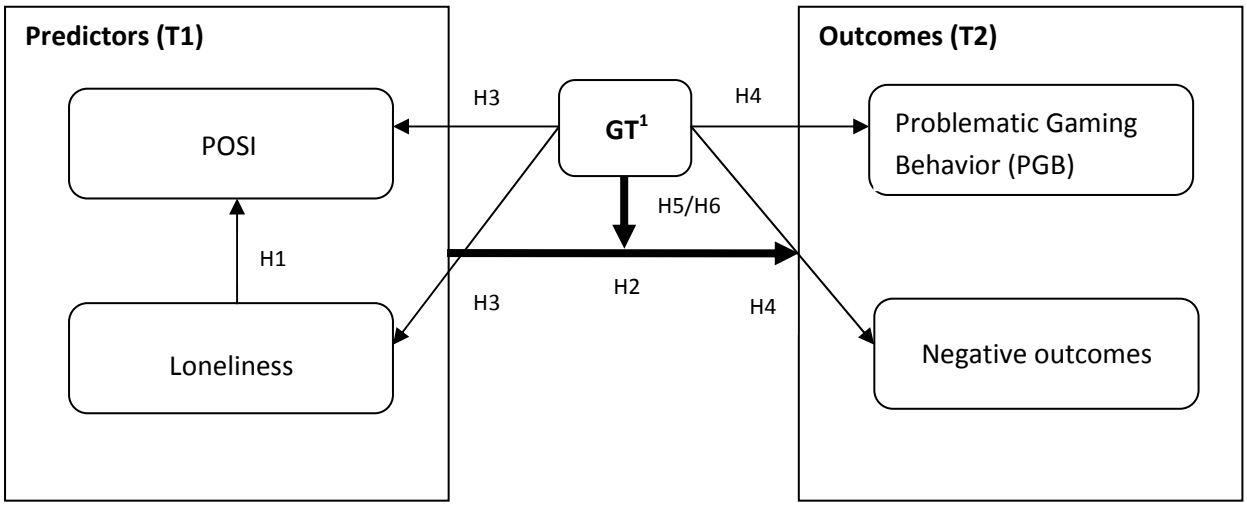

Figure 1. Hypothesized model.
[1] Dichotomous moderator: MMOG vs. non-MMOG

Method

This study is part of a larger project on PGB and psychosocial wellbeing (Haagsma et al., 2012; submitted). The study was conducted in collaboration with the *Brijder Addiction Care Group*. This is one of the largest addiction care organizations in the Netherlands and is located in the west of the Netherlands.

Procedure

The schools in the working area of the *Brijder Addiction Care Group* were initially invited by e-mail or telephone. In the pre-vocational schools, the 9th and 12th grade were invited while in senior vocational schools all grades were invited to participate. An information letter and informed consent was also provided for all parental authorities. The data were primarily collected with an online questionnaire. In September and October 2010 the first wave of data was collected where 15 schools were asked to participate whereof nine schools did participate. In March and April 2011 the second measurement was conducted. Inclusion criterion for this study was participants' self-reported gaming at both measurements.

Participants

In total 1488 respondents filled in the first online questionnaire. The second questionnaire was conducted by a total of 967 participants, which means that there was an attrition rate of 35% (Haagsma et al., submitted). Participants who did not game at all or who stopped gaming between T1 and T2 were excluded just as respondents with missing values. From the total sample, 180 participants were finally included in the study. These are participants who were gaming at the first measurement and were still gaming at the second. In total the respondents were aged between 13 to 22 years with a mean age of 15.51 years. One hundred forty-seven of the 180 respondents were male (81.7%) and 33 of the respondents were female (18.3%). Mean playing time per week was 21.09 hours (*SD* = 21.19) at T1 and 17.21 hours (*SD* = 19.89) at T2.

Measures

Demographic characteristics. At the beginning of the survey respondents were asked to fill in some demographic characteristics (e.g. gender, age, type of school, school performance, and family conditions) and a code to ensure to be able to match data of T1 and T2 for each individual.

Gaming Type. Participants who reported to play games filled in the following questions. To measure type of game the respondents played, they were asked to self-report which GT they played and how frequently they did so. There were ten game-categories given, each with a responding category from "*never*" to "*4 days per week*". By each GT category an example was given to clarify the meaning, e.g. World of Warcraft as example for a MMORPG. The following question asked about playing time at the weekend of the ten game-categories, with response categories ranging from "*never*" to "*3 days per weekend*". To perform the analysis, GT was transformed into a dichotomous variable, either MMOG or non-MMOG. Participants who played MMOGs more than 50% of their total playing time were categorized as MMOG players. Participants who played another type of game more than half of their playing time or participants who played many different types of games without any type more than 50% were categorized as non-MMOG players.

Playing Time. Two questions investigated the playing time of respondents. For each of the ten game-categories respondents could first fill in how many hours or minutes they play the game

during the week and second how many times they play each game at weekends. To calculate total playing time per week, answers from both questions were added up.

