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Title: Problematic gaming and quality of life in online competitive videogame players: Identification of motivational profiles

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Background:

Online competitive practice of video games has recently known a significant worldwide expansion. However, this practice can be associated to problematic use and deterioration of quality of life depending on multiple determinants, among which motivation is central. The purpose of this study was to identify motivational clusters and to compare them regarding quality of life, problematic use of video game, and personality traits.

Methods:

Participants (N=256) in this cross-sectional study were recruited through specialized websites to complete self-reported questionnaires assessing motivation to play online (MOGQ), personality (BFI-Fr), quality of life (WHOQOL-BREF), and problematic use (IGD-Scale). A hierarchical clustering analysis and intergroup comparative analyses were conducted.

Findings:

Three motivational clusters were identified ("recreational", "competitive" and "escapers"). "Competitive" and "escapers" players reported higher IGD scores than the "recreational" players ($p<.001$). However, "escapers" players had lower psychological health scores ($p<.001$), were more neurotic ($p<.001$), and less extroverted ($p<.001$) than the others. Based on IGD scores, “competitive” and “escapers” players were considered as problematic albeit

only "escapers" exhibited a functional impairment. Therefore, engaged and problematic players cannot be differentiated with IGD scores.

Discussion:

IGD scores were insufficient to differentiate between players at risk of evolution toward pathological states (i.e., "escapers" players) and those whose strong engagement is not detrimental to their quality of life (i.e., "competitive" players). Consequently, considering both psychological health and motivation is necessary to assess the problematic nature of competitive videogame practice. Better definitions and assessment tools are essential in order to avoid over-diagnosis of non-pathological behaviors.

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1.INTRODUCTION

1.1 Video game use and negative outcomes

Although several studies documented the positive effects of video game use (Granic et al., 2014), a large number of studies proposed to focus on the negative consequences associated with intensive online gaming patterns (Domahidi & Quandt, 2015; Festl et al.,2013; Lemmens & Hendriks, 2016; Rehbein et al., 2015). Some of these studies suggested that such a practice is associated with negative health effects (see Saunders et al., 2017, for a review), including the reduction of physical activity and sedentary behaviors (Mérelle et al., 2017), which have been linked with negative health outcomes (Tremblay et al., 2011). From a psychological point of view, time spent playing has been associated with mental health issues like depression and anxiety (Maras et al., 2015; Wei et al.,2012).

1.2 Internet Gaming Disorder (IGD) and Gaming Disorder (GD)

These negative consequences of intensive use of video games received particular attention in 2013, when the American Psychiatric Association included Internet Gaming Disorder (IGD) as a "Proposed Condition for Further Study" (American Psychiatric Association [APA], 2013) in its fifth edition of the DSM. IGD is defined as a “Persistent and recurrent use of the Internet to engage in games, often with other players, leading to clinically significant impairment or distress as indicated by five (or more) out of twelve criteria”. A recent meta-analysis reported that the worldwide prevalence of IGD can be estimated to be 1-2% (Stevens et al., 2021).

More recently, the World Health Organization (WHO) has also confirmed its project to include Gaming Disorder (GD) as a new condition in the eleventh International Classification of Diseases (ICD-11) (World Health Organization, 2019). Gaming disorder is defined as a pattern of gaming behavior (“digital-gaming” or “video-gaming”) characterized by impaired control over gaming, increasing priority given to gaming over other activities to the extent that gaming takes precedence over other interests and daily activities, and continuation or escalation of gaming despite the occurrence of negative consequences. For gaming disorder to be diagnosed, the behavior pattern must reach a sufficient level of severity to result in significant impairment in personal, family, social, educational, occupational or other important areas of functioning and would normally have been evident for at least 12 months. This decision was made on the grounds of epidemiological, clinical and neurobiological studies, and taking into account both clinical data obtained from health

professionals, as well as the increasing demand for treatment related to video game use in adolescents and young adults. Indeed, as a whole, these data showed an association of GD with a significant deterioration of individual functioning (Billieux et al.,2021). As a matter of simplicity, this study will use from now on the term GD to describe both the DSM-5 and ICD-11 entities of pathological gaming behaviors.

However, the consideration of gaming disorder as a mental disorder has fueled debates around the construct validity and clinical relevance of this disorder. Some authors (Aarseth et al., 2017; Bean et al., 2017; Van Rooij et al., 2018) consider this introduction to be premature and insist on the need for a stronger evidence base than the one currently available, highlighting the potential negative consequences of such integration (abusive diagnoses, false positives, stigmatization, etc.). In this context, and in an effort to avoid pathologizing intensive – but healthy – gaming patterns, research on problematic gaming should include measures of functional impact.

1.3 Gaming disorder and quality of life (QoL)

Some of the researches including those measures have shown a link between GD and the degradation of QoL indicators such as anxiety, stress, depression and lower life satisfaction (Bargeron & Hormes, 2017; Mentzoni et al., 2011), ill health (Männikkö et al.,2015), fatigue (Mérelle et al., 2017), suicidal thoughts (Mérelle et al., 2017), depressive symptoms (Gentile et al., 2011; Laconi et al.,2017), social anxiety (Gentile et al., 2011), low experienced school well-being, and weaker social integration in class (Rehbein & Baier, 2013). However, there is little evidence that symptoms of addictive or problematic gaming is always associated with negative changes in gamers' lives (Przybylski et al.,2017; Scharkow et al., 2014; Weinstein et al., 2017). Some authors have actually shown that the prevalence of GD decreased when health consequences were taken into consideration (Przybylski et al., 2017). These aspects question the validity of this clinical entity and emphasize the importance of using measures of QoL in studies that investigate GD. As underlined by Borges et al. (2019), the inclusion of such measures remains very rare in the literature, which is a major pitfall in the study of GD.

