



Problematic involvement in online games: A cluster analytic approach



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ABSTRACT

Playing online games can become problematic and engender adverse consequences. Several psychological factors have been shown to influence the development and the maintenance of this problematic behavior, including impulsivity traits, motives to play (immersion, achievement, social affiliation), and self-esteem. The aim of the current study is to determine whether reliable subtypes of problematic online gamers can be identified. A sample of 1057 online gamers was recruited. Validated questionnaires were used to measure established psychological risk factors (impulsivity, motives to play, self-esteem) and potential consequences of playing (addiction symptoms, positive and negative affect). Actual in-game behaviors were also monitored. Five reliable clusters of gamers were identified (three problematic and two nonproblematic clusters). Cluster comparison revealed that the psychological factors considered are differentially involved in problematic online gaming. At the theoretical level, the results emphasized that problem online gaming depends on a wide range of psychological factors. At the clinical level, the diversity of psychological profiles shown supports the development of personalized (custom-made) interventions targeting specific psychological mechanisms. Overall, our findings suggest that conceptualizing the problematic use of massively multiplayer online role-playing games as "behavioral addiction" is too restrictive and might result in the simplification of heterogeneous and multi-determined problematic behaviors.

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1. Introduction

Digital games have become a major leisure activity in recent years, especially since the development of the Internet allowed people to participate in online multiplayer games involving cooperation and/or competition (Herodotou, Winters, & Kambouri, 2012). The popularity of (online) video games and their exponential adoption in the community has raised concerns in the public and scientific communities, and a growing number of studies have been undertaken to test the positive and negative impact on the gamers' daily life and well-being.

On the one hand, several positive outcomes were identified. For example, it has been shown that being involved in collective online video games promotes the development of online social capital

(e.g., acquisition of new friendships, giving and receiving emotional support through online communication, socializing with persons having different types of social and economic backgrounds, or promoting online civic engagement; see Smyth, 2007; Zhong, 2011). Preliminary data also suggested that some cognitive functions (attentional, perceptual, and visuomotor skills) can be enhanced by the practice of certain types of action-based video games (Green & Bavelier, 2008). Moreover, recent evidence emphasized that an elevated commitment to online games (reflected by in-game rankings and achievements) does not necessarily interfere with daily life activities or social relationships (Billieux et al., 2013) and that most gamers do not play to fulfill unsatisfied basic psychological needs (Herodotou, Kambouri, & Winters, 2014). Such data support the position claimed by Charlton and Danforth (2007) stipulating that elevated engagement in online games has to be distinguished from their problematic use.

On the other hand, growing evidence suggests that the use of online games can become problematic and cause negative impacts

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on daily living (Gentile, 2009; Hussain & Griffiths, 2009; Smyth, 2007) and that online game overuse is often the main presenting issue in treatment-seeking self-identified problematic Internet users (Thorens et al., 2014). In recent years, several studies tried to establish the prevalence of problematic online gaming and to elucidate the factors involved in its etiology (see Kuss & Griffiths, 2011). Unfortunately, these studies vary considerably in their methodology (e.g., conceptualization and measurement of symptoms, representativeness of the samples), which precludes one from making any firm conclusions regarding the epidemiology of this potential psychopathological disorder (see Kuss, Griffiths, Karila, & Billieux, 2014, for a criticism of epidemiological studies on Internet-related disorders). In 2013, notwithstanding inconsistencies in classification and the limited evidence regarding the etiology and course of the condition, “Internet gaming disorder” was included in Section 3 of the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; DSM-5; American Psychiatric Association [APA], 2013; Petry & O’Brien, 2013). This decision of the APA, which aimed to foster research on that condition for potential inclusion as a mental disorder in a next edition of the DSM, has already resulted in attempts to validate the criteria proposed in the DSM-5 (Ko et al., 2014).

1.1. Psychological factors related to problematic online gaming

In recent years, numerous studies have been conducted to identify the various psychological factors involved in the etiology of problematic online gaming. Among these factors, the more extensively investigated are (1) motives to play online, (2) self-control-related traits, and (3) self-esteem.

First, an individual’s motivations for playing have an important role in the onset of online game involvement and its continuation (Billieux et al., 2013; Yee, 2006). A critical step in comprehending players’ motives resulted from a study by Yee (2006), which revealed the existence of three broad types of motivations, namely the achievement motive, the social motive, and the immersion (in a virtual world) motive. Each of these broad motives can actually be divided into subcomponents (e.g., the social factor comprises separate motives such as liking to chat/speak with other players while playing, playing to create new relationships or participating on teamwork-based quests involving cooperation between a group of players). Several recent studies tried to identify motives to play online that predict involvement in problematic online gaming (see Billieux, Deleuze, Griffiths, & Kuss, 2014, for a review). The achievement motive was consistently associated with problematic online gaming. More precisely, this motive predicted addiction symptoms (e.g., Billieux et al., 2013; Yee, 2006) and negative outcomes resulting from online game involvement (e.g., Hellström, Nilsson, Leppert, & Aslund, 2012; Kuss, Louws, & Wiers, 2012). Regarding the immersion motive, the picture is more balanced and depends on the type of immersion-related motives considered. The “escapism” dimension of immersion (i.e., playing to avoid thinking about real-life problems) has been consistently related to both addiction symptoms (Billieux et al., 2013; Yee, 2006) and negative outcomes resulting from playing online (e.g., Hellström et al., 2012; Kardefelt-Winther, 2014a; Kuss et al., 2012). Escapism was also shown to mediate the relationship between actual play time and psychological well-being (Kirby, Jones, & Copello, 2014). The “role-play” motive (i.e., giving importance to creating background stories and interacting with other players according to these stories) was also associated with online game addiction symptoms (Billieux et al., 2013), although this association is no longer significant when all motives to play online are considered together in a single multiple regression analysis (Yee, 2006). In contrast, the “discovery” motive (i.e., liking to explore virtual worlds and finding out the various game elements and places) was unrelated to prob-

lematic use (Billieux et al., 2013; Yee, 2006). Social-related motives, in contrast, were generally associated with a reduced risk of displaying problematic online game involvement (Billieux et al., 2013; Hellström et al., 2012).

