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Video Game Players' Personality Traits: An Exploratory Cluster Approach to Identifying Gaming Preferences

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We examined the relationship between Big Five personality and narcissistic traits and video game players' profiles. A total of 546 game users (78.8% men, 21.2% women; $M_{age} = 21.64$ years, $SD = 4.78$) completed self-report measures of personality traits, including Narcissism subdimensions, and different video game playing behaviors (time spent playing, frequency of game use, game genre, and type of interaction sought) in an online survey. Results indicated that daily game players reported lower Extraversion and Conscientiousness and higher Exploitativeness/Entitlement than less frequent players. Negative correlations were found between the frequency of game use index and Openness, Conscientiousness, and Extraversion, but not Agreeableness. Concerning game genre, positive correlations were found between sport and Extraversion, Leadership/Authority, and Exploitativeness/Entitlement, between role-playing and Openness, and between strategy and Special Person. Cluster analyses identified 4 video game user profiles: *casual*, *challenge*, *hardcore*, and *arousal*. *Casual* video game players scored higher on Extraversion and Conscientiousness than the other 3 groups, and lower on Neuroticism than the *hardcore* and *arousal* video game players. *Arousal* video game players were characterized by lower scores on Openness than the other video game players. *Challenge* video game players scored lower on Leadership/Authority and Grandiosity/Exhibitionism than the other groups. These results suggest that certain personality characteristics are associated with the development of video game use preferences.

Public Policy Relevance Statement

The current study explored relationships between personality traits and different types of video game playing. Cluster analysis identified four video game player types: *casual*, *arousal*, *challenge*, and *hardcore*. Daily game players reported lower Extraversion and Conscientiousness and higher Exploitativeness/Entitlement than less frequent players.

Keywords: gamer classification, video game behavior, Big Five personality traits, narcissistic personality traits, cluster analysis

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Video Game Use

In recent years, video game playing has emerged as an increasingly popular recreational activity for the younger generations, as well as for the older ones (Intercative Software Federation of Europe [ISFE] & GameTrack Digest, 2018). Despite undeniably positive aspects of video game playing (Granic, Lobel, & Engels, 2014; Sublette & Mullan, 2012), some academics and researchers argue that it has a potentially negative impact on academic achievement (Hastings et al., 2009), aggressive behaviors (Anderson & Bushman, 2001; Kepes, Bushman, & Anderson, 2017), physical activity (Gao, Chen, Pasco, & Pope, 2015), and even social relationships (Greitemeyer & Mügge, 2014). Given the massive exposure to video games, it is important to understand players' psychological characteristics and motivations (Johnson, Gardner, & Sweetser, 2016). Several studies have thus been conducted in an attempt to classify online gamers or video gamers according to different conceptualizations (Bateman, Lowenhaupt, & Nacke, 2011; Hamari & Tuunanen, 2014).

Types of Video Game Players

One set of studies (Faulkner, Irving, Adlaf, & Turner, 2015; Manero, Torrente, Freire, & Fernández-Manjon, 2016) has suggested that video game player classifications should be multidimensional, simultaneously considering diverse in-game behaviors (e.g., gaming frequency or time spent playing videogames) and real gaming. A second set of studies has established typologies based on different motivations for playing (Bartle, 1996; Billieux et al., 2013; Nacke, Bateman, & Mandryk, 2014; Yee, 2006), relating these to different problematic online or offline in-game behaviors (Laconi, Pirès, & Chabrol, 2017; Van Rooij, Schoenmakers, Vermulst, Van den Eijnder, & Van de Mheen, 2011; Wu, Lai, Yu, Lau, & Lei, 2017). Thus, several main types of players have been characterized according to their preferences for different in-game activities (for a review, see Hamari & Tuunanen, 2014). Unfortunately, these motivation-play models are often limited to massively multiplayer online role-playing games (MMORPGs), which are declining in popularity (Bartle, 2016), and neglect the variety of current game genres (e.g., simulation, strategy, action, and role-playing; Apperley, 2006). For example, Yee (2006) used a factor analytic approach to identify three MMORPG player motivations: *achievement* (advancement, mechanics, and competition), *social* (socializing, relationship, and teamwork), and *immersion* (discovery, role-playing, customization, and escapism). Two other theoretical approaches have recently emerged: a social-cognitive theory (De Grove et al., 2017) and neurobiological perspectives (Nacke et al., 2014), both promoting a gamer typology based on dispositional motivations for playing digital games, such as goal orientation, escapism, or trait theory.

Lastly, clinical psychologists (Oswald, Prorock, & Murphy, 2014) have explored the role of type of interaction as a way of understanding the *normal* versus *pathological* use of video games. They view video games as a dynamic form of interactivity, focusing on the relationship between game and player. The nature of this relationship determines both video game usage and the amount of time spent. This approach considers both the dangers and benefits of video games (Granic et al., 2014). Video games are regarded as a particular type of game that provides a means of overcoming stress, regulating emotions (e.g., anxiety), and projecting oneself

into adult behaviors. Video games are therefore useful spaces in which gamers can choose between different forms of possible interaction as and when they like.

In this context, Tisseron and Khayat (2013) described two main categories of interaction in video games. First, *sensorimotor interactions* are characterized by the quest for thrills (motor excitement; e.g., playing to relieve physical discomfort, importance of being congratulated and gratified by the game). In this type of interaction, extreme sensations are fundamental, and motor responses are stereotyped. The emotions involved are essentially primary (e.g., disgust, anger, fear). In this mode of gaming, referred to as a *stimulus-response situation*, narrative concerns tend to be absent. Second, *emotional-narrative interactions* involve a quest for complex and sophisticated emotions in gaming (e.g., feeling empathy for one's avatar, enacting painful real-life situations in video games). In this gaming mode, sensation-seeking plays less of a key role, and the motor response remains less of an imperative: The video gamer thinks before acting. The emotions involved are complex, based on identification and empathy. People play for the sake of the game, and to talk about their emotions. Narrative concerns dominate. This corresponds to the *symbolic* use of video games. According to Tisseron (Tisseron, 2009; Tisseron & Khayat, 2013), video gaming is mainly beneficial when gamers place the emphasis on *emotional-narrative interactions* rather than on *sensorimotor interactions*, even if the latter can be positively mobilized in competitive gaming or the enactment of aggression. *Non-problematic gaming* corresponds to the alternation of these two types of interaction. When both types are elicited, video gaming can be stimulating and enhance psychosocial skills. In contrast, in pathological gaming, *sensorimotor interactions* become exclusive, either because the game does not allow others to participate, or because the video game player prefers to focus on this type of interaction (Tisseron, 2012). These motivation-based game interactions may give rise to specific emotional patterns, which, in turn, may enhance game-based orientation and gaming activities. The nature of these motivations may, in part, be related to personality traits.

These three different approaches (based on either video game use, motivation, or type of interaction being sought) each try to capture the different profiles of video game players and make a significant contribution to research in this area. It is nevertheless regrettable that up to now, these approaches have all too often been (a) separated, without trying to integrate these different components, and (b) focused on addictive or pathological issues.