1.4 Online games and e-sport

These QoL concerns are of particular interest when assessing this disorder in highly engaged gamers (Billieux et al., 2019), including e-sport players: while the DSM-5 points out the importance of considering prolonged and recurrent participation in online games in order

to identify possible pathological use, the very modalities of these games frequently involve gaming behaviors that meet these criteria of intense involvement. Electronic sport or e-sport is the practice of video games in the form of organized competitions (Jenny et al., 2017), an emerging practice that is growing in popularity with millions of players worldwide (Cunningham et al., 2017; Jenny et al., 2017). The spread of this practice raises many questions, especially considering its intensive nature while a very limited number of scientific works have attempted to answer them (Banyai et al., 2019; Faust & Griffiths, 2013). Engaged practices such as the practice of e-sport, therefore, require more interest from the scientific community in order to improve knowledge on the psychological characteristics and the motivational background of these players (Faust & Griffiths, 2013; Kardefelt-Winther, 2015).

1.5 Engaged players and problem players

Given the unprecedented rise of competitive online games, e-sport and related practices (e.g., streaming of videogames), there is a risk of over-diagnosing non-problematic intensive gaming behaviors, that do not lead to a deterioration of QoL, by treating them as pathological (Aarseth et al., 2017; Billieux et al., 2019; Van Rooij et al., 2018). Indeed, some authors showed that high involvement in games is not inherently problematic (Billieux et al., 2013; Brunborg et al., 2014; Charlton & Danforth, 2007; Király et al., 2017). Recognizing the distinction between high-risk problem players and healthy highly engaged players is imperative to avoid over-pathologizing gaming patterns (Billieux et al., 2019) and is therefore a very important issue which must be investigated (Deleuze et al., 2017; Deleuze et al., 2018; Lehenbauer-Baum & Fohringer, 2015). Thus, the measurement of functional impairment through the degradation of QoL is crucial to prevent the pathologization of normal behavior and to assess the clinical utility of GD (Billieux et al., 2019; Brunborg et al., 2013; Deleuze et al., 2017; Kardefelt-Winther et al., 2017; Lehenbauer-Baum et al., 2015; Loton et al.,2016), especially in engaged players. This is further supported by Demetrovics and Király (2016), who suggest that the consequences of the behavior should be taken into account when assessing problematic use, as well as contextual characteristics, and most importantly the motivational background underlying gaming behaviors. Indeed, functional impairment could depend on people's motives, personality profiles, and the context in which their online behaviors take place (Shen & Williams, 2011).

1.6 Motivation

Some authors explored motivational factors within the research on GD (Ryan et al., 2006). For example, several studies relying on the self-determination theory (SDT) (Mills et al.,2018; Przybylski et al., 2010) highlighted a link between frustration of needs and problematic video game use. However, since SDT based models focus on the underlying attractiveness of games by assessing basic psychological needs that they are susceptible to satisfy (Przybylski et al., 2010), the understanding of the player's targeted goals behind their involvement in games remains unclear (Lafreniere et al., 2012).

Hence, a number of previous studies capitalized on models focused on the motivations related to the game contents, the first of which was Bartle's theoretical model (Bartle, 1996) who identified four distinct types of players (killers, achievers, socializers, and explorers). One of the most prominent models of player's motives is the one by Yee (2006), who developed a ten-factor model composed of three higher-level factors (achievement, social and immersion). However, as this model has been validated in the context of Massively Multiplayer Online Role-Playing Games (MMORPG), it does not necessarily allow the motivations of players taking part in other types of online games to be assessed (e.g., MOBA, FPS, Battle Royale). Thus, Demetrovics et al. (2011) have developed the Motives for Online Gaming Questionnaire (MOGQ) which covers 7 types of motivations and can be used for any online game, which is necessary considering the increasing variety of popular online games. The motives assessed by the MOGQ include Escape (escaping from reality and problems), Coping (coping with problems like stress, aggression, anxiety), Fantasy (stepping out of one's usual identity), Skill Development (improving various skills), Recreation (recreational, relaxing aspects of online gaming), Competition (competing with and defeating others in order to feel a sense of achievement), and Social (social aspects of gaming like playing together with other persons).

Some of these motivations have been identified as important risk factors for GD, including competition (Hussain et al., 2015; Kuss et al., 2012), socialization (Hussain et al., 2015; Laconi et al., 2017), fantasy (Laconi et al., 2017), coping (Kim et al., 2016; Laconi et al., 2017), and escape (Cole and Hooley, 2013; Kim et al., 2016; Laconi et al., 2017; Wu et al., 2017; Yee, 2007). Several authors have investigated motivation using a person-centered approach and identified risk profiles for GD through the use of classification methods, such as cluster analysis (Billieux et al., 2015; Kim & Kim, 2013) or latent class analysis (Colder Carras & Kardefelt-Winther, 2018; Hussain et al.,2015), in order to study the combined presence of different risk factors, including motivation. However, this literature does not

provide insights on the relationships between motivational profiles and functional impairment indicators, such as QoL, whose better understanding is crucial to the identification of at-risk profiles. Indeed, combining a person-centered approach with a measure of QoL provides a number of advantages, both at the applied and theoretical levels (Vansteenkiste et al., 2009). From an applied point of view, this approach could lead to the improvement of patient screening by identifying people at risk on the basis of their motivations to play and could help to better tailor prevention actions and psychological interventions based on their motivational profile. From a theoretical point of view, this approach could provide important insights into the contribution of motivational variables in identifying risk and protective factors toward the development of problematic gaming behaviors.

1.7 The present study

Although some studies have considered motivations to play online video games as potential risk factors for problematic video gaming, there is a lack of research on their association with QoL indicators. Therefore, the objectives of the present exploratory study were 1) to identify distinct motivational profiles in a population of players engaged in online competitive games, and 2) to assess the relationships between these profiles and several psychological and psychopathological variables, namely personality traits, gaming disorder symptoms, and QoL. Personality traits were considered in the current study to further validate the clusters identified. Indeed, a substantial amount of studies showed that specific personality traits act as risk or protective factors in the context of problematic gaming (see e.g., King & Delfabbro, 2018; Kuss & Griffiths 2012).