These data sustain the position that problematic engagement in massively multiplayer online role-playing games (MMORPGs) could either result from an uncontrolled drive to look for achievement in the game, or be the consequence of a maladaptive strategy used to cope with negative affect (e.g. anxiety, dysphoria) and/or boredom. Such a hypothesis received preliminary support in a study that used avatar-monitoring techniques (Billieux et al., 2013). In this study, it was emphasized that the escape motive is unrelated to actual in-game behaviors and progression in the game, implying that some individuals could play to cope with distress more than to succeed in the game (i.e., reaching in-game objectives or achievements). In contrast, the same study highlighted clear associations between achievement-related motives and in-game rankings and progression.

Second, a large body of evidence tied problematic online gaming to poor self-control (e.g., traits of impulsivity and sensation seeking) (Billieux & Van der Linden, 2012; Billieux et al., 2011; Gentile et al., 2011; Kim, Namkoong, Ku, & Kim, 2008). This focus on self-control can mainly be attributed to the fact that Internet-related disorders are conceptualized as addictive behaviors in which uncontrolled use is one of the key features (King, Haagsma, Delfabbro, Gradisar, & Griffiths, 2013). For example, an influential 2-year longitudinal study by Gentile et al. (2011) showed that greater impulsivity is a risk factor for the development of problematic use of video games. Moreover, several recent studies showed that excessive online gamers are characterized by inhibitory control impairment (Littel et al., 2012) and poor decision-making abilities (Pawlikowski & Brand, 2011). Despite having established a clear relationship between high impulsivity and excessive online gaming, existing studies bring about a limited comprehension of the psychological mechanisms involved, as they have been too often conducted without considering that impulsivity is a multifaceted construct. Indeed, it is now established that impulsivity encompasses a combination of multiple and separable psychological dimensions (Evenden, 1999; Smith et al., 2007; Whiteside & Lynam, 2001), which rely on various motivational factors (e.g., sensitivity to reward) and cognitive deficits (e.g., lack of inhibitory control, poor decision making) (Bechara & Van der Linden, 2005; Cyders & Coskunpinar, 2011; Dick et al., 2010). The last decade, several authors clarified the multidimensionality of impulsivity by subdividing it into five dimensions (UPPS model of impulsivity; see Cyders & Smith, 2008; Whiteside & Lynam, 2001). These dimensions are defined as follows: negative urgency, the tendency to act rashly when experiencing intense negative emotions; positive urgency, the tendency to act rashly when experiencing intense positive emotions; lack of premeditation, the tendency not to take into account the consequences of an act before engaging in that act; lack of perseverance, the tendency to have difficulty remaining focused on a boring and/or difficult task; and sensation seeking, the tendency to enjoy and pursue new and exciting activities. Notably, an exponential number of studies have highlighted specific links between these impulsivity facets and various psychiatric disorders and problematic behaviors (e.g., Billieux, Van der Linden, & Rochat, 2008; Miller, Flory, Lynam, & Leukefeld, 2003; Smith, Guller, & Zapolski, 2013). Regarding disordered online gaming, a recent study conducted on a small sample of players interviewed in cybercafés showed that problematic online game use is firstly predicted by the negative urgency facet of impulsivity (when controlling for other impulsivity components) (Billieux et al., 2011). It is noteworthy that the urgency component of impulsivity is a strong predictor of maladaptive behaviors that serve to regulate affective states through the relief of negative

emotions (e.g., Billieux, Gay, Rochat, & Van der Linden, 2010; Cyders & Smith, 2008; Selby, Anestis, & Joiner, 2008).

Third, individual differences in self-esteem have also been related to online game involvement. It thus appears that players characterized by low self-esteem more often tend to be involved in excessive use of video games (Kardefelt-Winther, 2014a; Kim & Davis, 2009; Ko, Yen, Chen, Chen, & Yen 2005; Li, Liao, & Khoo, 2011). Moreover, in a recent study, Przybylski, Weinstein, Murayama, Lynch, and Ryan (2012) emphasized that the appeal of video games is due in part to their ability to provide players with subjective experiences related to ideal aspects of their selves that might not find expression in daily life activities. These studies led researchers to postulate that playing allow to approach an ideal virtual self by avoiding the actual self.