Problematic Online Game Use Scale. The *Generalized Problematic Internet Use Scale 2* [GPIUS2] of Caplan (2010) was rephrased to apply to the context of online gaming. It measures two central components of this study, namely: POSI and negative outcomes, each measured with three items. The scale for POSI was not reworded. All items can be found in *Table 1*, even as mean scores, *SD* and reliability. Response category was a 5-point Likert scale which ranged from "*totally disagree*" to "*totally agree*". The individual subscales for POSI were all reliable, $\alpha > .70$ at T1 and T2 as was the measurement at T2 for negative outcomes ($\alpha > .70$). The T1 measurement of negative outcomes only nearly reached the reliability criterion of $\alpha > .70$. However, T1 measurement of negative outcomes had not to be used in this study (see *Table 1*).

Loneliness. Loneliness was measured to assess the psychosocial wellbeing. The measurement was based on the *20-item UCLA Loneliness Scale* (Russel, 1996) from which the five items with the highest item-total correlation were selected. Each statement was scored on a 5-point Likert scale. The scale seemed to be reliable ($\alpha > .70$) at T1 and T2 (see *Table 1*).

Game Addiction Scale. To measure PGB the Dutch version of the *Game Addiction Scale* [GAS] of Lemmens, Valkenburg, and Peter (2009) was used. The scale has both good convergent and good criterion validity (Lemmens et al., 2009; 2011). The scale consists of seven items developed to measure pathological gambling according to the Diagnostic and Statistical Manual of Mental Disorders, 4th edition [DSM-4] (APA, 1994). Each item refers to one of the seven underlying criteria of pathological gambling (see *Table 1*). In this study the criteria measure problems regarding gaming behavior and not symptoms of pathological behavior. Response category was a 5-point Likert scale which ranged from "*never*" to "*very often*". The GAS scale was reliable at both T1 and T2.

Table 1

Descriptive statistics and Cronbach´s α for the observed indicators at T1 and T2

Subscale (Cronbachs α at T1/T2)	***M (SD)***	
	T1	**T2**
Preference for online social interaction (POSI) (α = .84/.94)		
1. I prefer online social interaction over face-to-face communication	1.64 (.99)	1.48 (.96)
2. Online social interaction is more comfortable for me than face-to-face interaction	1.74 (1.04)	1.47 (.89)
3. I prefer communicating with people online rather than face-to-face	1.65 (.98)	1.43 (.90)
Loneliness (α = .82/.84)		
1. There is no one I can turn to	1.86 (1.03)	1.95 (1.19)
2. I feel alone	1.67 (.88)	1.68 (.90)
3. No one really knows me well	1.75 (1.04)	1.85 (1.15)
4. I feel isolated from others	1.64 (.88)	1.70 (.97)
5. There are people who really understand me (excluded from analysis)		
Problematic gaming behavior (PGB) (α = .83/.83) During the last six months how often…		
1. did you spend all day thinking about playing a game	1.77 (.87)	1.47 (.71)
2. did you start spending increasing amounts of time on games	2.37 (1.08)	1.88 (.99)
3. have you played games to forget about real life	1.90 (1.08)	1.68 (.99)
4. have others unsuccessfully tried to reduce your game use	2.11 (1.25)	1.75 (1.07)
5. did you felt bad when you were unable to play	1.78 (1.04)	1.58 (.93)
6. did you have fights with others (e.g., family, friends) over your time spent on games	1.51 (.85)	1.28 (.63)
7. have you neglected other important activities (e.g., school or work) to play games?	1.92 (1.08)	1.73 (1.00)
Negative outcomes (α = .69/.88)		
1. My game use has made it difficult to me to manage my life	1.40 (.72)	1.42 (.76)
2. I have missed other activities because of my game use	1.94 (1.10)	1.75 (1.11)
3. My game use has created problems for me in my life	1.41 (.77)	1.41 (.83)

Analysis

This study is a 2 (predictor: low or high) by 2 (GT: MMOG or non-MMOG) factorial design. SPSS Version 16.0 was used for data analysis. First, for all variables average scores of the items were calculated to run analysis. Second, descriptive statistics were performed. Then, correlations and regressions between constructs were tested. Next, it was assessed whether the relation between the predictor variables at T1 and the outcome components at T2 were moderated by GT. The procedure suggested by Baron and Kenny (1986) was used. Therefore, interaction terms of GT and the predictors were calculated before hierarchical regression analysis was performed. Moderations that seemed to be significant were subject to further simple slope-analysis to determine the kind of effect the moderation has. Diagrams show the moderation for high and low levels of the predictor variable. Last, path-analysis was performed for both levels of the moderator using AMOS to get insight in the predictive values of the variables.