The present study also aimed to address previous research limitations by focusing on gamers engaged in online competitive games, which are online games involving a central social component through cooperation and/or competition with other players. Indeed, some authors pointed out that most studies do not specify the characteristics of the games studied, questioning the validity of literature reviews that include heterogeneous populations of game players. As a result, several authors advised researchers to accurately describe the games participants engaged in (Griffiths & Nuyens, 2017; Kuss & Griffiths, 2012). The particularity of competitive games is that they are not structured around a beginning and an end and can be restarted endlessly. They involve the ranking of players by skill level within ladders, where players progress up or down by winning or losing games. Finally, these games allow for professional competitions (e-sport), watched by amateurs through streaming platforms like Twitch.

2. METHODS

2.1 Procedure

An online questionnaire was provided to French speaking competitive online gaming players, from February to March 2018. Participants were invited to take part in the study through a link on community platforms, gathering individuals who play online video games (Facebook groups, community forums and Discord servers). To account for the diversity of playing engagement patterns, sufficiently broad inclusion criteria were used to invite players to participate in the survey: being at least 18 years old and playing at least 5 hours per week. Although there is no consensus on how much is a “significant amount” of time spent gaming, some authors have proposed a minimum of 5 hours of playing per week as a criterion for a player to be considered as a “frequent video gamer” (Berard et al., 2015) or an “heavy gamer” (Hollis, 2014). Thus, a minimum of 5 hours per week have been set as an inclusion criterion in the present study. After submission and acceptance of an informed consent form, the objectives of the study, and its confidential and anonymous nature, participants were asked to complete several self-reported questionnaires. The estimated duration of the survey was 15 minutes. No incentives were provided to participants.

2.2 Participants

A total of 284 adult online video game players took part in the study. After removing participants who did not meet the inclusion criteria (under 18 years of age (n = 18), less than five hours of playing per week (n = 2) and incomplete or unreliable answers (n = 8), the final sample size was 256. This sample included 238 men (93%) and 18 women (7%) aged between 18 and 62 years (M=23.05, SD = 5.91) whose video game practice was considered intensive (mean hours played per week = 27.72, SD = 17.53).

In order to assess expertise, we used the five-point expertise scale proposed by Cabanac et al., (2010): novice, beginner, intermediary, confirmed, and expert. We removed "novice" for lack of relevance with respect to the aim of the current study, which was to include engaged gamers. 0 were identified as beginners, 31 as intermediary players, 147 as confirmed players and 78 as expert players. Participants were asked which game they spent the most time playing. They specialized in various games including: Age of Empire 2 (n = 1), Black desert online (n = 1), Dragon Ball Fighter Z (n = 1), H1Z1 (n = 1), Quake (n = 1), Smite (n = 1), Tekken 7 (n = 1), World of Tanks (n = 1), Guild Wars 2 (n = 2), FIFA (n = 2), Street Fighter (n = 2), Paladins (n = 3), World of Warcraft (n = 5), Rocket League (n = 6), Heroes Of The

Storm (n = 6), PUBG (n = 7), Starcraft 2 (n = 10), Fortnite (n = 11), DOTA2 (n = 15), Hearthstone (n = 21), League of Legends (n = 26), Counter-Strike (n = 37), Rainbow 6 Siege (n = 37), Overwatch (n = 55). The games have also been classified into games genres, which have been described elsewhere (e.g., Elliott et al., 2012): (First Person Shooters (FPS) (n=133), Massively Multiplayer Online Role-Playing Games (MMORPG) (n=8), Fighting (n=4), Real Time Strategy (RTS) (n=11), Multiplayer Online Battle Arena (MOBA) (n=48), Sport (n=8), Battle Royale (n=19) and Card Games (n=21), in order to explore possible differences between clusters and to be able to compare our results with those in the literature.

2.3 Measures

Motivations for online gaming were assessed using the French version of the Motives for Online Gaming Questionnaire (MOGQ) (Demetrovics et al, 2011), translated by Laconi et al. (2017). It is composed of 27 items rated on a 5-point scale ranging from 1 "almost never/never" to 5 "almost always/always", assessing seven different motivations: escape (α =.89, 95%CI [.87, .91]), social (α =.78, 95%CI [.73, .82]), competition (α =.79, 95%CI [.74, .83]), coping (α =.65, 95%CI [.58, .72]), skill development (α =.87, 95%CI [.84, .90]), fantasy (α =.84, 95%CI [.79, .86]) and recreation (α =.82, 95%CI [.78, .86]). High scores on these dimensions reflect high motivations to play.

Personality traits were assessed using the French version of the Big Five Inventory (Plaisant & al., 2010), a questionnaire composed of 45 items rated on a 5-point Likert scale from 1 "Disagree strongly" to 5 " Agree strongly" and evaluating five personality dimensions with reference to the five-factor model of Costa and McCrae (1992): Openness (α =.75, 95%CI [.71, .80]), Conscientiousness (α =.80, 95%CI [.76, .83]), Extraversion (α =.86, 95%CI [.84, .89]), Agreeableness (α =.81, 95%CI [.77, .84]), and Neuroticism (α =.82, 95%CI [.79, .85]).

QoL was assessed using the short version of the World Health Organization Quality Of Life (WHOQOL-BREF) (WHOQOL Group, 1998) validated in French by Baumann et al. (2010). This 26-item questionnaire, rated from 1 to 5 (response modalities vary depending on the domains explored), evaluates domains related to physical health (seven items) (α =.70, 95%CI [.64, .75]), psychological health (six items) (α =.80, 95%CI [.75, .83]), social relationships (three items) (α =.66, 95%CI [.59, .73]), and environment (eight items) (α =.79,

95%CI [.75, .83]). Two items add an overall assessment of QoL. High scores indicate a satisfactory QoL.

The problematic use of online video games has been evaluated using the Internet Gaming Disorder Scale (IGD-Scale) developed according to the recommendations for an international consensus (Petry et al., 2014) based on the DSM 5 criteria for problematic use of video games (American Psychiatric Association, 2013). This questionnaire, validated in French by Sarda et al. (2016), includes 9 items rated on a 6-point Likert scale from 1 “not at all” to 6 “totally”, referring to last year's behavior. A high score indicates a problematic use of online video games (α =.74, 95%CI [.69, .78]).