Big Five Personality Traits and Video Game Use

Identifying which personality traits characterize which gamer subtype (problematic or not) would pave the way to a better understanding of the transactions between video games and dispositional factors. Again, there has been relatively little research on the specific connections between personality and in-game behavior in nonproblematic gaming, as previous studies have essentially focused on subgroups of problematic online or video game users (Braun, Stopfer, Müller, Beutel, & Egloff, 2016; Liau et al., 2015; Müller, Beutel, Egloff, & Wölfling, 2014; Starcevic, Berle, Porter, & Fenech, 2011; Wang, Ho, Chan, & Tse, 2015) or heavy users of specific games (e.g., MMORPGs; Worth & Book, 2014). In a nonclinical setting, Zammito (2010) and Nacke et al. (2014) concluded that gaming preferences are connected to players' per-

sonality. Personality traits have been identified as a motivational factor for online gaming (Jeng & Teng, 2008; Park, Song, & Teng, 2011), influencing both play style (Bean & Groth-Marnat, 2016) and game genre preference (Braun et al., 2016). Thus, personality traits may be related to specific needs, insofar as gamers are motivated to play video games to satisfy these needs.

Personality refers to the fundamental characteristics that affect human behavior. The five-factor model of personality (FFM or Big Five) is widely recognized as a framework for classifying and understanding personality traits (Goldberg, 1990; John, Naumann, & Soto, 2008; McCrae & Costa, 2013). According to this model, there are five fundamental and universal personality dispositions or traits: Extraversion (i.e., tendency to be sociable, talkative, active, and ambitious), Neuroticism (i.e., tendency to experience negative emotions), Agreeableness (i.e., tendency to be courteous, flexible, trusting, cooperative, and tolerant), Conscientiousness (i.e., tendency to be careful, organized, efficient, systematic, and self-disciplined), and Openness to experience (i.e., tendency to be curious, creative, broad-minded, and imaginative).

In studies of personality dimensions related to video gaming, some researchers have compared video gamers with nongamers (Braun et al., 2016; Teng, 2008) or on specific video games such as violent video games (Chory & Goodboy, 2011; Markey & Markey, 2010) or *World of Warcraft* (Collins, Freeman, & Chamarro-Premuzic, 2012; Graham & Gosling, 2013; Worth & Book, 2014). Studies focusing on online gamers have found divergent results. On the one hand, studies have highlighted an association between online game addiction or MMORPG use and lower Extraversion scores (Braun et al., 2016; Collins et al., 2012; Peters & Malesky, 2008). In the latter studies, online game players were also characterized by higher Neuroticism, Conscientiousness, and Agreeableness scores. On the other hand, Teng (2008) found that online game players scored higher on Extraversion, Openness, and Conscientiousness than nonplayers, and did not differ on Agreeableness or Neuroticism. These different findings can be explained by the heterogeneity of the tools used and populations studied (Western vs. Asian regions, broad sample vs. student sample).

Regarding violent video games, individuals who play them report higher levels of Openness and Neuroticism, and lower levels of Agreeableness than those who do not play them (Chory & Goodboy, 2011; Witt, Massman, & Jackson, 2011). With respect to other video game player profiles, action gamers have lower Neuroticism scores and higher Extraversion scores, and role-playing video players have higher Openness scores (Braun et al., 2016). In contrast, creative video game behaviors (e.g., building, exploring, categorizing, and choosing a game character) are associated with higher Conscientiousness scores, and helping behaviors during video game play with higher Agreeableness scores (Worth & Book, 2015).

All these initial results are encouraging, in that they reveal potential personality differences among gamers according to the level and nature of their gaming. However, MMORPGs and other online games are not representative of video games in general, and there is an emerging notion that other specific individual difference constructs such as trait Narcissism may also predict video game behaviors (Stopfer, Braun, Müller, & Egloff, 2015), especially as video game players (at least very frequent gamers) seem to have difficulty with social interactions (Lo, Wang, & Fang, 2005). For some gamers, video gaming could be a way of reinforcing or obtaining narcissistic gratification other than by socialization.

Narcissistic Traits and Video Game Use

Although approaches differ, Narcissism is generally characterized as a relatively broad personality trait lying on a continuum (Foster & Campbell, 2007), expressed as an exaggerated sense of self-importance, self-centered grandiosity, arrogance, manipulativeness, and a desire for admiration (Wright et al., 2013). *Grandiose* Narcissism corresponds to a tendency to display behavior that is overtly grandiose, entitled, and exploitative (Cain, Pincus, & Ansell, 2008; Pincus & Roche, 2011). Over the past decade, two studies (Kim, Namkoong, Ku, & Kim, 2008; Stopfer et al., 2015) have explored individual differences in video gaming in terms of Narcissism. According to this recent scientific research, the narcissistic personality trait is an important factor for understanding the online game addiction process. When Kim et al. (2008) considered power gain and status in video gaming, they underlined the possibility that narcissistic personality traits could drive players to seek an admiring audience or other narcissistic gratification (Park & Lee, 2012). In their study, a narcissistic personality trait was positively correlated with the online game addiction score. This was an interesting result, but the study failed to adopt a wider pathological perspective (i.e., video game addiction and narcissistic personality disorder). For their part, Foster, Shiverdecker, and Turner (2016) highlighted the importance of distinguishing between the multidimensional facets of Narcissism (e.g., Leadership/Authority, Grandiosity/Exhibitionism, Exploitativeness/Entitlement, Special Person). For example, Stopfer et al. (2015) concluded that Narcissism subdimensions are differentially related to preferred video-game genre, with a high Rivalry score being associated with action games, and a high Admiration score with role-playing.

The Present Study

Research Question 1: What are the correlations between personality traits and dimensions of in-game behavior in video games generally?

It is important to study the association between personality traits and video game use, as studies have shown that the personality of video gamers is related to gaming frequency, game type/genre, and game preference. The results of previous research point to a relationship between online game use and higher Neuroticism and lower Extraversion, Conscientiousness, and Agreeableness (Braun et al., 2016; Collins et al., 2012; Peters & Malesky, 2008). Several studies of online game players have also found a relationship between addiction to online games and narcissistic personality traits (Kim et al., 2008). Based on these research findings, the aim of the present study was to examine the relationships between broader in-game behavior (e.g., game preferences, time spent, and frequency) and personality dimensions (FFM and Narcissism).

Research Question 2: What is the cluster structure of video game behaviors?

In the absence of an overall comparison of video game players' profiles, it is difficult to reach any firm conclusions as to the relationships between personality and video gamer profiles, or to generalize results beyond online or addict gamers. As a second step, we therefore sought to determine player typologies by adopting a cluster analysis approach. We set out to establish specific

gamer subgroups based on game genres (including—but not limited to—MMORPG and other online games, in contrast to previous studies), frequency of play, time spent, and motivations for video gaming (sensorimotor interactions/emotional–narrative interactions). Based on the idea of player types (e.g., Bartle’s model), distinct game behavior patterns (frequency, game genre, types of interaction, etc.) can be used to establish gamer profiles, adopting a cluster analysis approach. This exploratory statistical technique has the advantage of minimizing the interpretative approach required when using focus groups. As suggested by Billieux et al.’s (2015) research on online gamers, the subtyping of similar game behavior patterns enables researchers to identify at-risk or problematic gamers, and to develop specific and empirically grounded psychological interventions.

Research Question 3: What are the differences between video gamer profiles in terms of personality traits?

The third aim of the current study was to investigate differences between the video game player subgroups we had identified on broad personality traits (Big Five and narcissistic traits). A consensual framework in personality research based on the Big Five might help to detect significant personality trait differences between subgroups of video game players. Each gamer cluster could then be seen as having singular personality traits, opening up the possibility of providing more tailored patient care and designing more targeted preventive measures to identify those vulnerable to problematic video game play.