1.2. Present study

The aim of the current study was to determine, from primary established psychological risk factors in the literature, whether subgroups of problematic gamers can be shown through a cluster analysis. Our rationale for adopting this approach is that it yielded influential findings in the field of gambling research, through the identification, based on psychological factors (e.g., impulsivity traits and gambling motives), of reliable and clinically meaningful subgroups of problem gamblers (Blaszczynski & Nower, 2002; Ledgerwood & Petry, 2006; Milosevic & Ledgerwood, 2010; Stewart, Zack, Collins, & Klein, 2008). In particular, the subtyping of pathological gambling allowed researchers to distinguish between “emotionally vulnerable” gamblers, who mainly gamble to escape from intolerable emotional experiences, and “impulsive/antisocial” gamblers, whose problematic gambling is mainly driven by uncontrolled urges and poor decision making (Milosevic & Ledgerwood, 2010). For the former, problem gambling can be conceptualized as a secondary disorder, whereas for the latter, it can be conceptualized as a primary disorder. Each subtype is liable to exhibit unique psychological characteristics, and each may require a specific treatment approach (Blaszczynski & Nower, 2002). Applying a similar approach to problematic online gaming is thus a substantial contribution in the sense that it will allow researchers to disentangle the psychological characteristics of problematic gamer subtypes, which is a necessary step in the development of specific and empirically grounded psychological interventions.

To identify potential subgroups of problematic online gamers based on established psychological risk factors, we designed a large-scale online survey. To avoid a potential confounding effect of online game type (each game has specific features and structural characteristics), we included only those persons playing the same online video game, *World of Warcraft* (WoW, the most popular video game worldwide). In MMORPGs such as WoW, players create an avatar that evolves in a permanent virtual world (i.e., a world that exists independently of the fact that the player is or is not connected), in which they can interact with thousands of other players (e.g., players can be part of virtual social networks regrouping hundreds of players). It has been found that, compared with those playing other types of video games, MMORPG players more often display signs of problematic use (Kuss et al., 2012; Smyth, 2007), supporting the relevance of focusing on this specific type of video game. Validated questionnaires were selected to measure psychological factors used to create the clusters of gamers (impulsivity facets, motives to play online, self-esteem), on the one hand, and to measure potential consequences of gaming on the other hand (addiction symptoms, positive and negative affect). In-game behaviors (avatar rankings) were also collected to determine whether cluster membership translates into distinct gaming patterns.

1.3. Hypotheses regarding subtypes of online gamers

Drawing from both studies about risk factors for problematic online gaming (see Billieux, Deleuze, Griffiths, & Kuss, 2014, for a review) and about the existence of problem gambling subtypes (see Milosevic & Ledgerwood, 2010, for a review), we hypothesized that cluster analysis would allow the identification of at least two distinct subgroups of problematic online gamers.

For a first subgroup, problematic involvement could result from an unsuccessful attempt to control gaming behaviors, which are promoted by the desire to obtain achievement and stimulation. For these gamers, problematic gaming can be conceptualized as a primary disorder. This subgroup could match the “impulsive/anti-social” gamblers identified by Blaszczynski and Nower (2002). For a second subgroup, problematic involvement has rather to be viewed as secondary to another problem (e.g., a depressive mood, a trauma, the loss of a job). For these gamers, problematic gaming could be conceptualized as an uncontrolled coping strategy displayed to face negative affect and/or adverse life events. This subgroup of gamers, which has recently been described by Kardefelt-Winther (2014b), could match the “emotionally vulnerable” gamblers identified by Blaszczynski and Nower (2002).

H1. A subgroup of gamers will be characterized by high impulsivity (regarding all components of the UPPS model of impulsivity) and achievement-related motives. These gamers will display problematic gaming symptoms and their avatars will have elevated in-game rankings.

H2. A subgroup of gamers will be characterized by high urgency (emotion-related impulsivity), escapism-related motives, and low self-esteem. These gamers will display problematic gaming symptoms and elevated negative affect.

Our sample will predominantly be composed of nonproblematic gamers, and it is likely that they will be divided into more than one subgroup. Nevertheless, from the evidence that social motives are negatively correlated to problematic patterns of use (Billieux et al., 2013; Hellström et al., 2012), we postulate the existence of a subgroup of nonproblematic gamblers whose members will be mainly driven by social motives.

H3. A subgroup of gamers will be characterized by social-related motives and medium to high self-esteem. These gamers will not display problematic gaming symptoms or high levels of negative affect.

2. Method

2.1. Participants and procedure

Inclusion criteria were French-speaking WoW players aged 18 years and older (we assumed that participants must be at least 18 to give their informed consent to participate in the study). Participants were recruited through advertisements posted in specialized French-language European forums (e.g., official forums, private forums of guilds, general forums about video games) and in the local press (newspaper and television). All participants gave online consent before starting the online survey. Anonymity of the participants was guaranteed (no data on the gamers' identification were collected, including their Internet Protocol address). The study protocol was approved by the ethical committee of the Psychology Department of the University of Geneva.

In total, 1601 participants started the survey, of whom 1057 (66.02% of the sample) were aged at least 18 years and completed

all questionnaires in the survey. Most participants were male (87.67%). Ages ranged from 18 to 66 years ($M = 26.01$, $SD = 7.96$). The participants lived in France (74.93%), Switzerland (16.65%), Belgium (4.92%), or other countries (2.46%). The remaining participants (1.04%) did not report their nationalities. At the time of the survey, the participants reported being employed (54.59%), undergraduate students (36.90%), or unemployed (5.77%), or did not include their profession (2.74%). The mean number of hours devoted weekly to playing WoW was 25.11 ($SD = 15.56$, range 2–112), which corresponds to the findings in independent study samples (Billieux et al., 2011; Peters & Malesky, 2008).