Results

Differences between GT groups

Descriptive statistics of the two GT groups can be found in *Table 2.* Mann-Whitney *U* test was conducted to test whether there were significant differences between groups. The difference between the MMOG group and the non-MMOG group with regard to gender was significant, $z = -3.96$, $p < .001$, with the MMOG group having a higher percentage of male gamers than the non-MMOG group but both GT groups having significantly more male gamers than female gamers, $z = 5.08$, $p < .001$ for MMOG and $z = 4.24$, $p < .001$ for non-MMOG. Differences between groups in age reached no significance, $z = -0.94$, $p = .35$. The two groups differed significantly regarding total playing time at T1, $z = -3.33$, $p < .01$, and T2, $z = -2.71$, $p < .01$. At both measurements the MMOG group had a total longer playing time per week as was reflected in the mean ranks. The MMOG group had a mean rank of 103.58 at T1 and 101.14 at T2 and the non-MMOG group had a mean rank of 77.7 at T1 and 80.09 at T2. Besides, Wilcoxon *signed-rank test* was used to compare total playing time at T1 and T2 within groups. For the MMOG group the difference between total playing time at T1 and T2 reached significance, $z = 3.09$, $p < .01$, with a mean rank of 45.98 for positive ranks and 42.98 for negative ranks. Differences between playing time at T1 and T2 did not reach significance for the non-MMOG group, $z = -2.66$, $p = .99$.

Table 2

Descriptive statistics for both GT groups

Variable	MMOG	non-MMOG
n	89	91
Male (n)	83 (93.3%)	64 (70.3%)
Female (n)	6 (6.7%)	27 (29.7%)
Age (mean/SD)	15.6 (1.8)	15.4 (1.7)
Total playing time per week, T1 in hrs (mean/SD)	24.1 (20.6)	18.2 (21.4)
Total playing time per week, T2 in hrs (mean/SD)	19.2 (19.9)	15.3 (19.8)

To answer the research question, correlation and regression values were calculated. The correlation matrix of the average scores of the components of both waves are shown in *Table 3*. In accordance to hypothesis H1, POSI at T1 and loneliness at T1 are positively correlated, $r = .27$, $p < .001$. The regression between POSI (T1) and PGB at T2 was significant, $b = .27$, $t = 3.77$ $p < .001$, as was the regression of POSI on negative outcomes at T2, $b = .24$, $t = 3.35$, $p < .01$. Also regression between loneliness (T1) and PBG at T2 reached significance, $b = .15$, $t = 1.99$, $p < .05$, but not between loneliness (T1) and negative outcomes at T2, $b = .08$, $t = 1.05$, $p = .30$. So, H2 was just partially confirmed.

Also the differences in scores of the predictor and outcome components were tested between the MMOG and the non-MMOG group using Mann-Whitney *U* test. The only significant differences were found for PGB-score and negative outcomes, both at T1, $z = -3.54$, $p < .01$ and $z = -2.36$, $p < .05$. In the case of PGB, MMOG had a mean rank of 104.34 and non-MMOG of 76.97. For negative outcomes mean ranks were 98.81 (MMOG) and 81.48 (non-MMOG). No significant differences could be found for POSI and loneliness at T1 between GTs, $z = -0.05$, $p = .96$ and $z = -0.13$, $p = .90$, which means that H3 is not confirmed. Hypothesis H4, that MMOG gamers score significantly higher on PGB (T2) and negative outcomes (T2), could also not be confirmed, $z = -1.24$, $p = .22$ for PGB (T2) and $z = -1.13$, $p = .26$ for negative outcomes (T2).

Table 3
Correlationmatrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) POSI T1								
(2) POSI T2	.41**							
(3) Loneliness T1	.27**	.19*						
(4) Loneliness T2	.15	.19*	.36**					
(5) PGB T1	.31**	.19*	.28**	.19*				
(6) PGB T2	.27**	.40**	.15*	.17*	.40**			
(7) Negative outcomes T1	.34**	.30**	.39**	.30**	.54**	.28**		
(8) Negative outcomes T2	.24**	.28**	.08	.30**	.32**	.44**	.39**	

**. Correlation is significant at the .01 level (2-tailed).

*. Correlation is significant at the .05 level (2-tailed).

Moderation-analysis

With hypothesis H5 and H6 it was tested whether there is an interaction of GT with POSI and GT with loneliness in predicting the outcome variables PGB and negative outcomes. Only one of the hypothesized interactions was found to be significant, namely that of GT and loneliness. First, GT does significantly moderate the relation between loneliness (T1) and PGB at T2, F (1, 176) = 5.23, p < .05. This indicates that the GT one plays influences the effect that loneliness has on PGB. Second, GT was found to significantly moderate the relation between loneliness (T1) and negative outcomes (T2), F (1, 176) = 5.46, p < .05, indicating that the GT played does have an impact on the relation between loneliness and negative outcomes. So H5, that GT does interact with loneliness was confirmed but not H6, that POSI does interact with GT, t = 0.30, p = .77 for PGB and t = -0.18, p = .86 for negative outcomes.