2.4 Ethics

In view of the legislation in force in the country in which the study was conducted, no accreditation by ethics committees was required due to the anonymous, cross-sectional and non-interventional nature of the study which was carried out in accordance with the declaration of Helsinki (World Medical Association, 2013)

2.5 Statistical analysis

All analyses were performed using R software (R Development Core Team, 2008). We used the FactoMineR package to conduct cluster analysis (Lê et al., 2008).

To test the existence of motivational profiles, a hierarchical cluster analysis of MOGQ scores was conducted, including all seven dimensions. This analysis has already been used to extract groups based on their motivations (Gillet et al., 2012), including in the context of video games (Kim & Kim, 2013), but also to examine differences in health outcomes, such as quality of life (Hirschberg et al., 1991) or addiction (Décamps et al., 2013). This analysis groups the participants into a limited number of clusters based on their similarities (Broc et al., 2016) and was carried out following the procedure of Broc et al. (2016). According to the recommendations of Vachon et al., (2005), all dimensions of the MOGQ were included as Z-scores in order to make them share the same metric, so that every dimension equally contributed to the cluster extraction. A hierarchical classification has been conducted because we did not have a clear preconception on the expected number of clusters. Following the recommendations of Vachon et al. (2005), the analysis was carried out using the Ward's aggregation method and the Euclidean distance as a measure of similarity. A k-means

consolidation of the solution obtained through hierarchical cluster analysis was also performed.

To assess the differences between clusters regarding QoL, GD and personality, two one-way MANOVAs were conducted. Since our multivariate analyses showed an absence of distribution normality but a homogeneity of variances, we opted for the Pillai trace test, which is relatively more robust when conditions are violated (Finch & French, 2013). In order to identify the dependent variables that contributed to the overall effect, univariate analyses were conducted: ANOVAs when the assumptions were met and Kruskall-Wallis tests when they were not. Post-hoc tests were carried out to compare the groups when significant differences were found, using Tukey and Wilcoxon tests (depending on whether the univariate analysis was respectively an ANOVA or a Kruskall-Wallis). Differences in demographic and gaming related variables were examined using ANOVAs and Chi^2 tests. Regarding games played, we used Fisher's Exact test because the expected cell counts were not large enough for Chi^2 tests, given the large number of different games and genres played.

3. RESULTS *(color should be used for graphs and tables)*

3.1 Descriptive analysis

The participants' characteristics are presented in Table 1. In terms of QoL, the scores of our participants were compared to those obtained in the general French population by Baumann et al. (2010), for the 18-24 and 25-34 age groups, representing 96% of our sample (Table 1): for men, the average scores obtained in psychological health are similar to those of the general population (69.94 vs. 69.3 and 70.8). Those obtained in physical health (78.67 versus 81.4 and 82.9) and in social relations (67.42 versus 75.6 and 76.7) are lower. Due to a very limited number of female participants in the sample, gender comparisons were not conducted.

3.2 Cluster analysis

The results of the cluster analysis highlighted a three-cluster solution, based on inertia gain. The solution's interpretability was sound and theoretically relevant. This solution was also validated by the results of the comparative analyses on external variables presented below.

A first cluster (Cluster 1) was characterized by lower motivation scores in all dimensions of the MOGQ, except for recreation which was the highest motivation score in this cluster. This cluster was labeled "recreational" (N = 108, 42% of the total sample). A second cluster (Cluster 2) was characterized by higher scores in the competition, skills development and social motivations. This cluster was labeled "competitive" (N = 79, 31% of the total sample). A third cluster (Cluster 3) was characterized by higher scores in the fantasy, escape and coping motivations. This cluster was labeled " escapers" (N = 69, 27% of the total sample).

3.2.1 Cluster validation on internal variables

A one-way MANOVA was carried out to assess the observed motivational differences between clusters, using the MOGQ dimensions as dependent variables, and the clusters as independent variables (the scores of the three clusters are depicted in Figure 1). It yielded a multivariate significant effect of cluster membership on investigated motivational scores: Pillai's Trace = 1.20, $F(2,253) = 53.35$, $p < .001$. The following univariate analysis (ANOVA and Wilcoxon tests) showed significant differences for social: $F(2, 253) = 48.77$, $p < .001$; escape: $F(2, 253) = 122.90$, $p < .001$; coping: $\chi^2(2,N=256) = 107.69$, $p < .001$; fantasy: $\chi^2(2, N = 256) = 128.13$, $p < .001$; skill development: $\chi^2(2, N = 256) = 91.76$, $p < .001$ and competition: $F(2, 253) = 41.34$, $p < .001$. On the other hand, no significant differences between groups were found for the recreation dimension: $F(2, 253) = 2.77$, $p = .06$. Post hoc comparisons were conducted using Tukey and Wilcoxon tests and showed significant differences. These differences are provided in Table 2. η^2 was used to assess effect sizes, in order to compare our results with those of Billieux et al. (2015). The effect sizes found for the significant effects (.24 to .55), were similar to the ones of Billieux et al. (2015) (.21 to .30) regarding motivations.

3.2.2 Demographic and Gaming related variables

Results of ANOVAs and Chi² tests on demographic and gaming related variables are presented in Table 3. The analysis did not show significant differences between the groups for

games played (p = 0.65, *Fisher's exact test*), games genre played (p=.20, *Fisher's exact test*), weekly playing time (F(2,248) =2.14, p=.12), or in terms of age (F(2,253)=2.77, p=.06).

On the other hand, there were differences in the participants' skill level of play, which varied significantly between groups (χ2(4, N=256) = 19.50, p <.001): Cluster 2 "competitive" included a significantly lower proportion (p <.05) of intermediate level players (6%) and a significantly higher proportion (p <.05) of expert level players (48%).

3.2.3 Clusters validation on external variables

A second one-way MANOVA was carried out to assess the clusters differences regarding QoL (WHOQOL-BREF), IGD (IGD Scale) and personality (BFI-Fr). The four dimensions of the WHOQOL-BREF, the scores of the IGD Scale, and the five dimensions of the BFI-Fr were used as dependent variables and cluster membership as independent variables. It yielded a multivariate significant effect: Pillai's Trace = 0.27, F(2,253) = 3.76, p < .001.