Method

Participants

We recruited 635 participants through advertisements posted on specialized French-language online game forums (e.g., official video game forums, private forums of guilds, general forums about video games), game messaging, and general social networking sites. The data of 89 participants were excluded from analyses because they provided incomplete (pairwise deletion, $n = 32$, 5.0%) or nonsensical ($n = 5$, 0.8%) responses, or reported never playing video games ($n = 52$, 8.2%). Of the 546 participants who provided usable data, 78.75% were male ($n = 430$), and 21.25% were female ($n = 116$). Participants ranged in age from 14 to 53 years, with a mean age of 21.64 years ($SD = 4.78$), and there was no significant difference across the sexes, $t(544) = .56$, $p = .57$. At the time of the survey, 27.6% ($n = 143$) were in employment (or job seekers) and 72.4% ($n = 375$) were students. Furthermore, 53% of them lived in urban areas ($n = 290$), 35% ($n = 188$) in periurban areas, and 12% ($n = 66$) in rural areas. See Table 1 for video game behavior and personality and test scores.

Measures

Demographic information. Participants responded to several demographic questions, including age, sex, education level, occupation, and geographical location. The survey also included the following items related to video game playing and preferences.

Video gaming.

Time spent playing. The frequency of video game playing was established by asking participants how many times per month they

played video games (five possible answers ranging from *never* to *daily*). We also asked them how long they tended to play these games on average (expressed in minutes per session). This duration of play was used as a continuous variable, but we also established six groups (0–1 hr, more than 1 hr to 2 hr, more than 2 hr to 3.5 hr, more than 3.5 hr to 6 hr, more than 6 hr to 10 hr, and more than 10 hr) for descriptive and informational purposes. In line with previous studies (Chory & Goodboy, 2011), we calculated a frequency index for each participant, by multiplying the *times per month* response by the *how long* response.

Video game genres. Participants indicated on a Likert-like scale ranging from 1 (*never*) to 7 (*more than 10 hr*) the number of hours they spent each week playing each of the following eight video game genres: first-person shooter (FPS), action/adventure, sports and racing, role-playing, fighting game, strategy, puzzle game, and MMORPG. The choice of these genres was based on the classification proposed by Lee, Karlova, Clarke, Thornton, and Perti (2014).

Interactions with the game. The Type of Interaction with the Game Questionnaire is a French questionnaire designed by Tisseron and Khayat (2013) to measure two types of interaction in video game use. It is intended to distinguish between normal and problematic use. It comprises 26 questions, with 13 items probing the degree of sensorimotor interactions (e.g., “I seek to reduce tension through playing the game”) and 13 probing the degree of emotional–narrative interactions (e.g., “I sometimes change my avatar to match my mood”). All 26 items were rated by respondents on a 4-point Likert-like scale ranging from 1 (*strongly disagree*) to 4 (*fully agree*). The higher the score, the higher the level of interaction. Cronbach’s α s were acceptable (.67–.71).

Personality traits.

Big five. The French version (BFI-Fr) of the Big Five Inventory (John, 1990; John & Srivastava, 1999; Plaisant, Courtois, Réveillère, Mendelsohn, & John, 2010) contains 45 items. This self-report questionnaire was chosen because it is brief, freely available, widely used in Internet assessments, and demonstrates good psychometric properties in diverse age groups. Each item is a short sentence featuring an adjective characterizing one of the Big Five personality dimensions (i.e., Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness). Participants are asked to rate each characteristic (e.g., being talkative, having a tendency to criticize others, working conscientiously) on a 5-point Likert-like scale ranging from 1 (*strongly disapprove*) to 5 (*strongly approve*). A mean score is calculated for each dimension. The higher the score, the greater the tendency toward a given personality trait. The BFI-Fr has been validated for use with young adults (Plaisant et al., 2010). Cronbach’s α s for the BFI-Fr in this study were between .78 and .81.

Narcissistic personality. The Narcissistic Personality Inventory - French version (NPI-Fr; Potard, Lignier, & Henry, 2018) is a self-report measure of trait Narcissism derived from the original Narcissistic Personality Inventory - 40 items (NPI-40; Raskin & Terry, 1988). Its 33 items are rated on a Likert-like scale ranging from 0 (*not at all applicable*) to 7 (*highly applicable*). The NPI-Fr captures four different subdimensions of Narcissism: Leadership/Authority (e.g., “I would prefer to be a leader”), Special Person (e.g., “I am an extraordinary person”), Grandiosity/Exhibitionism (e.g., “I really like being the center of attention”), and Exploitativeness/Entitlement (e.g., “I find it easy to manipulate people”). A mean

Table 1
Prevalence, Means, Standard Deviations, and Sex Comparisons for In-Game Behaviors and Personality Scales

Variables	Whole sample (N = 546)		Women (n = 116)		Men (n = 430)		Group comparisons		
	n	%	n	%	n	%	χ^2	p	
Frequency									
Once a month	41	7.5	27	23.3	14	3.3	52.72	***	
2/3 times a month	50	9.2	18	15.5	32	7.4	7.16	**	
At least once a week	166	30.4	33	28.4	133	30.9	0.27	ns	
Daily	289	52.9	38	32.8	251	58.4	24.06	***	
Duration of play									
≤1 hr	103	18.9	35	30.2	68	15.8	14.25	***	
1 hr > × ≤ 2 hr	188	34.4	37	31.9	151	35.1	0.15	ns	
2 hr > × ≤ 3.5 hr	149	27.3	26	22.4	123	28.6	0.84	ns	
3.5 hr > × ≤ 6 hr	50	9.1	7	6.0	43	10.1	3.15	ns	
6 hr > × ≤ 10 hr	37	6.8	8	6.9	29	6.7	0.22	ns	
>10 hr	19	3.5	3	2.6	16	3.7	1.04	ns	
	<i>M (SD)</i>		<i>M (SD)</i>		<i>M (SD)</i>	<i>U</i>	h_p^2	<i>p</i>	95% CI
Video gaming behaviors									
Time spent (min per session)	215.24 (325.36)		182.33 (237.20)		224.13 (345.01)	−1.23	.003	ns	[187.91, 242.59]
Frequency index	3,240.60 (6,888.19)		3,266.29 (8,919.96)		3,233.67 (6,240.81)	−0.04	.001	ns	[−1,774.08, 1,708.84]
FPS	2.62 (1.81)		1.66 (1.19)		2.80 (1.85)	−5.08	.053	***	[2.37, 2.66]
Action/adventure	3.07 (1.63)		2.95 (1.67)		3.10 (1.63)	−0.75	.008	ns	[2.85, 3.12]
Sport	1.74 (1.36)		1.36 (.69)		1.82 (1.44)	−2.64	.010	*	[1.62, 1.85]
Role-playing	3.15 (1.98)		3.23 (2.10)		3.14 (1.96)	0.34	.004	ns	[1.17, 4.87]
Fighting	1.82 (1.29)		1.99 (1.14)		1.80 (1.32)	1.16	.004	ns	[1.69, 1.90]
Strategy	2.83 (1.83)		2.45 (1.50)		2.90 (1.87)	−1.97	.016	**	[2.59, 2.89]
Puzzle	1.19 (0.61)		1.38 (0.73)		1.16 (0.58)	2.77	.014	**	[1.15, 1.25]
MMORPG	2.26 (2.03)		2.72 (2.09)		2.53 (2.02)	0.71	.001	ns	[2.31, 2.65]
SMI	21.82 (5.93)		21.14 (6.62)		22.01 (5.73)	−1.40	.004	ns	[21.33, 22.32]
ENI	26.69 (6.27)		25.09 (6.54)		27.13 (6.14)	−3.13	.018	***	[26.17, 27.22]
Big Five									
E	2.84 (0.91)		2.99 (0.85)		2.81 (0.93)	1.91	.007	*	[2.77, 2.92]
A	3.69 (0.61)		3.75 (0.57)		3.68 (0.62)	1.12	.002	ns	[3.64, 3.77]
C	3.05 (0.69)		3.30 (0.68)		2.99 (0.69)	4.29	.033	***	[2.99, 3.11]
N	2.87 (0.86)		3.24 (0.89)		2.77 (0.83)	5.40	.051	***	[2.80, 2.94]
O	3.61 (0.60)		3.71 (0.57)		3.59 (0.61)	2.02	.007	*	[3.56, 3.66]
Narcissism									
LA	3.64 (1.24)		3.21 (1.14)		3.76 (1.25)	−4.34	.033	***	[3.54, 3.75]
GE	3.18 (1.01)		3.08 (0.96)		3.21 (1.02)	−1.18	.003	ns	[3.10, 3.26]
SP	3.95 (1.12)		3.64 (1.02)		4.04 (1.13)	−3.42	.021	**	[3.86, 4.05]
EE	4.27 (1.31)		3.76 (1.21)		4.41 (1.30)	−4.81	.041	***	[4.16, 4.38]
Total score	3.76 (0.92)		3.42 (0.84)		3.85 (0.92)	−4.54	.037	***	[3.68, 3.83]