To test direction of the found moderation, simple slope-analysis was conducted. To see results for the interaction of GT and loneliness on PGB see *Figure 2.* It seems that participants playing non-MMOGs who have low scores on loneliness do score low on PGB. Participants belonging to the MMOG group scoring low on loneliness score significantly higher on PGB. For non-MMOG gamers the scores raise considerable for gamers with high loneliness scores in comparison to non-MMOG gamers with low loneliness. This simple main effect of loneliness for non-MMOG players is significant, t = 3.02, p < .01, which means that the increase in PGB scores is significant for non-MMOG players. The decrease in PGB scores for the MMOG group is not significant, which is indicated by the simple main effect of loneliness for the MMOG group not reaching significance, t = -0.46, p = .64 (see *Figure 2*). So analysis shows that only for the non-MMOG group, PGB scores significantly change due to the level of loneliness.

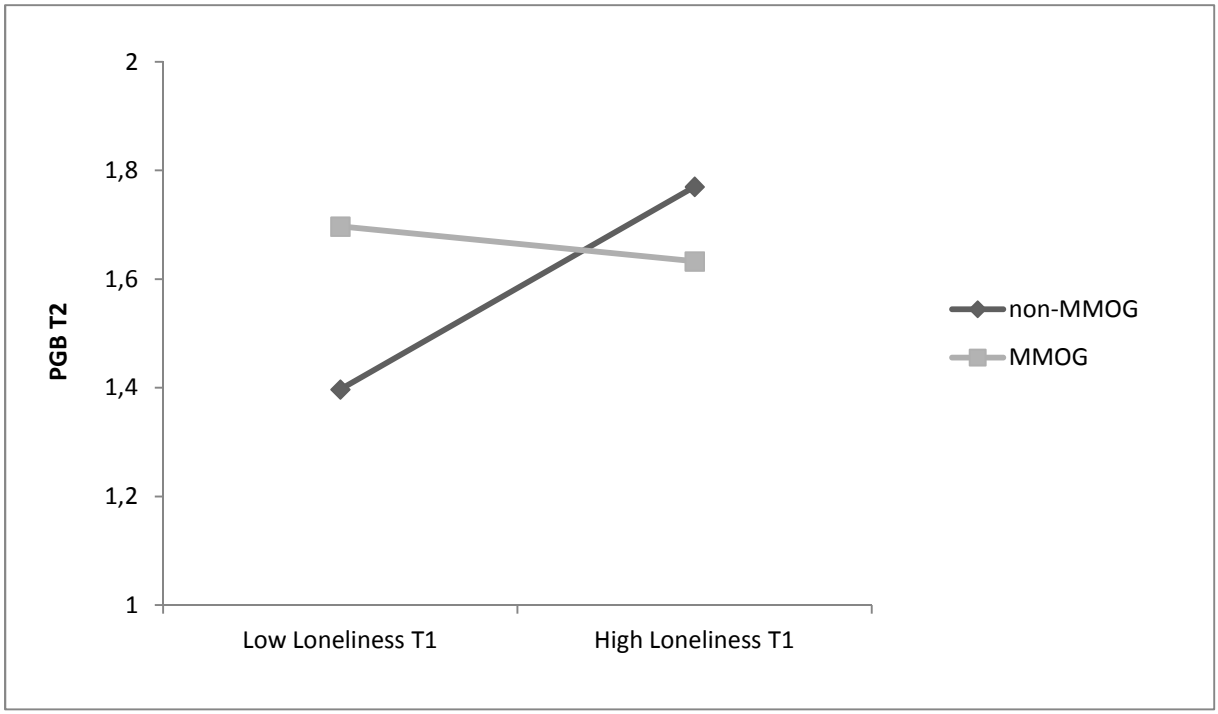

Figure 2. Moderation of GT between loneliness and PGB.

Results from slope-analysis for the interaction of GT and loneliness on negative outcomes (see *Figure 3)* show a similar pattern as the interaction described above. While respondents of the MMOG group scoring low on loneliness seem to score relatively high on negative outcomes, respondents who mainly play non-MMOGs scoring low on loneliness do score low on negative outcomes. This pattern does reverse for both GT groups with participants reporting high loneliness at T1. Simple main effect of loneliness for the non-MMOG group was found to be significant, $t = 2.31$, $p < .05$, but simple main effect of loneliness for the MMOG group did not reach significance, $t = -1.11$, $p = .27$. So only for the non-MMOG group scores on negative outcomes significantly change due to the level of loneliness.