3.2.3.1 Personality traits

The univariate analysis (ANOVA) (Table 4) showed significant differences for extraversion: F(2,253) =10.44, p <.001 and neuroticism: F(2,253) =12.91, p <.001. Post hoc comparisons using Tukey tests showed that participants in cluster 3 (escapers) reported lower scores of extraversion and higher scores of neuroticism than those of the two other clusters.

3.2.3.2 QoL and IGD

The univariate analyses (ANOVA) (Table 5) showed significant differences for psychological health: F(2,253) =9.77, p <.001; physical health: F(2,253) =3.60, p <.05; social relationships: F(2,253) =4.66, p <.05; and IGD : F(2,253) =15.44, p <.001. Post hoc comparisons using Tukey tests showed that: a) participants in Cluster 2, "Competitive" and Cluster 3, "Escapers", had significantly higher IGD scores than those in Cluster 1, "Recreational"; b) participants in Cluster 1, "Recreational" and Cluster 2, "Competitive", had significantly higher psychological health scores than those in Cluster 3, " Escapers; c) participants in Cluster 1, "Recreational", had significantly higher physical health and social relations scores than those in Cluster 3, " Escapers ". The effect sizes found for the significant

effects (.07 to .11) are somewhat smaller than those of Billieux et al. (2015) (.09 to .17) regarding external correlate measuring problematic gaming and comorbidities.

4. DISCUSSION

4.1 Motivational clusters

The aim of this study was to identify reliable and theoretically sound motivational clusters in a population of online competitive video game players. Three clusters were extracted from the hierarchical classification analysis and consolidated with k-means clustering.

Cluster 1, named "recreational", was composed of players motivated mainly by the recreational aspects of the game, all other motivations being lower than Clusters 2 ("competitive") and 3 (“escapers”). Compared to escapers, these players had higher QoL in all dimensions (physical, psychological, and social relationships) and were more extroverted and less neurotic. Finally, they had the lowest levels of GD symptoms compared to the other two clusters.

Cluster 2, named "competitive", represented a group of players with greater motivation for the development of their skills, the competition with other players, as well as the social aspects of the game. The psychological characteristics of these players were similar to those of the “recreational” players, as they were also more extroverted, less neurotic and had higher psychological QoL compared to escapers.

Finally, Cluster 3, named "escapers ", included players more motivated by what the game offers in terms of coping, escape and fantasy. These three motivations cover the same process, through which playing represents a way for players to deal with their daily problems (coping), to avoid them (escape), and to experience virtual world experiences in order to distance themselves from these problems (fantasy) (Laconi et al., 2017). Motivations for escape, fantasy and coping, therefore, are intrinsically linked. Indeed, the motivation for coping involves the use of online gaming as a strategy to manage suffering, stress, or to improve the player's mood. In this framework, players would face their difficulties by avoiding negative emotions (escape) and by venturing into virtual worlds (fantasy).

Such findings are consistent with those of Billieux et al. (2015) and suggest that problematic gaming patterns in escapers can be viewed as a dysfunctional coping strategy which is not found in recreational and competitive profiles. As for personality, these players were less extroverted and more neurotic than those in the other two clusters.

Regarding the "excessive" aspect of video game playing, we did not observe any differences in weekly play time between the groups (27.72 hours per week on average), while there were significant differences regarding QoL, in particular between the "recreational" and "escapers" clusters. Therefore, engaged players can be involved in intensive playing practices without necessarily suffering negative consequences as a result of this practice (Billieux et al., 2013; Deleuze, et al., 2018). According to Király et al. (2017), time spent playing cannot be considered as a sufficient indicator to talk about problematic use, confirming the observations in the present study. Finally, some authors have shown that GD symptoms might be more likely to be associated with the use of certain types of games, particularly MMORPGs and FPSs (Elliott et al., 2012; Na et al., 2017). However, our results do not support these findings since there was no differences regarding the games or the types of games played between clusters.

Recreational players are comparable to the “normal players” identified by Laconi et al. (2017), the “low intensity enjoyment class” of Hussein et al. (2015) which was used as a comparison class, and the “Regulated Recreational Gamers” of Billieux et al. (2015). Consistent with our results, Laconi et al. (2017) found that the motivation scores of “normal players” were relatively balanced and lower overall than those of problematic players. Our findings also align with the previous proposal by Billieux et al. (2015) that, for such gamers, playing is not used as a means of satisfying basic needs that are likely to be met through other activities, making these players less at risk. Past research conducted by Hussein et al. (2015) also identified a group composed of highly social and competitive players, which matches the “competitive” cluster identified in the current study. Hussain et al. (2015) further suggested that these players were at higher risk of problematic use than the typical “low intensity enjoyment” players (e.g. “low intensity enjoyment class”). Finally, the “escapers” group found in the present study was also identified by Billieux et al. (2015), under the name ‘‘unregulated escapers’’, as having more addiction symptoms and negative affect than the “Regulated Recreational Gamers”. Thus, consistent with these studies, the “competitive” and “escapers” players in our study were characterized by greater overall motivations, some of them prevailing over the others, and also displayed higher GD symptoms than recreational gamers.

4.2 High involvement is not necessarily problematic

Despite similarities regarding GD symptoms, important differences were found between clusters in terms of QoL, especially for psychological health, competitive players in particular scoring higher than escapers, warranting further elaboration. Our findings indeed support the importance of distinguishing problem players experiencing negative health outcomes from players who are simply engaged in their activity and who present fewer risks (Charlton & Danforth, 2010; Lehenbauer-Baum & Fohringer, 2015; Pontes et al.2014). Our results support the assumption that high involvement is not necessarily problematic and suggest that players of the "competitive" cluster can be considered as engaged players and those of the "escapers" cluster as problematic gamers.

Therefore, according to our results, the evaluation of psychological health and motivational profiles is a more accurate way to identify people whose use of video games is problematic and at risk of developing pathological outcomes, than the GD criteria. Considering the higher neuroticism and lower extraversion of the at-risk escaper cluster, personality assessment, in association with the motivational background, is relevant to identify at-risk gamers. These results corroborate the view that problematic use can only be assessed if the motivations, personality traits, consequences, and contextual characteristics of the behavior are taken into account (Demetrovics & Király, 2016; Griffiths, 2010; Shen & Williams, 2011).