Note. CI = confidence interval; ns = nonsignificant; FPS = first-person shooter; MMORPG = massively multiplayer online role-playing game; SMI = sensorimotor interaction; ENI = emotional–narrative interaction; E = Extraversion; A = Agreeableness; C = Conscientiousness; N = Neuroticism; O = Openness; LA = Leadership/Authority; GE = Grandiosity/Exhibitionism; SP = Special Person; EE = Exploitativeness/Entitlement.

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

score is calculated for each subdimension. The higher the score, the greater the tendency toward the particular Narcissism subdimension. The NPI is currently one of the most popular measures of Narcissism in personality psychology (Ackerman et al., 2011). In our study, Cronbach's α s were between .71 and .85.

Procedure

Volunteers could click on a link to a web page to respond to the survey. First, they read a consent and disclaimer form that described the aim and purpose of the study. Second, after giving their consent on line, participants completed the measures in the form of an online questionnaire. Their anonymity was guaranteed (Internet Protocol addresses not collected). To be included in the study, participants had to have played at least one video game and be at least 14

years old. Participants under 18 years of age needed to declare that they had parental consent. There were no other exclusion criteria. The questionnaire was constructed using LimeSurvey software. The average survey completion time was 25 min. All participants completed the questionnaires in the same order and none received any remuneration. The overall response rate was 67%.

Statistical Analyses

Any participants with missing data were removed from the database when preparing the data for analysis. Preliminary analyses indicated no violation of the normality assumptions required for parametric analyses, knowing that game variables violate this condition. We ran descriptive statistics for all key variables. To examine sex differences in the constructs, we used independent sample tests (Student's

t test for parametric distribution and Mann–Whitney U test for non-parametric distribution) for continuous variables, and χ^2 difference tests for categorical variables. Partial correlations (controlling for participants' sex) were then conducted between personality and video gaming behavior variables. Finally, to identify groups of safer or at-risk video game players who shared similar video gaming behavior patterns, we performed a cluster analysis. Z scores were selected as the clustering variables, and a two-step analytic process was then conducted. All the variables we included were z -transformed to share the same metric, so that each of them would contribute equally to the formation of the clusters. Cluster analysis is an exploratory statistical technique that aims to identify subgroups within a specific population, based on shared characteristics. In other words, this technique assigns individuals to groups according to the characteristics they have in common. Respondents in the same group or cluster are more similar to each other (across the selected characteristics) than they are to those in other clusters. The cluster analysis procedure was used to identify different video gamer clusters based on the in-game behaviors and attitudes we had identified as characteristics (time spent, frequency, use of various videogame genres, sensorimotor interactions, emotional–narrative interactions). To be consistent with clustering methods used in previous studies (Billieux et al., 2015; Faulkner et al., 2015; Manero et al., 2016), we carried out two types of cluster analysis: hierarchical clustering to define the clusters and, once the number of clusters had been determined, k -means clustering to assign participants to their best fitting clusters. *Hierarchical cluster analysis* (Ward's method and squared Euclidean distances) is a method that minimizes within-cluster variance and maximizes between-cluster variance to determine the number of clusters. Defining the number of clusters in hierarchical clustering involves examining tree diagrams for indications of the best cluster solution (Hair, Black, Babin, Anderson, & Tatham, 2006) and the interpretability of cluster solutions derived from the k -means procedures. Second, k -means cluster analyses were used to examine which groups belonged to which cluster, meaning that the number of clusters to calculate had to be determined beforehand. *K-means cluster analysis* is considered superior to hierarchical methods, as it is less sensitive to outliers and has been found to result in greater within-cluster homogeneity and between-cluster heterogeneity. Kruskal–Wallis nonparametric analyses of variance (ANOVAs) were performed to compare the clusters in terms of gaming behaviors/habits. Finally, for continuous variables, differences between clusters on personality variables were evaluated using ANOVAs and Bonferroni post hoc comparisons. A 5% level of significance was used for all statistical tests. Data analysis was performed using IBM SPSS Statistics Version 19 and Statistica Software Version 13.

Results

Video Gaming Characteristics of the Sample

Based on index frequency, participants reported playing video games for 10–4,200 min ($M = 755.19$, $SD = 1,287.25$). The average time spent per gaming session was close to 4 hr (in minutes, $M = 215.24$, $SD = 325.36$). The most frequently played genres were action (78.5%, $n = 444$), role-playing (70.95%, $n = 408$), strategy (67.4%, $n = 391$), FPS (62.3%, $n = 367$), and MMORPG (47.0%, $n = 294$). Concerning playing frequency,

52.9% ($n = 289$) participants reported that they played 7 days a week, 30.4% ($n = 166$) at least once a week, 9.2% ($n = 50$) twice or three times a month, and 7.5% less than once a month ($n = 41$).

To control for the sex effect, given the difference in the number of men and women in our sample, we compared their personality dimensions and video game behavior scores (see Table 1). Women scored statistically higher than men on all dimensions except Agreeableness (nonsignificant). The t test for narcissistic personality reached statistical significance for Leadership/Authority, Special Person, and Exploitativeness/Entitlement, with higher scores for men. With respect to video game behaviors, men reported spending significantly more time playing FPS, sport, and strategy games, and sought more emotional–narrative interactions than women. In contrast, women reported spending more time playing puzzle games than men. They also tended to play less frequently on a daily basis than men. The detailed results (means, standard deviations, t tests and p values) are set out in Table 1.