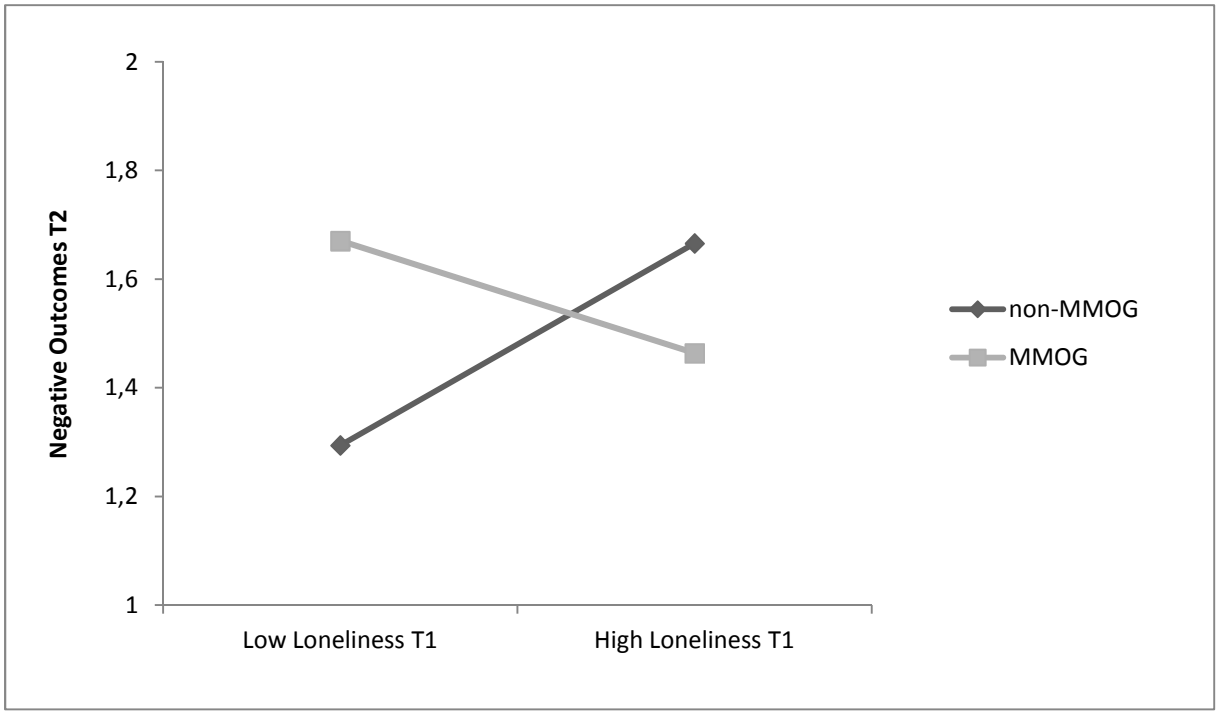

Figure 3. Moderation of GT between loneliness and negative outcomes.

Path-analysis

Results from path-analysis can be found in *Figure 4*. For the MMOG group, the only significant regression-coefficients could be found between POSI (T1) and PGB (T2), b= .31, t = 3.04, p < .01, and POSI (T1) and negative outcomes (T2), b = .25, t = 2.4, p < .05. The two models explain 10% and 8% of the variation in the outcome variables PGB and negative outcomes respectively. In case of non-MMOG players, three significant regressions could be found. In the model predicting PGB, regression between loneliness (T1) and POSI (T1) is significant, b = .35, t = 3.50, p < .001, as is the regression of loneliness (T1) on PGB, b =.24, t = 2.24, p < .05. In this model, 11% of the variation in PGB can be explained. In the model explaining negative outcomes the regression of loneliness (T1) on POSI (T1) was found to be significant, b = .35, t = 3.50, p < .001. The regression of POSI (T1) on negative outcomes almost reached significance, p = 0.058 (2-tailed). This model explains 9% of the variation in negative outcomes.