2.2. Measures

2.2.1. Questionnaires

Questionnaires included in the online survey were selected to prioritize those instruments that have been validated with francophone samples. Table 1 describes the scales used and reports their internal reliability. The multidimensional construct of impulsivity was measured with the French UPPS-P Impulsive Behavior Scale, which assesses five reliable impulsive traits that have been related to a wide range of psychiatric disorders (Billieux, Rochat et al., 2012). Motives to play online were measured with the French Motivation to Play in Online Games Questionnaire (MPOGQ) (Billieux et al., 2013; original English version: Yee, 2006), which is based on the most comprehensive model of online gamers' motives to play (Yee, 2006). The original instructions of the MPOGQ were adapted so that they referred only to WoW. Finally, individual differences in self-esteem were assessed with the Single-Item Self-Esteem Scale (SISE) (Robins, Hendin, & Trzesniewski, 2001).

Symptoms of MMORPG overuse were measured with the French Internet Addiction Test (IAT; Khazaal et al., 2008; original English version: Young, 1998). The IAT was chosen because it is currently the most frequently used scale to measure and diagnose Internet-related disorders (Kuss et al., 2014). The original instructions of the IAT were adapted so that they referred only to WoW. This scale measures symptoms of problematic use (e.g., compensatory usage of the Internet, compromised control, lack of control, excitatory usage) and negative consequences of overuse of the

game (compromised social and individual quality of life, compromised scholarly/academic/working careers).

The French Positive Affect and Negative Affect Schedule (PANAS; Gaudreau, Sanchez, Blondin, 2006; original English version: Watson, Clark, & Tellegen, 1988) was used as an indirect measure of comorbid psychopathology. This scale was selected because it allows parsimonious measurement of affect in general (i.e., not related to a particular disorder or negative life event such as depression, anxiety, or trauma exposure); a comprehensive assessment of comorbidity would have been too long.

2.2.2. Direct measure of involvement in the game

In-game related information can be collected at the WoW official website, *Armory*, which is a comprehensive database reporting the achievements of the avatars evolving in WoW. We chose to extract a global achievement score (i.e., the total number of missions and/or objectives completed), which represents a direct measure of progression and involvement in the game. All data extracted were taken from the *Armory* website of the French community of WoW: <<http://eu.battle.net/wow/fr/>>. These data were available for the participants who agreed to provide the name of their main avatar and the server in which they play ($N = 690$, 65.16% of the participants included). An in-depth longitudinal analysis (8 months) of the actual in-game behaviors of this subsample is presented in detail elsewhere (Billieux et al., 2013).

2.3. Data analysis

We decided to use data clustering techniques to identify subgroups of gamers. Data grouping was achieved through a combination of hierarchical and nonhierarchical procedures, as recommended by recent theoretical trends in data clustering approaches (Hair, Black, Babin, & Anderson, 2010). Subgroups of players were identified from three established risk factors: impulsivity (UPPS-P), motives to play online (MPOGQ), and self-esteem (SISE). Cluster analysis is noninferential, which implies that variable selection is a critical part of the analytic process. Variables were thus selected according to a trade-off between (1) parsimony (cluster composed of too many variables are hard to interpret) and (2) the existing literature. The following choices were made. First,

Table 1
Questionnaire variables used in the online survey.

Questionnaire	Scale	Scale description	Reliability coefficient (α)
Motivation to Play in Online Games Questionnaire	Advancement	Desire to gain power and progress rapidly in the game	.80
	Mechanics ^a	Interest in understanding the rules and the functioning of the game	.74
	Competition ^a	Desire to challenge and compete with other players	.78
	Socializing	Interest in socializing with other players in the game (chatting, helping, etc.)	.76
	Relationship ^a	Desire to form long-term meaningful relationships with other players	.73
	Teamwork ^a	Deriving satisfaction from being part of a group effort	.74
	Discovery ^a	Desire to find out and know the various game elements and places	.85
	Role-play	Interest in developing the background and story of the avatar (i.e., playing its role)	.69
	Customization ^a	Interest in customizing the appearance of the avatar	.74
	Escapism	Desire to play to avoid thinking of real-life problem or to cope with negative affect	.65
UPPS-P Impulsive Behavior Scale	Negative urgency	Proneness to act rashly in negative emotional contexts	.80
	Positive urgency	Proneness to act rashly in positive emotional contexts	.77
	Lack of perseverance	Difficulty to remain focused on difficult or boring tasks	.86
	Lack of premeditation	Difficulty to take into account the consequences of an action	.81
	Sensation seeking	Openness to new experiences and preferences for risky activities	.79
Single-Item Self-Esteem Scale	Self-esteem	Extent to which individuals view themselves as likeable and worthy	.89
Internet Addiction Test	Addiction symptoms	Problematic involvement in the game (e.g., loss of control, salience, impact in daily life)	.89
Positive Affect and Negative Affect Schedule	Positive affect	Proneness to experience positive affect states	.76
	Negative affect	Proneness to experience negative affect states	.82

^a Variables not included in the cluster analysis (see Data Analysis section). Internal reliability coefficients (α) are those obtained in the current sample.

the positive and negative urgency subscales of the UPPS-P, which highly correlate ($r = .58, p < .00001$), were regrouped into a single factor of urgency (Cronbach's $\alpha = .86$). The three remaining facets of the UPPS-P were retained (lack of perseverance, lack of premeditation, sensation seeking). Second, we selected four subscales of the MPOGQ that represent the main motives investigated in the MMORPG literature (their intercorrelations ranged in our study from $r = -.07$ to $r = .26$). The motives retained were the advancement motive, the social motive, the role-playing motive, and the escapism motive. Finally, the SISE was included as an index of self-esteem.

External correlates of the clusters were then considered in relation to demographics (age, gender), reported involvement in WoW (hours played per week), in-game achievement index (extracted from the *Armory* website), addiction symptoms (IAT), and affect (PANAS). Analyses of variance (ANOVAs; computed separately for cluster profiling and external correlates) with Neuman–Keuls post hoc tests (significance level at $p < .01$) were computed to compare clusters.