Personality Traits and Gaming Behaviors/Habits

When we explored the relationships between personality traits and video game behaviors (see Table 2), we found differences in personality scores according to the amount of time spent gaming. ANOVAs showed that Extraversion, Conscientiousness, and Grandiosity/Exhibitionism scores were significantly lower for the daily gamer group than for the other groups ($p < .05$). In contrast, the daily gamer group scored higher on Exploitativeness/Entitlement ($p < .01$). Sex differences emerged for a number of variables (see Table 1). To control for these differences, partial correlations were calculated for the relationships between personality dimensions and video game playing (see Table 3 for details). Results showed that both types of interaction (sensorimotor and emotional–narrative) were negatively correlated with Extraversion, Agreeableness, and Conscientiousness ($r = -.10$ to $-.22$, $p < .01$) and positively correlated with Neuroticism, Grandiosity/Exhibitionism, Special Person, and Exploitativeness/Entitlement ($r = .08$ to $.30$, $p < .05$). In contrast, Extraversion, Conscientiousness and Openness were significantly negatively correlated with specific video game genres and time spent. Neuroticism was positively correlated with action games ($r = .07$, $p < .05$), and Openness with role games ($r = .13$, $p < .01$). It should also be noted that the Leadership/Authority, Special Person, and Exploitativeness/Entitlement subdimensions were negatively related to the sport genre ($r = -.08$ to $-.13$, $p < .05$), whereas the Special Person subdimension was positively related to the strategy genre ($r = .11$, $p < .01$).

Typology of Video Gamers

The two-step cluster analysis revealed four clusters. The profiles of the four clusters are depicted in Figure 1. Z scores close to ± 0.5 were the criteria for describing high or low scoring clusters, and scores close to ± 0.3 described clusters that scored moderately high or moderately low.

The first of the four clusters, labeled *casual* ($n = 189$, 34.6%), was characterized by low levels of gaming in terms of both frequency and time spent (in general and for each game genre), and low levels of sensorimotor interaction and emotional–narrative interaction. The second cluster, named *challenge* ($n = 126$, 23.1%), was characterized by moderate involvement in video gaming, a high

Table 2
Comparisons Between Time Spent Gaming and Personality Scores

Variables	Once a month (a)	2/3 times a month (b)	At least once a week (c)	Daily (d)	Group comparisons				
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>F</i>	<i>p</i>	h^2_p	95% CI	Bonferroni post hoc test
Big Five									
E	3.21 (0.13)	3.08 (0.14)	2.82 (0.07)	2.77 (0.05)	3.94	**	.021	[2.77, 2.92]	a > c & d b > d
A	3.85 (0.08)	3.73 (0.07)	3.62 (0.05)	3.71 (0.04)	1.82	<i>ns</i>	.010	[3.64, 3.74]	—
C	3.39 (0.11)	3.19 (0.10)	3.09 (0.05)	2.96 (0.04)	5.78	***	.031	[2.99, 3.11]	a > c & d b > d
N	2.77 (0.15)	2.96 (0.11)	2.87 (0.07)	2.87 (0.05)	0.33	<i>ns</i>	.002	[2.75, 2.94]	—
O	3.68 (0.10)	3.60 (0.08)	3.67 (0.05)	3.58 (0.04)	0.94	<i>ns</i>	.005	[3.56, 3.69]	—
Narcissism									
LA	3.56 (1.25)	3.90 (1.20)	3.59 (1.31)	3.63 (1.20)	0.84	<i>ns</i>	.010	[3.54, 3.74]	—
GE	3.01 (0.98)	3.51 (0.91)	3.27 (0.97)	3.09 (1.02)	3.41	*	.020	[3.09, 3.26]	b > a & d
SP	3.65 (1.16)	3.92 (0.95)	3.96 (1.11)	4.00 (1.46)	1.15	<i>ns</i>	.006	[3.86, 4.05]	—
EE	3.74 (1.34)	3.96 (1.15)	4.29 (1.20)	4.38 (1.35)	3.94	**	.021	[4.16, 4.38]	c & d > a d > b
Total score	3.49 (0.96)	3.82 (0.82)	3.78 (0.93)	3.78 (0.93)	1.28	<i>ns</i>	.007	[3.68, 3.84]	—

Note. CI = confidence interval; *ns* = nonsignificant; E = Extraversion; A = Agreeableness; C = Conscientiousness; N = Neuroticism; O = Openness; LA = Leadership/Authority; GE = Grandiosity/Exhibitionism; SP = Special Person; EE = Exploitativeness/Entitlement.
* $p < .05$. ** $p < .01$. *** $p < .001$.

frequency of role-playing, strategy and action/adventure video gaming, and high levels of sensorimotor interaction and emotional–narrative interaction (emotional–narrative interaction > sensorimotor interaction). The third cluster, labeled *hardcore* ($n = 143, 26.2\%$), was characterized by high levels of game playing, especially on MMORPG, and very high levels of sensorimotor interaction and emotional–narrative interaction (emotional–narrative interaction > sensorimotor interaction). The fourth cluster, called *arousal* ($n = 88, 16.1\%$), was characterized by high gaming frequency (but moderate time spent), very high involvement in FPS games only, a high gaming frequency, and moderate sensorimotor interaction and emotional–narrative interaction levels (sensorimotor interaction > emotional–narrative interaction).

The ANOVAs we conducted revealed a significant effect of cluster membership on each of the gaming factors we investigated, except for one genre subfactor (puzzle). Descriptive statistics for the clusters and ANOVAs are reported in Table 4. Women were overrepresented in

the *casual* cluster, $\chi^2(1) = 23.45, p < .001$, and underrepresented in the *arousal* cluster, $\chi^2(1) = 13.05, p < .001$. Concerning demographic characteristics, members of the *casual* cluster tended to be older than those of the other clusters, $F(3, 542) = 3.58, p < .01$. Differences between the four clusters on other sociodemographic variables were not significant (for more details, see Table 4).

Video Gamer Cluster Differences on Personality Traits

Finally, as the clusters were created according to a combination of gaming measures, we ran an ANOVA for each personality variable to explore potential differences between the clusters on these characteristics. Table 5 lists the means and standard deviations of each personality trait for the four video gamer clusters. The ANOVAs showed significant differences between the four clusters on personality dimensions (Wilks' $\eta^2 = .937$), $F(15, 1460.7) = 2.323, p = .003$. Participants in the *casual* cluster

Table 3
Partial Correlations Between Personality Traits and Video Game Playing (Controlling for Sex)

Variables	Time spent	Frequency index	FPS	Action adventure	Sport	Role	Fighting	Strategy	Puzzle	MMORPG	SMI	ENI
Big Five												
E	.00	.01	-.08*	-.04	.09*	-.13**	.01	-.07	.02	.02	-.22***	-.14**
A	.01	.02	.02	.06	-.03	.03	.02	-.05	-.03	.02	-.19***	-.10**
C	-.12**	-.11**	-.10**	-.15***	.01	-.15***	-.05	-.11**	.03	-.04	-.18***	-.20***
N	.01	.01	.00	.07*	-.02	.06*	.02	.05	.06	-.01	.30***	.14***
O	-.11**	-.11**	-.08*	.05	-.14***	.13**	-.03	.06†	.05	-.01	-.07*	.00
Narcissism												
LA	-.02	-.01	.02	-.01	.13**	-.04	.07†	.04	.01	-.01	.03	.07*
GE	-.07*	-.07	.01	-.02	.05	-.04	.07†	.05	.06	.01	.22***	.20***
SP	-.01	-.01	.00	-.05	.12**	.02	.00	.11**	.05	-.02	.16***	.19***
EE	.03	.05	-.02	.00	.08*	.03	-.03	.06†	.06†	.03	.08*	.10**
Total score	-.02	-.01	.02	-.01	.11**	-.03	.03	.08*	.05	.02	.15**	.17**

Note. E = Extraversion; A = Agreeableness; C = Conscientiousness; N = Neuroticism; O = Openness; LA = Leadership/Authority; GE = Grandiosity/Exhibitionism; SP = Special Person; EE = Exploitativeness/Entitlement; FPS = first-person shooter; MMORPG = massively multiplayer online role-playing game; SMI = sensorimotor interaction; ENI = emotional–narrative interaction.
* $p < .05$. ** $p < .01$. *** $p < .001$. † $p < .09$.