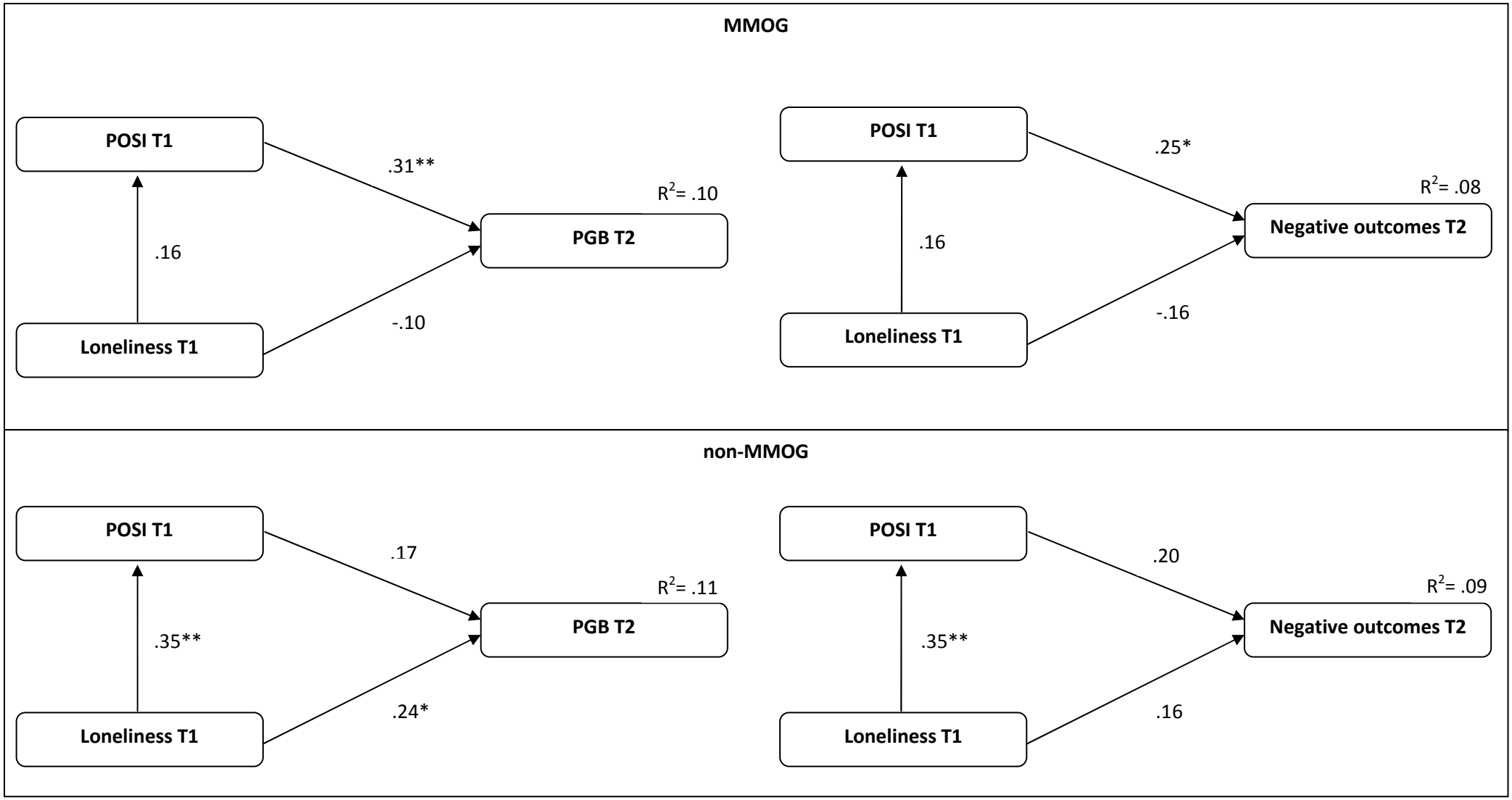

Figure 4. Results from path-analysis showing significant and non-significant regression-coefficients and R^2 for both levels of the moderator.

**. Regression is significant at the .01 level (2-tailed).

*. Regression is significant at the .05 level (2-tailed).

Discussion

This study used components of the cognitive behavioral model to get insight in the mechanisms of developing PGB and negative outcomes of gaming due to the type of game played. Therefor, this study focused on MMOG gamers in comparison to non-MMOG gamers.

When analyzing the whole sample it was found that POSI and loneliness are correlated cross-sectionally. POSI at baseline seems to be a significant predictor of PGB and negative outcomes at 6-month follow-up. Loneliness is found to be a significant predictor of PGB but not of negative outcomes at 6-month follow-up. Neither was evidence found to support the hypothesis that MMOG players score higher on POSI and loneliness at baseline in comparison to non-MMOG gamers. Nor was evidence found for the hypothesis that MMOG gamers score higher on PGB and negative outcomes at 6-month follow-up in comparison to non-MMOG gamers. A significant interaction between GT and loneliness, but not between GT and POSI was found in this study.

When looking at the mechanisms of developing PGB and negative outcomes for each GT apart, the major finding of this study is that for the two GTs different variables seem to predict negative consequences of gaming. For the non-MMOG group results clearly indicate that loneliness is a risk factor for gamers developing PGB and negative outcomes of gaming. For the MMOG group results suggest that POSI may be a risk factor; but results are not clear in this case. Moderation-analysis shows that non-MMOG gamers scoring high on loneliness at baseline do score high on both PGB and negative outcomes at 6-month follow-up. However, MMOG gamers scoring high on loneliness do not score high on outcome variables; actually for the MMOG group the level of loneliness does not affect scores on outcome variables at 6-month follow-up. So, when comparing the results of the two GTs, one could say that playing MMOGs seems to protect gamers from developing PGB and negative outcomes due to loneliness. Further, while no significant interaction between GT and POSI could be found, path-analysis does indicate that POSI is a significant predictor of PGB and negative outcomes in MMOG-gamers. So results are not yet clear about the role POSI plays in developing PGB and negative outcomes in MMOG gamers. Interestingly, in this study, playing MMOGs seems to be a protective factor for gamers from developing PGB and negative outcomes due to loneliness. This is in contrast to many studies which found that playing MMOGs is strongly linked to problematic gaming and negative effects of gaming. Looking at the mechanisms of developing PGB and negative outcomes in detail gives another view on the problematic potential of this GT.