Our results are consistent with recent empirical work suggesting that the conceptualization of GD as defined in the ICD-11 represents an important step forward (Billieux et al., 2019; Deleuze et al., 2017; 2018). Indeed, the impact on the person's functioning is brought to the forefront and includes only central criteria (loss of control, persistent use despite negative consequences). As a result, this nosographic framework seems less conducive than the APA framework to the misdiagnosis of normal behaviors. Indeed, In the DSM-5 (APA, 2013, p.797), it is specified that:

> The essential feature of Internet gaming disorder is persistent and recurrent participation in computer gaming, typically group games, for many hours. These games involve competition between groups of players (often in different global regions, so that duration of play is encouraged by the time-zone independence) participating in complex structured activities that include a significant aspect of social interactions during play. Team aspects appear to be a key motivation" (APA, 2013, p.797).

Crucially, we argue that the "competitive" cluster fits this definition, which can lead to a genuine risk of false positives if a diagnosis is based on these social and competitive aspects, and could result in the pathologization of both amateur and e-sport practice.

4.3 Limitations

The first limitation of this work would be its cross-sectional nature, which does not allow causality to be inferred from our results nor to determine whether the clusters identified reflect stable or fluctuant motivational dispositions. Another limitation is the reliance on a self-selected sample, which compromises the generalizability of the results. In addition, the use of self-reported questionnaires is sensitive to social desirability and raises concerns about the reliability of reported time spent playing (Scharkow, 2016). Furthermore, the choice of a three-cluster model, although the most relevant statistically and theoretically in the context of this study, does not exclude the possibility that other solutions integrating smaller groups may also be relevant, according to the objectives of the researchers and clinicians. One more potential limitation is the relatively low internal reliability coefficient of some subscales from MOGQ and WHOQOL questionnaires. Yet, these values remain acceptable (>.60) and are heavily dependent on the low number of items composing the concerned subscales. Finally, the functional impact was measured through the QoL construct, without considering other unmeasured types of functional impacts. Yet, our study is among the few ones in the field that actually measure functional impairment, which is central to the distinction between high and pathological involvement in video games (Billieux et al., 2017; 2019).

4.4 Future research and practical implications

Future studies should consider the determinants and consequences associated with different motivational profiles in a longitudinal setting. Studies that focus on assessing the secondary nature of GD could be particularly useful in this context, especially for clinicians. Indeed, GD could represent a dysfunctional coping strategy aiming at reducing psychological distress and escaping reality, which would be consistent with our findings regarding the “escapers” cluster.

It also seems necessary to further explore the distinctions between engaged and problematic players. Beyond the variables studied, there are certainly other fundamental aspects of the video gaming behavior and of the individual characteristics of players that have

not been taken into account, such as other psychological dimensions (e.g., emotion-regulation strategies) or socio-demographic characteristics (occupational situation, relationship status…). Indeed, the literature emphasizes that beyond personality and motivation, other etiological factors of GD and associated health issues have been identified and need to be further investigated. Furthermore, the literature stresses the importance of structural characteristics of games in the etiology of IGD (Griffiths & Nuyens, 2017; Kuss & Griffiths, 2012) suggesting that more research integrating these characteristics into longitudinal studies is needed in order to better understand their relations with GD and their possible interactions with motivations to play.

It would also be interesting to investigate in more detail the psychological characteristics of professional or semi-professional players, whose involvement in games is probably even higher than among our population.

5. CONCLUSIONS

The IGD Scale based on the DSM-5 diagnostic criteria proved to be insufficient to differentiate players whose use presented a risk of evolution towards pathological states ("escapers" cluster) from those whose intensive use reflected a healthy high level of engagement ("competitive" cluster), without negative consequences on QoL. In other words, it is likely that the GD definition included in DSM-5 includes some criteria that do not allow to distinguish high (but not-problematic) involvement from pathological ones, which ultimately increase the risk of overpathologization. Therefore, our results question the construct validity of DSM-5 criteria and support the necessity to take into account the motivations of the players and the consequences on their QoL in order to assess the problematic nature of online video games practice. In particular, psychological health can be considered as a central indicator to identify players whose practice presents a risk of pathological evolution. Moreover, motivations and personality assessments could also help to identify at-risk players in clinical settings, with a particular focus on escape, coping and fantasy motivations, and another on neuroticism and extraversion.

To conclude, our results are consistent with the view of King et al. (2018) who specified that in order to consider the problematic use of video games in the field of behavioral addictions, it is fundamental that researchers and clinicians focus on the motivations that underlie and maintain the problematic behaviors so as to better understand what problematic gamers really look for in games and to avoid false positives in clinical and research settings. Our work supports those positions and confirms the point made by Griffiths (2010) and Faust & Griffiths (2013), that it is necessary to question the context of the practice, especially if this practice takes place in the context of online competitive gaming.

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Tables and graphs, in the order in which they are cited:

Table 1

Descriptive statistics for the total sample (MOGQ and WHOQOL scores)

Variable	Total N= 256 M (SD)			
MOGQ			Laconi et al. (2017) M (SD)	
	Men N =238	Women N = 18	Men	Women
Social	11.43 (3.83)	10.28 (4.48)	8.7 (3.9)	6.9 (3.5)
Escape	10.94 (4.89)	11.83 (5.17)	9.1 (4.2)	8.7 (4.2)
Coping	9.79 (3.33)	10.28 (3.32)	8.1 (3.2)	7.7 (3.4)
Fantasy	8.53 (4.44)	9.22 (4.24)	8.2 (3.9)	7.2 (4)
Skill development	13.41 (4.37)	12.50 (4.97)	10.4 (4.9)	7.8 (4)
Compétition	12.68 (4.00)	9.00 (4.20)	9.6 (4.3)	7.1 (3.3)
Recreation	13.72 (1.90)	12.89 (3.01)	13.5 (2)	12.4 (2.9)
WHOQOL			Baumann et al. (2010) M	
	Men N =238	Women N = 18	Men 18-24 / 25-34	Women 18-24 / 25-34
Psychological health	69.94 (15.90)	59.63 (20.45)	69.3 / 70.8	66.6 / 67.3
Physical health	78.67 (12.04)	67.78 (15.86)	81.4 / 82.9	79.4 / 79.9
Social relationships	67.42 (18.31)	62.22 (20.71)	75.6 / 76.7	78.0 / 77.8
Environnement	79.41 (12.09)	71.39 (20.74)	-	-