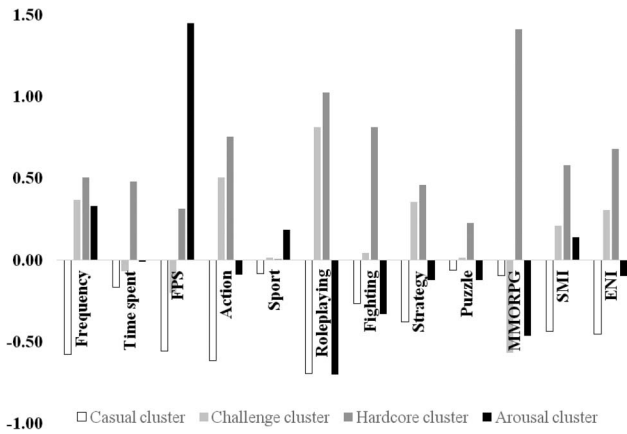


Figure 1. Z scores for video gaming variables for the final four-cluster solution.

scored significantly higher on Extraversion and Conscientiousness than those in the other clusters, and significantly lower on Neuroticism than those in the *hardcore* and *arousal* clusters. Participants in the *challenge* cluster tended to score significantly lower on Grandiosity/Exhibitionism (with a trend toward significance for

Leadership/Authority, $p = .08$). Finally, participants in the *arousal* cluster scored significantly lower on Openness than those in the other clusters. Moreover, it is important to note that we found a significant difference between clusters when men and women were considered separately. For Narcissism, women in the *hardcore* cluster had higher Exploitativeness/Entitlement scores than those in the other clusters, $F(3, 112) = 3.22, p = .02$.

Discussion

Video games are an increasingly popular pastime, meaning that it is crucial to understand the different patterns of game play. Personality psychology provides a theoretical reference (Big Five) for individual differences in video game use. As previous research has mainly focused on MMORPGs and/or other forms of online play, the current study examined the connections between personality traits and broader video game player profiles. Based on previous research (Braun et al., 2016; Chory & Goodboy, 2011; Collins et al., 2012; Graham & Gosling, 2013; Teng, 2008; Witt et al., 2011), we expected Big Five personality traits to be related to video game use frequency and game preferences. We also explored Narcissism, which was recently postulated to be involved in video game use (Kim et al., 2008; Park & Lee, 2012; Stopfer et al., 2015). The results of our study revealed several links between

Table 4
Descriptive Statistics for the Four Clusters

	Casual cluster <i>n</i> = 189 34.61%	Challenge cluster <i>n</i> = 126 23.08%	Hardcore cluster <i>n</i> = 143 29.19%	Arousal cluster <i>n</i> = 88 16.12%	Group comparisons			
Sociodemographic variables	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	η^2	<i>p</i>		
Sex								
Women	60 (11%)	21 (3.9%)	29 (5.3%)	6 (1.1%)	25.02	***		
Men	129 (23.6%)	105 (19.2%)	114 (20.9%)	82 (15%)				
Activity					3.56	<i>ns</i>		
Employed	55 (10.6%)	26 (5%)	36 (7%)	26 (5%)				
Student	130 (25.1%)	93 (18%)	99 (19.1%)	53 (10.23%)				
Areas					5.80	<i>ns</i>		
Rural	19 (3.5%)	13 (2.4%)	22 (4%)	12 (2.2%)				
Periurban	60 (11%)	45 (8.3%)	55 (10.1%)	28 (5.1%)				
Urban	109 (20%)	67 (12.3%)	66 (12.1%)	48 (8.8%)				
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>F</i>	h_p^2	<i>p</i>	95% CI
Age	22.55 (5.51)	21.19 (4.02)	21.20 (4.60)	21.02 (4.10)	3.58	.019	**	[21.67, 23.65]
Video gaming variables	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>KW</i>	h_p^2	<i>p</i>	95% CI
Frequency per month	3.46 (7.23)	11.82 (8.50)	21.00 (0.0)	18.00 (0.89)	424.46	.780	***	[12.30, 13.00]
Time spent per session	172.56 (453.31)	208.73 (215.64)	256.88 (356.13)	206.36 (265.49)	16.64	.382	***	[187.86, 242.60]
FPS	1.82 (1.18)	2.36 (1.71)	2.73 (1.67)	2.81 (1.97)	111.89	.386	***	[2.37, 2.66]
Action/adventure	2.30 (1.37)	3.17 (1.69)	3.26 (1.63)	2.88 (1.61)	50.06	.210	***	[2.85, 3.12]
Sport	1.77 (1.35)	1.84 (1.45)	1.68 (1.35)	1.59 (0.98)	5.65	.035	***	[1.62, 1.85]
Role-playing	2.97 (2.05)	3.21 (1.87)	3.41 (2.01)	2.01 (1.42)	109.97	.382	***	[2.86, 3.18]
Fighting	1.84 (1.14)	1.84 (1.46)	1.89 (1.38)	1.48 (0.82)	15.71	.080	***	[1.69, 1.90]
Strategy	2.74 (1.86)	2.79 (1.84)	3.04 (1.81)	2.05 (1.44)	39.21	.184	***	[2.59, 2.89]
Puzzle	1.25 (0.61)	1.23 (0.66)	1.13 (0.62)	1.16 (0.52)	0.99	.010	<i>ns</i>	[1.15, 1.25]
MMORPG	2.39 (2.09)	2.03 (1.70)	2.71 (2.08)	2.32 (1.87)	593.72	.020	***	[2.32, 2.65]
SMI	19.34 (5.45)	22.13 (6.06)	22.73 (6.04)	21.89 (5.62)	53.81	.037	***	[22.32, 24.00]
ENI	23.53 (6.16)	27.06 (6.11)	27.70 (6.20)	26.96 (6.03)	63.96	.051	***	[26.16, 27.21]

Note. CI = confidence interval; KS = Kruskal–Wallis test; *ns* = nonsignificant; FPS = first-person shooter; MMORPG = massively multiplayer online role-playing game; SMI = sensorimotor interaction; ENI = emotional–narrative interaction.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 5
Means (Standard Deviations) of the Four Clusters on the Personality Scales