As the cut-offs used for the IAT vary among studies and were not empirically determined (Kuss et al., 2014; Lortie & Guitton, 2013), we decided to determine the proportion of gamers presenting abnormal scores regarding this measure for each cluster by using two distinct methods. First, we applied the traditional cut-off of IAT >50 that was used in several previous studies (e.g., Ni, Yan, Chen, & Liu, 2009; Wang et al., 2011). Second, we adopted an empirical approach in which a deviance criterion was fixed at a threshold of 1.65 SD of the mean for control participants on the basis of the validation data of the French IAT (Khazaal et al., 2008). In a normal distribution, this corresponds to the fifth percentile, which is a common threshold to highlight deviance from the mean.

For all analyses, missing data ($N = 288$; 0.27% of the data) were replaced by the mean of the related factor if its internal consistency was high (Cronbach's $\alpha > .70$); otherwise pairwise deletion was used.

3. Results

A hierarchical cluster analysis was first undertaken. All variables included were Z-transformed to share the same metric, so that each of them would contribute equally to the formation of the clusters. Multicollinearity between variables may have an impact on the cluster analysis by giving more weight to collinear variables. An analysis of the correlations between the variables selected for the cluster analysis supports the absence of multicollinearity (the highest correlation was $r = .43$) (Hair et al., 2010). The hierarchical cluster analysis was performed by using Ward's method with squared Euclidian distance measurement. The agglomeration schedule confirmed that the passage from five to four clusters would have more impact on the heterogeneity of the clusters than previous stages of the analysis, as continuing to regroup the clusters would result in joining together quite different clusters at this stage. Cluster memberships were then determined through consecutive nonhierarchical K-means cluster analysis computed to identify an optimal five-factor solution. The profiles of the five clusters are depicted in Fig. 1. The ANOVAs conducted revealed a significant effect of cluster membership on each psychological factor investigated (impulsivity facets, motive to play online, self-esteem), as well as with the external correlates considered (age, weekly hours of play, in-game achievements, addiction symptoms, affect). Descriptive statistics for each cluster and ANOVA (including results of post hoc analyses) are reported in Table 2.

The identified clusters were then compared for external correlates. Concerning demographics, members of clusters 1 and 4 tended to be younger than players belonging to the other three clusters. Females were overrepresented in cluster 3 compared with other clusters (26.9% of females belong to cluster 3). Members of cluster 4 played more hours per week than members of all other

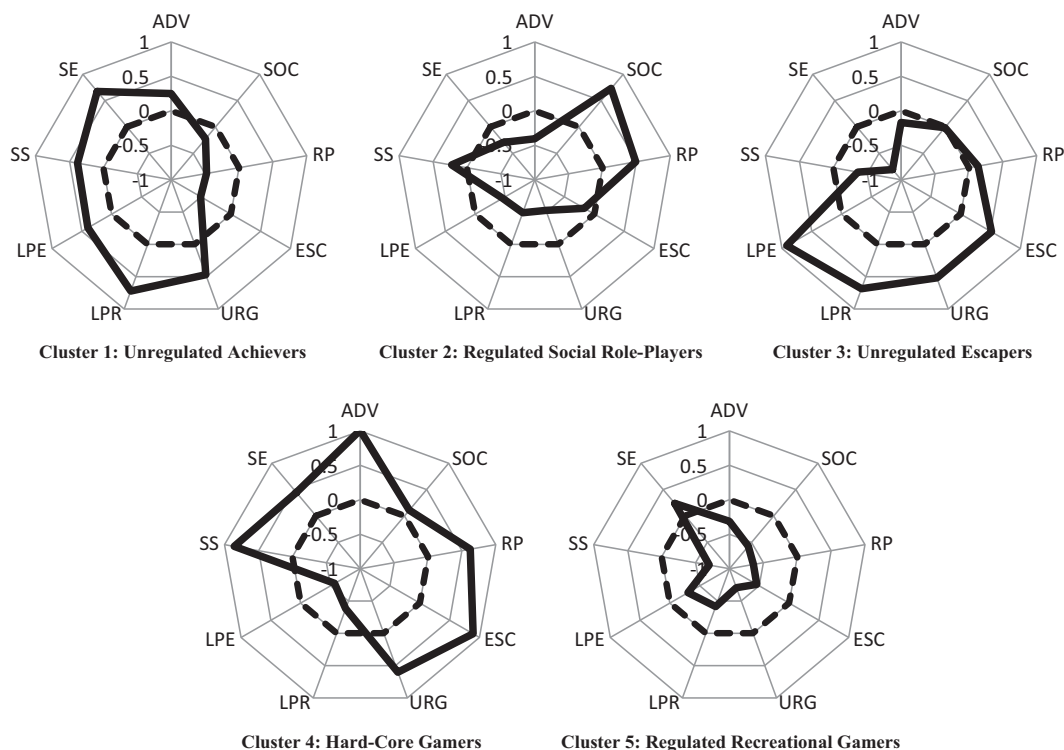


Fig. 1. Psychological Profiles of the Subgroups of Players. ADV = Advancement (MPOGQ); SOC = Socializing (MPOGQ); RP = Role-play (MPOGQ); ESC = Escapism (MPOGQ); URG = Urgency (UPPS-P); LPR = Lack of premeditation (UPPS-P); LPE = Lack of perseverance (UPPS-P); SS = Sensation seeking (UPPS-P); SE = Self-esteem (SISE). Dashed lines refer to mean Z-scores of the entire sample. Bold lines refer to mean Z-scores for each specific cluster.