MOGQ=Motivations for Online Gaming Questionnaire,
WHOQOL=World Health Organization Quality of Life,

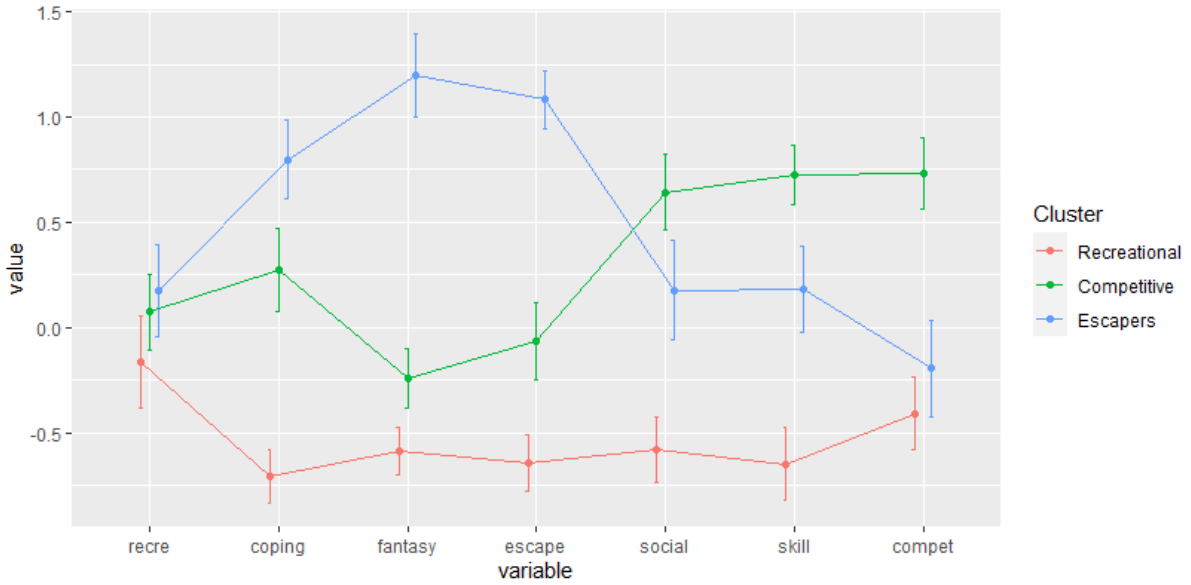

Figure 1. Graphical representation of the standardized average scores of the three clusters, for each dimension of the MOGQ (error bars indicate ± 1 SD) **(2-column fitting image)**

Table 2

Descriptive statistics, ANOVAs, and post-hoc tests for each dimension of the MOGQ.

Variable	Total sample N= 256 M (SD)	Cluster			F (*p*) / *χ^2 (*p*)	η²
		Cluster 1 n=108 « Recreational » M (SD)	Cluster 2 n=79 « Competitive » M (SD)	Cluster 3 n=69 « Escapers » M (SD)		
MOGQ						
Social	11.35 (3.88)	**9.09 (3.10)^{c}**	**13.84 (3.12)^{a}**	**12.03 (3.81)^{b}**	**48.77 (*p*<.001)**	**.27**
Escape	11.00 (4.90)	**7.85 (3.46)^{c}**	**10.68 (4.07)^{b}**	**16.30 (2.80)^{a}**	**122.90 (*p*<.001)**	**.49**
Coping	9.82 (3.33)	**7.46 (2.22)^{c}**	**10.72 (2.94)^{b}**	**12.48 (2.63)^{a}**	***107.69 (*p*<.001)**	**.40**
Fantasy	8.57 (4.42)	**5.97 (2.57)^{c}**	**7.51 (2.77)^{b}**	**13.87 (3.69)^{a}**	***128.13 (*p*<.001)**	**.55**
Skill development	13.35 (4.41)	**10.49 (3.95)^{c}**	**16.56 (2.77)^{a}**	**14.14 (3.75)^{b}**	***91.76 (*p*<.001)**	**.35**
Competition	12.43 (4.12)	**10.74 (3.70)^{b}**	**15.43 (3.14)^{a}**	**11.62 (3.88)^{b}**	**41.34 (*p*<.001)**	**.24**
Recreation	13.66 (2.01)	13.33 (2.32)^{abc}	13.81 (1.61)^{abc}	14.01 (1.81)^{abc}	2.77 (*p*=.06)	.02

MOGQ: Motivations for Online Gaming Questionnaire.
a,b,c: labels are used to specify mean differences by indicating where are group differences in post-hoc analysis (Tukey's test). e.g.: the players of cluster 3 obtain significantly higher escape scores than the players of cluster 2, the latter obtaining significantly higher scores than those of cluster 1.

Table 3

Demographic and game-related variables (level, play time and games played) for the total sample and for each cluster.