A possible explanation for the findings regarding loneliness might be that gamers, already suffering from feelings of loneliness, who choose to play non-MMOG games without the online interaction component of MMOGs, get more isolated and hence score higher on PGB and negative outcomes at the 6-month follow-up. This explanation can also be applied to MMOG players scoring high on loneliness who do in fact score lower on PGB and negative outcomes in comparison to high-loneliness non-MMOG players. For these MMOG players, loneliness does not seem to be a risk factor for showing PGB and negative outcomes of gaming. Making use of the social interaction component typical for MMOGs may prevent that these high-loneliness MMOG gamers suffer from negative effects of their gaming. When compared to high-loneliness non-MMOG gamers, gaming MMOGs even seems to protect gamers from developing PGB and negative outcomes due to loneliness. This is in line with findings of a case study of Griffiths (2010) who found that a MMOG player, lacking real-life social contact, even had benefit of his excessive online gaming by making social contacts and avoiding feelings of isolation. Besides, there is some evidence (Longman et al., 2009) that MMOG gamers who regularly play with others and who communicate with other players outside the game receive in-game social support. And this social support, which is derived from playing MMOGs, has

the potential to promote wellbeing. Interestingly, low-loneliness MMOG gamers score relatively high on both outcome-variables compared to non-MMOG gamers. Maybe they do not communicate as frequently in these games as high-loneliness MMOG gamers do which can result in higher PGB and negative outcomes, above all in combination with longer playing time these gamers have in comparison to non-MMOG players. However, change in outcome scores for MMOG players due to loneliness was not significant.

Low-loneliness non-MMOG gamers score relatively low on outcome variables. One explanation for this could be that these gamers are indeed not lonely, thus having quite good social contacts. And the fact that non-MMOGs are not as time consuming as MMOGs may prevent that playing these games has a negative impact on these gamers. Support for this explanation is that non-MMOG players indeed do spend significantly less time on their gaming in comparison to MMOG players. At both baseline and 6-month follow-up measurement the MMOG group had a total longer playing time per week than the non-MMOG players. This is in accordance with previous research finding longer playing time for MMOG gamers (e.g. Nagygyörgi et al., 2013).

But results should be taken with caution, because this study has some limitations that could have affected outcomes. First, the criterion to classify the GTs was that gamers had to play one of the two GTs more than 50% of their total playing time per week. One could argue that this is not a valid classification because negative effects of gaming should rise not only when playing a GT more than 50% of the total playing time. Also, many respondents indeed did play both GTs, so it is unclear whether the game which is played more than 50% of the playing time has more impact on outcomes. This, and the fact that in this study relatively many gamers (23%) changed their main GT between both measurements raises the doubt to which extent gamers can be classified as a typical gamer of one GT. Anyhow, Nagygyörgy et al. (2013) studied whether MMOG gamers can be categorized into different subgroups performing latent profile analysis based on playing time. The authors found much of their respondents (79%) having a clear gaming preference, playing about 90% of total playing time one GT. Next to the four distinct MMOG groups found, the authors also found three groups with gamers playing different GTs, thus not showing a clear gaming preference. Unfortunately, the study of Nagygyörgy et al. (2013) had a cross-sectional design, so no information is given over stability of GT preference. However, that study shows that classification of GT based on total playing time is common even if it is questionable what a valid cut-off score might be to classify gamers into GT groups.

Second, another limitation might be that the sample used here is not representative for the general population of MMOG gamers. Other studies found that MMOG gamers are somewhat older, most being older than 19 years (Griffiths et al., 2003), about 26 (Yee, 2006) or 30 years on average (Williams et al., 2008). So, the generalizeability to the average MMOG gamer might be low. Besides, though this was a longitudinal design, only two measurements were performed. Therefore, this approach could not give insight in changes of the main variables over a longer duration of time, e.g. due to possible reciprocal effects. Further, no adjustment for confounding effects (e.g. of gender) was performed. Besides, this study tested a simplified model of the cognitive behavioral model. Thus, no insights could be gained in the complex mechanisms of developing negative consequences of gaming, which are indicated by other studies using a more extensive model (e.g. Haagsma et al. 2012; submitted). The fact that this study used a simple model as basis may be the reason why just small percentages of variability in outcomes could be explained here. Moreover, there are other aspects interesting to study that also might have impact on the mechanisms studied here, like the feature of creating avatars which is typical for MMORPGs. There is already some evidence that MMORPG gamers showing PGB have an impaired self-concept and a high degree in avatar

identification (Leménager et al., 2013).