Variables	Casual cluster	Challenge cluster	Hardcore cluster	Arousal cluster	Group comparisons				
	<i>n</i> = 189 34.61% <i>M</i> (<i>SD</i>)	<i>n</i> = 126 23.08% <i>M</i> (<i>SD</i>)	<i>n</i> = 143 29.19% <i>M</i> (<i>SD</i>)	<i>n</i> = 88 16.12% <i>M</i> (<i>SD</i>)	<i>F</i>	h_p^2	<i>p</i>	Bonferroni post hoc test	95% CI
Big Five									
E	3.02 (0.90)	2.64 (0.91)	2.82 (0.92)	2.79 (0.89)	16.26	.028	***	Casual > 3 other clusters	[2.70, 2.92]
A	3.71 (0.60)	3.71 (0.59)	3.68 (0.64)	3.66 (0.60)	0.17	.008	<i>ns</i>	—	[3.64, 3.74]
C	3.21 (0.71)	2.90 (0.71)	2.99 (0.65)	3.00 (0.66)	5.86	.024	***	Casual > 3 other clusters	[2.99, 3.11]
N	2.77 (0.84)	2.94 (0.78)	2.97 (0.82)	2.98 (0.78)	2.24	.011	.08	Casual < Hardcore & Arousal	[2.79, 2.94]
O	3.67 (0.60)	3.62 (0.56)	3.59 (0.62)	3.42 (0.55)	3.54	.017	**	Arousal < 3 other clusters	[3.56, 3.66]
Narcissism									
LA	3.77 (1.16)	3.41 (1.16)	3.67 (1.22)	3.73 (1.22)	2.32	.008	.08	Challenge < Casual	[3.54, 3.74]
GE	3.19 (0.87)	2.98 (0.88)	3.24 (1.07)	3.36 (0.88)	3.12	.010	*	Challenge < 3 other clusters	[3.09, 3.26]
SP	3.84 (1.03)	3.93 (1.17)	3.97 (1.04)	3.94 (1.03)	0.98	.006	<i>ns</i>	—	[3.86, 4.05]
EE	4.09 (1.23)	4.33 (1.35)	4.33 (1.33)	4.28 (1.15)	1.36	.007	<i>ns</i>	—	[4.16, 4.38]
Total score	3.72 (1.07)	3.66 (1.14)	3.80 (1.17)	3.83 (1.07)	1.98	.003	<i>ns</i>	—	[3.68, 3.84]

Note. CI = confidence interval; *ns* = nonsignificant; E = Extraversion; A = Agreeableness; C = Conscientiousness; N = Neuroticism; O = Openness; LA = Leadership/Authority; GE = Grandiosity/Exhibitionism; SP = Special Person; EE = Exploitativeness/Entitlement.

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

players' personality traits and video gaming patterns. Individuals with higher levels of Extraversion and Conscientiousness, but lower levels of Neuroticism, played more occasionally and less frequently. Heavy video game players tended to score higher on Neuroticism, but this tendency needs to be confirmed by other studies. Compared with other gamers, less open video game players generally preferred to play FPS games (*arousal* gamers). In addition to all this, *challenge* video game players (heavy gamers preferring adventure/role-playing) were characterized by lower scores on specific Narcissism subdimensions (Leadership/Authority and Grandiosity/Exhibitionism). As postulated, results suggested that personality dimensions are reliably linked to video game player profiles. We discuss this finding in two parts. First, we consider the link between daily video game players' personality traits and the use of gaming to avert negative emotions. Second, we tackle the issue of at-risk gaming, identifying different typologies/profiles of video game players.

Link Between Personality Traits and In-Game Behaviors

First, our findings suggest that the most frequent gamers are generally characterized by an entitled narcissist's expectations, possibly masking an underlying sense of social inferiority/inadequacy and/or social anxiety. Using another model of narcissistic personality, Stopfer et al. (2015) demonstrated an absence of connection between the overall Narcissism score and gaming frequency, but specific associations with narcissistic subdimensions (e.g., admiration and rivalry). Overall time spent (i.e., exposure to video games) was significantly associated with lower self-discipline, and an individual preference for familiar and routine activities may lead to more time being spent on gaming (lack of control) than on other, more important, daily activities.

Concerning the frequency of game use by genre, results indicated that Extraversion was positively correlated with sport game use, and negatively correlated with role-playing and FPS use. Playing sport video games may meet people's needs for success

and competition. This is consistent with the results obtained by Zammitto (2010), who reported a positive relationship between sport video gaming and Extraversion. In contrast, participants who frequently played role-playing and FPS games tended to score lower on Extraversion. This result is inconsistent with Zammitto (2010), who found that a high level of Extraversion increases the preference for action shooting games. Role-playing games are characterized by various creative and social aspects, but ones that involve virtual interactions with other people. Therefore, people who tend to be quiet, reserved, and less involved in social situations are more likely to devote more time to games with intrinsic social elements and anonymous cooperation in elaborating narratives (compensatory strategy for dealing with low social confidence; Ryan, Rigby, & Przybylski, 2006). Conscientiousness was negatively associated with time spent on role-playing, action/adventure, and strategy games. People with low Conscientiousness tend to be more spontaneous and undisciplined (McCrae, Gaines, & Wellington, 2013), and may therefore spend less time on games requiring long-term strategies (less able to resist a drive or defer the temptation to perform an action). Openness was positively correlated with role-playing and negatively correlated with FPS and sport game use. These results are not surprising, given the greater relevance of creativity in role-playing, and the minimal abstract component of FPS and sport games. Lastly, the preference for action adventure games was moderately associated with higher Neuroticism (i.e., an individual's tendency to experience unpleasant emotions, such as anger, anxiety, depression, and vulnerability). The more introverted video gamers may prefer the imaginative scenarios of adventure games, which allow them to escape negative emotions (e.g., anxiety, tension). No statistical differences were found among other types of game use or personality traits, including Agreeableness, in contrast to previous research on problematic MMORPG use (Teng, 2008).

Results for Narcissism indicated a positive association between the Leadership/Authority, Special Person and Exploitativeness/

Entitlement subdimensions and sport video game use. Participants who played these games more often tended to exhibit a high motivation or desire to obtain positions of power or leadership, and high self-perceptions as a special or high-status person. Higher Exploitativeness has been associated with higher stimulation when competing against others (Buelow & Brunell, 2014). Competition games such as sport video games presumably satisfy the need for short-term success and superiority (narcissistic rivalry; Back et al., 2013). The absence of a link between FPS, a game that also has a competitive dimension, and narcissistic traits might appear to contradict this idea, but FPS gamers seem to have poorer behavioral and emotion regulation (e.g., impulsivity; Metcalf & Pammer, 2014), rather than narcissistic issues. Special Person scores were also positively correlated with time spent on strategy games, indicating a link between the tendency to consider oneself as having a special destiny and greater involvement in strategy games.