Variable	Cluster			F (*p*)
	Cluster 1 n=108 « Recreational » M (SD)	Cluster 2 n=79 « Competitive » M (SD)	Cluster 3 n=69 « Escapers » M (SD)	
N (%)	108 (42)	79 (31)	69 (27)	
Age M (SD)	24.06 (6.94)	22.37 (3.67)	22.26 (6.08)	2.77 (*p*=.06)
Play time M (SD) [1]	27.30 (15.30)	25.25 (14.54)	31.18 (22.81)	2.14 (*p*=.12)
				χ^2(dl), *p*
Level, n(%),				**19.50 (4), *p*<.001**
Beginers	0 (0)	0 (0)	0 (0)	
Intermediate	14 (13) 0.07	5 (6) 2.18	12 (17) 1.59	
Confirmed	72 (67) 1.61	36 (46) 1.93	39 (57) 0.01	
Expert	22 (20) 3.62	38 (48) 8.06	18 (26) 0.44	
Games played				*p*=.65
Games genre played				*p*=.20

[1] Average weekly playing time in hours

Table 4

Descriptive statistics, ANOVAs, and post-hoc tests for each dimension of the BFI-Fr

Variable	Cluster			F (*p*)	η²
	Cluster 1 n=108 « Recreational » M (SD)	Cluster 2 n=79 « Competitive » M (SD)	Cluster 3 n=69 « Escapers » M (SD)		
BFI-Fr					
Openness	3.52 (0.70)	3.71 (0.64)	3.58 (0.66)	1.89 (p=.15)	.02
Conscientiousness	3.21 (0.76)	3.25 (0.69)	2.99 (0.65)	2.97 (p=.05)	.02
Extraversion	**3.07 (0.92)[a]**	**3.31 (0.90)[a]**	**2.63 (0.87)[b]**	**10.44 (p<.001)**	**.08**
Agreeableness	3.75 (0.70)	3.77 (0.81)	3.75 (0.68)	0.03 (p=.97)	.00
Neuroticism	**2.37 (0.82)[b]**	**2.58 (0.93)[b]**	**3.04 (0.81)[a]**	**12.91 (p<.001)**	**.09**

BFI-Fr: French Big Five Inventory
a,b: labels are used to specify mean differences by indicating where group differences are in post-hoc analysis (Tukey's test). E.g.: clusters 1 and 2 obtain significantly higher extraversion scores than cluster 3

Table 5

Descriptive statistics, ANOVAs, and post hoc tests for each dimension of the WHOQOL-BREF and GD Scale

Variable	Cluster			F (*p*)	η²
	Cluster 1 n=108 « Recreational » M (SD)	Cluster 2 n=79 « Competitive » M (SD)	Cluster 3 n=69 « Escapers » M (SD)		
WHOQOL					
Psychological health	**21.87 (4.66)[a]**	**21.09 (4.37)[a]**	**18.67 (5.33)[b]**	**9.77 (p<.001)**	**.07**
Physical health	**27.94 (4.28)[a]**	27.34 (4.31)	**26.13 (4.58)[b]**	**3.60 (p<.05)**	**.03**
Social relationships	**10.55 (2.62)[a]**	10.09 (2.86)	**9.26 (2.77)[b]**	**4.66 (p<.05)**	**.04**
Environnement	31.75 (5.30)[abc]	32.27 (4.62)[abc]	30.38 (5.53)[abc]	2.62 (*p* = .07)	.02
IGD Scale	**2.39 (0.80)[b]**	**2.78 (0.83)[a]**	**3.09 (0.88)[a]**	**15.44 (p<.001)**	**.11**

WHOQOL: World Health Organization Quality of Life, IGD Scale: Internet Gaming Disorder Scale
a,b: labels are used to specify mean differences by indicating where are group differences in post-hoc analysis (Tukey's test). E.g.: Clusters 1 and 2 obtain significantly higher scores in psychological health than Cluster 3.

Table 6

Means, standard deviations, and correlations of the main variables

Variable	*M*	*ET*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. MOGQ Recreation	13.66	2.01																
2. MOGQ Social	11.35	3.88	.10															
3. MOGQ Coping	9.82	3.33	**.16***	**.27****														
4. MOGQ Escape	11.00	4.90	.05	**.20****	**.58****													
5. MOGQ Fantasy	8.57	4.42	.08	**.21****	**.45****	**.65****												
6. MOGQ Skill Dev.	13.35	4.41	**.10****	**.36****	**.40***	**.14***	**.20****											
7. MOGQ Competition	12.43	4.12	.05	**.16****	**.13***	.09	.08	**.36****										
8. BFI-Fr Openness	3.60	0.68	.10	.08	.02	**-.14***	-.03	**.17****	.01									
9. BFI-Fr Conscientiousness	3.16	0.72	-.06	.05	-.08	**-.23****	**-.18****	.15*	.03	**.25****								
10. BFI-Fr Extraversion	3.02	0.93	.06	.09	-.04	**-.30****	**-.24****	.09	.05	**.31****	**.21****							
11. BFI-Fr Agreeableness	3.76	0.72	.07	**.24****	-.03	-.03	-.05	.10	**-.22****	.11	**.21****	-.01						
12. BFI-Fr Neuroticism	2.61	0.89	-.09	.06	**.33****	**.47****	**.25****	.01	.03	-.09	**-.21****	**-.24****	**-.26****					
13. WHOQOL Physical	27.27	4.42	**.15***	.00	**-.16***	**-.39****	**-.18****	.03	.02	**.17****	**.36****	**.26****	.10	**-.50****				
14. WHOQOL Psychological	20.77	4.93	.08	-.04	**-.17****	**-.44****	**-.26****	.08	.01	**.26****	**.38****	**.42****	**.15***	**-.48****	**.65****			
15. WHOQOL Social	10.06	2.77	.12*	-.05	-.07	**-.33****	**-.19****	.03	.02	**.21****	**.20****	**.44****	**.18****	**-.37****	**.47****	**.72****		
16. WHOQOL Environnement	31.54	5.20	**.21****	.06	-.10	**-.27****	**-.17****	.04	.04	**.17****	**.32****	**.23****	**.13***	**-.30****	**.59****	**.61****	**.47****	
17. IGD-Scale	2.70	0.88	-.09	**.19****	**.21****	**.42****	**.35****	.07	**.16****	**-.14***	**-.24****	**-.14***	**-.15***	**.35****	**-.32****	**-.36****	**-.30****	**-.24****

Note. M and *SD* are used to represent mean and standard deviation, respectively. * Indicates $p < .05$. ** indicates $p < .01$
MOGQ: Motivations for Online Gaming Questionnaire. WHOQOL: World Health Organization Quality of Life. IGD-Scale: Internet Gaming Disorder Scale. BFI-Fr: Big Five Inventory French version.