clusters, whereas members of clusters 1 and 3 played more hours per week than members of clusters 2 and 5. Members of cluster 4 reached more in-game achievements (based on data from the *Armory* website) than players of other clusters, whereas other clusters did not differ regarding this measure. Adverse consequences of playing and addictive patterns were significantly more pronounced in clusters 1, 3, and 4, in comparison to clusters 2 and 5. Adverse consequences of playing were significantly higher in cluster 4, in comparison to all other clusters. Negative affect was highest in cluster 3, followed by clusters 1 and 4. Positive affect was highest in cluster 4 and lowest in cluster 3. No difference regarding positive affect was found in the other clusters. It is worth noting that regarding external correlates, the higher significant differences between clusters concern symptoms of problematic use and negative affect, which supports the clinical relevance of the clusters identified.

The proportion of problematic MMORPG use (based on the IAT) was determined with two distinct methods. Based on the traditional cut-off approach (IAT > 50), the proportion of problematic users was 16% for cluster 1, 7.36% for cluster 2, 24.89% for cluster 3, 41.32% for cluster 4, and 6.27% for cluster 5. Based on a deviance criterion computed on the normative data taken from the French validation study of the IAT (Khazaal et al., 2008), the proportion of problematic users was 32.57% for cluster 1, 19.91% for cluster 2, 41.05% for cluster 3, 60.48% for cluster 4, and 15.29% for cluster 5. Although the prevalence of problematic online gaming was more elevated when the deviance criterion was applied, the two methods yielded comparable results (proportion of problematic gamers: cluster 4 > cluster 3 > cluster 1 > cluster 2 > cluster 5). On the whole, these proportions confirm that MMORPGs may imply adverse consequences, even for “less problematic” profiles.

4. Discussion

The aim of the current study was to determine whether reliable subtypes of problematic online gamers can be identified based on established risk factors. Five different clusters were determined:

three clusters of problematic gamers (clusters 1, 3, and 4) and two clusters of nonproblematic gamers (clusters 2 and 5). Regarding our hypotheses, H1 and H2 were confirmed (H1 corresponds to cluster 1 and H2 corresponds to cluster 3), whereas H3 was partially confirmed (H3 approximately corresponds to cluster 2). However, the two remaining clusters (4 and 5) cannot directly be related to our a priori hypotheses.

Two nonproblematic clusters, representing about 46% of the sample, were identified. Members of the first cluster of nonproblematic gamers are characterized by low impulsivity traits and high self-esteem; they assess the various motivations to play online as nonfundamental. This suggests that, for them, the game does not serve to satisfy basic needs (such as autonomy, competence, or social affiliation), which are probably pursued through real-life activities. Such an assumption is in line with a recent study of Herodotou et al. (2014), showing that basic psychological needs are reasonably satisfied in most WoW players. Members of this cluster were named “regulated recreational gamers.” The second cluster of nonproblematic players is composed of gamers who reported relatively low levels of self-esteem, low impulsivity (except sensation seeking), and motivations related to social exchange and role-playing. Contrary to what was expected in H3, members of this cluster are characterized by low self-esteem. It is thus possible that these players like to create and identify themselves as an idealized virtual self (their avatar) with which they socialize in the virtual world. This hypothesis is in accordance with a recent study emphasizing that WoW players with low self-esteem rated their avatar as having more favorable attributes than their own self-rated attributes (Bessi re, Seay, & Kiesler, 2007). Members of this cluster were named “regulated social role-players.” We cannot exclude the possibility that some members of this cluster are socially anxious individuals for whom communicating through a virtual world can be conceptualized as an avoidance process.

The first problematic cluster is composed of gamers characterized by low achievement and high escapism motives, as well as by poor self-esteem. They present high impulsive traits (but a low level of sensation seeking). This subgroup corresponds to H2.

Table 2
Descriptive statistics for the five clusters.