Finally, sample size is relatively low. This is due to the fact that this study is part of another study that does not focus on online gaming and GTs. Many respondents had to be excluded because they were not gaming at all or stopped gaming at the 6-month follow-up. Respondents who had stopped gaming at the 6-month follow-up were excluded from analysis because it seemed not to be valid to use their data to predict outcome variables. This group did not show the relevant behavior (gaming) anymore and thus had no scores on outcome variables at the 6-month follow-up and therefore should have distorted results. Small sample size may explain some contradictory results, like the expected interaction of GT and POSI not reaching significance while prediction was well found to be significant for the MMOG group. However, to estimate the effect of excluding stoppers from analysis, both moderation- and path-analysis were also performed including stoppers. Results were almost exactly the same; this shows that exclusion of stoppers in this case does not impact the pattern of results found here.

Apart from the limitations named above, this study has some strong points which do justify that results should be considered in future research. First, despite the relatively short measurement period mentioned above, this study had a longitudinal design which allows for detecting effects of variables in time. Second, cognitive behavioral model was used as basis for this research which seems to be useful because other studies found that components like POSI and loneliness are important in explaining PGB (e.g. Caplan, 2003; Haagsma et al. (submitted)). Besides, there is some evidence that variables as playing time may not be good indicators of PGB (Griffiths, 2010) because it seems that it is more important *why* someone is gaming, e.g. because of feeling lonely or trying to regulate mood. So, investigating psychosocial variables is wanted and gives important insights in how PGB may develop and maintain. A related strong point of this study is that there were two outcome measures used to capture the construct of interest, which makes results more valid.

Future research about negative effects of gaming should be conducted over a longer time period to better understand variations in predictors and outcomes. Based on their ambiguous findings about online videogame addiction, Van Rooij et al. (2011) hypothesized that gaming on the one hand can have a positive effect (regarding loneliness and self-esteem) on gamers by providing a social environment to act in. On the other hand, later on, this virtual environment may interfere with real life and thus having a negative impact on gamers (e.g. increasing loneliness) because the virtual environment is not as rich and stimulating as real life would be. So, it would be interesting to study variations in time of these variables in the context of gaming history of the gamers. Also reciprocal effects could be studied. There is already some evidence of some relationships being reciprocal, like loneliness being both cause and consequence of PGB in Dutch adolescent gamers (Lemmens et al., 2011). Haagsma et al. (submitted) found indicators for a reciprocal relationship between psychosocial wellbeing (lower social competence and higher loneliness) and PGB. Studying a longer period could also deliver information about why a relatively large group of MMOG and non-MMOG gamers stop playing games as it was the case here. In this study 21.8% of MMOG gamers and 43.8% of non-MMOG gamers stopped gaming between the two measurements.

Second, future studies should make use of a more sophisticated sampling method. When focusing on online gaming, respondents should be selected in online fora and on gaming websites. This would prevent high exclusion rates due to not-gaming. And as already mentioned above, studies show that MMOG gamers are somewhat older than respondents in the sample used here. It would be interesting to include these older gamers because they are in another life setting so mechanisms leading to PGB and negative outcomes of gaming might be different, e.g. because of having more developed regulation-skills at this age.

A study of Williams, Yee, and Caplan (2008) about MMOG gamer profiles was the first which combined self-report survey data with in-game play data measuring gaming behavior at real-time. This approach is interesting because it does not just prevent problems regarding self-report bias (like under- or overestimation of playing time) and raises external validity, but also could deliver new insights, e.g. regarding frequency of using interaction components of MMOG gamers. In the study performed here it was assumed that use of the interaction possibilities in MMOGs may prevent that high-loneliness MMOG gamers suffer from negative effects of their gaming due to loneliness. If this in indeed the case could be tested with these unobtrusive in-game data when measuring how frequently communication occurs and whether this is not the case by low-loneliness MMOG gamers scoring higher on PGB and negative outcomes.

Future research should also focus on the role POSI plays in gamers of different GTs. According to Fioaravanti et al. (2012) POSI is one of the central components of PGB research and has a rather strong association with PGB. This research could only partially confirm that by finding that POSI predicts PGB and negative outcomes in MMOG players, but no interaction with GT was found. Furthermore, regression-coefficients between POSI and outcome variables in this study were quite small. Thus, future research should further investigate the role POSI plays in developing PGB and negative outcomes of gaming, especially for MMOG gamers.

To conclude, despite of some inconsistency in results it seems that both loneliness and POSI are predictive factors of PGB and negative outcomes, depending on the GT gamers preferably play. Playing MMOGs even seems to be a protective factor for gamers from developing PGB and negative outcomes due to loneliness. This study gives important insights in the mechanisms of developing PGB and negative outcomes of gaming due to the GT played and does confirm that it is meaningful to look at psychosocial components for different GTs apart.

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