Variable		Cluster 1 (N = 175, 16.55%) Unregulated Achievers (Problematic)	Cluster 2 (N = 231, 21.85%) Regulated Social Role-Players (Nonproblematic)	Cluster 3 (N = 229, 21.67%) Unregulated Escapers (Problematic)	Cluster 4 (N = 167, 15.80%) Hard-Core Gamers (Highly problematic)	Cluster 5 (N = 255, 24.13%) Regulated Recreational Gamers (Nonproblematic)			
Cluster profile	Range	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	F	p	η^2
Urgency	1–4	2.56 (0.04)	1.96 (0.03) ^a	2.59 (0.03) ^b	2.64 (0.04) ^b	1.85 (0.03) ^{a,c,d}	130.8	.001	.33
Lack of premeditation	1–4	2.18 (0.03)	1.54 (0.03) ^a	2.16 (0.03) ^b	1.59 (0.03) ^{a,c}	1.58 (0.03) ^{a,c}	114.1	.001	.30
Lack of perseverance	1–4	2.05 (0.04)	1.54 (0.03) ^a	2.36 (0.03) ^{a,b}	1.48 (0.04) ^{a,c}	1.63 (0.03) ^{a,c,d}	128.5	.001	.33
Sensation seeking	1–4	2.91 (0.04)	2.80 (0.04)	2.41 (0.04) ^{a,b}	3.23 (0.04) ^{a,b,c}	2.18 (0.04) ^{a,b,c,d}	112.0	.001	.30
Advancement motive	1–5	2.92 (0.06)	2.36 (0.05) ^a	2.56 (0.05) ^{a,b}	3.56 (0.06) ^{a,b,c}	2.44 (0.05) ^{a,d}	81.9	.001	.24
Social motive	1–5	3.47 (0.04)	4.20 (0.05) ^a	3.63 (0.05) ^b	3.73 (0.05) ^{a,b}	3.20 (0.04) ^{a,b,c,d}	68.3	.001	.21
Role-playing motive	1–5	2.23 (0.05)	3.02 (0.05) ^a	2.73 (0.05) ^{a,b}	3.13 (0.06) ^{a,c}	2.09 (0.04) ^{b,c,d}	91.00	.001	.26
Escapism motive	1–4.75	2.50 (0.05)	2.77 (0.04) ^a	3.32 (0.04) ^{a,b}	3.63 (0.05) ^{a,b,c}	2.47 (0.04) ^{b,c,d}	115.0	.001	.30
Self-esteem	1–4	3.07 (0.05)	2.30 (0.04) ^a	1.89 (0.05) ^{a,b}	2.89 (0.05) ^{b,c}	2.73 (0.04) ^{a,b,c}	101.8	.001	.28
<i>External correlates</i>									
Age	18–66	24.23 (0.60)	26.80 (0.52) ^a	26.29 (0.52) ^a	23.57 (0.61) ^{b,c}	27.88 (0.50) ^{a,d}	10.34	.001	.04
Hours/week	2–112	25.11 (1.14)	21.72 (1.00)	25.92 (1.01) ^b	33.48 (1.17) ^{a,b,c}	21.96 (0.95) ^{c,d}	18.51	.001	.07
In-game achievements	20–11380	4749.42 (210.92)	4327.60 (185.58)	4216.46 (190.46)	5396.35 (226.56) ^{a,b,c}	4599.17 (180.97) ^d	4.77	.001	.03
Addiction symptoms	1–4.75	1.95 (0.04)	1.76 (0.04) ^a	2.11 (0.04) ^{a,b}	2.45 (0.05) ^{a,b,c}	1.66 (0.04) ^{a,c,d}	54.12	.001	.17
Negative affect	1–5	2.19 (0.04)	1.93 (0.04) ^a	2.50 (0.04) ^{a,b}	2.30 (0.04) ^{b,c}	1.88 (0.04) ^{a,c,d}	46.04	.001	.15
Positive affect	1–5	3.37 (0.04)	3.40 (0.03)	3.02 (0.03) ^{a,b}	3.53 (0.04) ^{a,c}	3.31 (0.03) ^{c,d}	27.05	.001	.09

^a Statistically significant in comparison to cluster 1 ($p < .01$).

^b Statistically significant in comparison to cluster 2 ($p < .01$).

^c Statistically significant in comparison to cluster 3 ($p < .01$).

^d Statistically significant in comparison to cluster 4 ($p < .01$).

For them, excessive use can be conceptualized as a maladaptive coping strategy serving to overcome negative affect (Karddefelt-Winther, 2014b) and/or negative life events (e.g., a traumatic event; see Schimmenti, Guglielmucci, Barbasio, & Granieri, 2012; Schimmenti, Passanisi, Gervasi, Manzella, & Famà, 2014). In other words, they play more to “dissociate” from real life than to succeed in the game (Schimmenti & Caretti, 2010). Members of this cluster were named “unregulated escapers.” It is likely that for this subgroup of players, excessive use has to be considered a consequence of another problem (e.g., consecutive to a depressive mood or a negative life event). This assumption is indirectly supported by the fact that these players reported an elevated level of negative affect. This cluster had a high proportion of female players, which may be related to the higher prevalence of depressive disorders in women (Nolen-Hoeksema, 2001).

Members of the second problematic cluster are characterized by high scores on all impulsivity facets. They are primarily motivated by achievement in the game and are not interested in role-playing, socializing, or in playing to escape real-life problems. This subgroup corresponds to H1. For them, exaggerated game playing is promoted by a combination of strong drive toward achievement within the game and poor self-control (e.g., weak inhibitory control and decision making). They have trouble overcoming the immediate gratifications provided by the game (e.g., excitement associated with a virtual fight or a challenging quest, reinforcements resulting from leveling-up or obtaining a very rare item). In fact, neurobiological evidence suggests that dopamine release during video game play is higher in frequent video game players, reflecting altered reward processing and representing adaptive neural plasticity (Koepp et al., 1998; Kühn et al., 2011). Accordingly, regular players with diminished self-control capacities will be more at risk of developing excessive patterns of use because of the heightened incentive nature of the game. Finally, these players have high self-esteem, meaning that they probably do not play to approach an idealized self. In accord with their characteristics, we named these players “unregulated achievers.”

The individuals of the third problematic cluster have the highest adverse consequences resulting from gaming and display high involvement in the game, as reflected both by their self-reported hours of play and by the in-game objective progression of their main avatar (data taken from the *Armory* website). They are mainly motivated by achievement and escapism, although role-playing is also important for them. They have high self-esteem. Surprisingly, they reported both a high level of self-esteem and a high level of escapism. A tentative explanation for this unexpected association is that their self is boosted by their in-game achievements and reputation. In other words, it is as if for them the “virtual” self has overwhelmed the real self, implying a potential denial of real life and an overinvolvement in virtual life. These players are also characterized by a distinctive impulsivity profile. On the one hand, they display high levels of both sensation seeking and urgency. The urgency component of impulsivity, that is, a tendency to act rashly when faced with intense emotional states, has been related to poor inhibition and decision-making capacities (Billieux et al., 2010; Gay, Rochat, Billieux, d’Acremont, & Van der Linden 2008; Xiao et al., 2009). Accordingly, we think that these gamers will have great difficulty in inhibiting gaming when they are faced with positive or negative emotional states (generated by real-life and in-game events). On the other hand, they reported high premeditation and perseverance. Thus, it is possible that reaching and maintaining an elevated in-game level (e.g., a guild-master position, a good place in international WoW ranking) requires both an ability to perform in-game actions by balancing short-term outcomes with their long-term consequences (premeditation) and the involvement of frequent and lengthy in-game sessions requiring demanding attentional control (perseverance). Interestingly, the

impulsivity profile of these gamers, characterized simultaneously by very high urgency and premeditation, partially matches that found in obsessive-compulsive-prone individuals who are characterized by symptoms of ordering and checking (Zermatten & Van der Linden, 2008). A tentative implication of this result is that when problematic online gaming is a primary disorder, it could be conceptualized as either an “addictive” behavior (cluster 1) or an “obsessive-compulsive” behavior (cluster 4). We named the members of this cluster the “hard-core gamers.” It is worth noting that although hard-core gamers present a certain degree of regulation of their in-game behaviors (to reach in-game objectives), they elude real-life adverse outcomes, which engenders problematic involvement in the game.

Some limitations of the study have to be mentioned. First, a comprehensive comorbidity assessment was not included in order to avoid extending the duration of the survey. Such an assessment would have strengthened our hypothesis that for unregulated escapers, overuse is secondary to another problem. Second, as this study is cross-sectional, further research is required to longitudinally confirm the validity of the clusters highlighted. Third, the sample of players is self-selected, which entails the generalization of the study’s results to the entire population of MMORPG players (see Khazaal et al., 2014). For example, a random sample could have resulted in the identification of potential supplementary cluster not highlighted in the current study. Fourthly, the current study mainly relies on self-report. Such types of subjective data are indeed prone to be influenced by social desirability bias or lack of insight (Dunning, Heath, & Suls, 2004). Nevertheless, this weakness is balanced by the fact that we recruited a large sample ($N > 1000$) and also relied on ecological data (avatar monitoring). Finally, other types of psychological factors, although less well documented (e.g., social anxiety, schizotypy, attachment styles e.g., Mittal, Dean, & Pelletier, 2013; Schimmenti et al., 2014) that could play a role in problematic online gaming were not assessed.

The current study is the first to demonstrate the existence of distinct subtypes of reliable (and clinically meaningful) problematic online gamers. This finding has some critical implications, both at the theoretical and at the clinical level. At the theoretical level, and similar to what was established in the field of research on pathological gambling (Billieux, Lagrange, et al., 2012; Stewart et al., 2008), our results emphasize that problem online gaming is highly heterogeneous and depend on a wide range of psychological factors. Further studies are however required to disentangle the role of these factors in the development, perpetuation, and recurrence of problematic involvement in online games. From a clinical point of view, the results deserve attention with regard to both the assessment and the treatment of problematic online gaming. Our findings indeed suggest that the assessment of the psychological factors leading to problematic use of online games (motives to play, impulsivity traits, self-esteem) is more useful for understanding an individual’s potential problems with those games than is an assessment that solely focuses on diagnosis and/or symptoms. Furthermore, the diversity of the psychological profiles highlighted herein supports the development of personalized (custom-made) intervention targeting specific psychological mechanisms (see, e.g., Billieux, Philippot, et al., 2014; Dudley, Kuyken, & Padesky, 2010). For example, a problematic gamer from cluster 1 (unregulated achievers) could benefit from an intervention designed to increase self-control capacities (see Friese, Hofmann, & Wiers, 2011, for empirically grounded techniques devoted to the improvement of self-control abilities). In contrast, a problematic gamer from cluster 3 could benefit from an intervention targeting the actual primary problem and its underlying psychological processes (which can be different from one individual to another, e.g., an individual who has developed depression following job loss versus a traumatized individual who plays to dissociate

from the flashbacks and intrusive thoughts related to the traumatic event). Eventually, a problematic gamer from cluster 4 could benefit from an intervention that combines the improvement of emotion regulation (e.g., mindfulness-based therapy) and the optimization of self-control. Furthermore, members of cluster 4 would also benefit from the implementation of activities that tend to reinforce the real self in order to reduce the discrepancy between the real and the virtual self.

To conclude, we would like to emphasize the current trend to consider a high commitment to (or a passion for) a wide range of daily or leisure activities such as video game playing as “behavioral addictions” (see Billieux, Philippot, et al., 2014, and Mihordin, 2012, for critical discussions). Indeed, in the recently released DSM-5, Internet gaming disorder was proposed as a tentative new psychiatric condition and conceptualized as an addictive disorder. Besides this evolution leading to growing pathologization of everyday behaviors, it also neglects the evidence that excessive behaviors (e.g., playing video games, gambling, eating, shopping) are heterogeneous and multi-determined.

Contribution

JB, GT, SA, YK, DZ, and MVdL designed the study. JB did the statistical analyses. JB, GT, SA and MVdL interpreted the results. JB, GT, SA, and YK carried out the data acquisition and supervised the monitoring of the players’ in-game behaviors (avatar data). JB and GT wrote the article. SA, YK, DZ, and MVdL participated in the review of the manuscript. All authors approved the final version of the manuscript.

Conflicts of interest

The authors have no interests to disclose.

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