Adaptive or Maladaptive Outcomes of Video Gaming: Different At-Risk Profiles

Previous studies had found specific links between personality traits and the amount of time spent on various video game genres. However, although time spent playing is an indicator of behavior, it does not allow the players' motivations and preferences to be identified. The present study was therefore designed to objectify player profiles identified by means of a cluster analysis. These profiles were then compared on personality traits. We were able to identify four distinct clusters of video game players, which we labeled *casual*, *hardcore*, *challenge*, and *arousal*. The prototypical *casual* video game player was a sporadic player who engaged in brief sessions of different games and sought very little sensorimotor interaction or emotional–narrative interaction. This player profile (occasional and obviously nonproblematic gamers) represented a little less than 35% of our sample, and could correspond to the *regulated recreational gamer* type proposed by Billieux et al. (2015) for online players. It has also been identified as a profile in a multifaceted player type model (Kallio, Mäyrä, & Kaipainen, 2011; Stewart, 2011), as well as in a more controversial dichotomous model (i.e., *casual* vs. *hardcore* gamers; Ip & Jacobs, 2005). The *challenge* video game player cluster (23% of the sample) contained participants who preferred strategy, action, and role-playing games, and played frequently but in short bursts. It should be emphasized that although these players did not exactly correspond to the two heavy gamer profiles (*hardcore* and *arousal*), they nevertheless tended to report high levels of seeking for sensorimotor and emotional–narrative interactions. This video game player profile can be compared with the *immersion* player type characterized by Yee (2006) as being oriented to discovery and role-playing. The third profile (*hardcore*) accounted for people who could be regarded as heavy video game players (high frequency and time spent), specifically involved in MMORPGs. They had the highest sensorimotor interaction and emotional–narrative interaction scores, and represented around 29% of the sample. The label *hardcore* was chosen to describe people who play in every way, often in longer sessions (Ip & Jacobs, 2005). The fourth and final cluster (*arousal*) accounted for 16% of our sample. These video game players had an exclusive preference for FPS games, frequently playing in short sessions, and scored higher on senso-

rimotor interaction than on emotional–narrative interaction—an indicator of potentially problematic video gaming, according to the author of this scale (Tisseron & Khayat, 2013). This profile, related to the expression of aggressive behavior, such as character attack or killing, matches the online killing player described by Whang and Chang (2004). Our findings suggest that video gamers are characterized by heterogeneous and multidetermined behaviors, and MMORPGs only concern one of several gamer profiles. As underlined by a literature review on pathological gambling (Milosevic & Ledgerwood, 2010), establishing variability in gamer subtypes allows researchers to distinguish between emotionally or behaviorally vulnerable players and nonproblematic users. Based on this typology, we compared the personality scores of these four profiles, to determine the specific traits of each one.

First, *casual* video game players were more socially confident, controlled, and consistent, and experienced more positive emotions, than participants with other game use profiles. We can assume that these gamers, who displayed greater social engagement and more positive emotions, primarily played to socialize (e.g., in the company of others) or have fun, and were in control of the game (high Conscientiousness score). In other words, less extraverted people may derive social gratification from heavier video game use (e.g., for interacting with others), which may lead them to play more frequently. *Casual* video game players were also more likely to feel confident and optimistic than other gamers. In other words, Neuroticism scores were higher in the other video game player clusters, suggesting a tendency to be more emotionally unstable and a lower tolerance of stressful situations (Verduyn & Brans, 2012) among heavier gamers. *Casual* players also tended to be more persistent and more plan- and achievement-oriented (Hart, Stasson, Mahoney, & Story, 2007; McCrae et al., 2013). In contrast, heavier gamers scored lower on Conscientiousness, suggesting that they had difficulty with self-discipline (Roberts, Jackson, Fayard, & Edmonds, 2009). This result is in accordance with Graham and Gosling (2013)'s study of *World of Warcraft* gamers, in which the authors concluded that regular video game use could serve as a leisure pursuit or procrastination strategy that distracts players from other activities.

Challenge video game players were characterized by low scores on self-assurance or self-perceived confidence (Grandiosity/Exhibitionism) and leadership ability (Leadership/Authority). Combined with their tendency to being neurotic, these gamers tend to be more avoidant, self-denying (oriented toward others), and self-effacing. They presumably played more to compensate for feeling uncomfortable with themselves or feeling that they lacked social skills (e.g., prior sense of inadequacy when it comes to achieving a mission or taking on a leadership role). Because they should find narcissistic gratification in gaming, they invest in it a great deal, and spend more time playing. Our results were generally in line with early studies of the relationship between Narcissism and online game addiction (Kim et al., 2008; Park & Lee, 2012), and reflect Stopfer et al.'s (2015) conclusion that narcissists prefer playing action games and acting alone or as team leaders.

Finally, as previously noted, *hardcore* and *arousal* video game players tended to be more reserved, easily anxious, and emotionally reactive/unstable. However, this result approaching significance should be viewed cautiously, even if it seems to be consistent with previous studies (Braun et al., 2016; Peters & Malesky, 2008), where low Extraversion and Conscientiousness and high

Neuroticism were found to be useful predictors of MMORPG addiction or Internet gaming disorder. Additionally, *arousal* video game players were characterized by a lack of interest in adventure, imagination, curiosity, or creative experiences (McCrae et al., 2013). Unlike Krcmar and Kean (2005), who found that Openness was positively related to violent media consumption, in the current study, lower Openness emerged as a characteristic of FPS game players. This result suggests that FPS video game players exhibit a specific personality trait organization, to be set alongside their sensorimotor interaction-seeking in video games, which may lead them to prefer games of stimulation/discharge. Agreeableness scores did not differ across the four video game player clusters. This result adds to the conflicting literature, for although studies have described a strong association between problematic gaming behavior or addiction to violent games (Chory & Goodboy, 2011; Worth & Book, 2015) and higher Agreeableness, they have failed to find a significant link in the case of nonpathological gaming (Teng, 2008).

Limitations

Despite these encouraging results, the current study had several limitations, starting with the personality measures. Although the BFI-Fr is a widely used and well recognized measure of personality, it does not allow the facets of each personality trait to be assessed (in contrast to the NEO Personality Inventory-3 [NEO-PI-3] or the HEXACO model). More research with more precise tools is needed to develop a more nuanced understanding of personality and its relationship to video game use. Future studies should also continue to examine narcissistic personality and video game use, including measures that allow overt/covert Narcissism, or grandiose/vulnerable Narcissism (Pincus & Roche, 2011; Rose, 2002), to be evaluated (and differentiated), in terms of both occasional and heavy (i.e., potentially problematic) gamers. Furthermore, the present study was based on a sample of French volunteers recruited over the Internet who completed a subjective online survey. Its findings may not, therefore, be representative of the video game player population as a whole, and should be treated with caution. Nevertheless, our results are consistent with several other studies using similar methodologies (Billieux et al., 2015). Although previous findings pointed to sex differences in the relationships between personality and video game use, our sample had a relatively small proportion of women. Another area not considered in this study was the online (vs. offline) component of game play, which could constitute a third (i.e., social) type of interaction-seeking to be taken into account in a holistic typology of video game players.

More exhaustive research with larger samples would increase the precision of gamer classification and its relationship with personality traits. Account should be taken of the potential psychopathology on respondents, such as social anxiety disorder or depression. The present study featured a survey method (with potential self-reporting bias) and a cross-sectional design, limiting our ability to establish causality among the variables. Future studies could feature a longitudinal design and a larger sample. From a gratification perspective, motives or gratification (e.g., task-focused, social orientation, goal achievement) obtained by playing video games should be assessed. Other considerations should include the influence of sex, cultural and social issues, and the gaming environment, and their links to personality characteristics.

Conclusion

In summary, the current study revealed relationships between personality traits and different types of video game playing. These results indicate that personality traits may influence the amount of time spent on video games, and specific traits may explain individual differences in video game playing preferences (or habits). Results revealed that narcissism subdimensions were differentially associated with video gamers: Individuals low on Grandiosity/Exhibitionism preferred adventure or role-playing games that would stimulate their imagination or allow them to play the role of team leader. The fact that the *hardcore* and *arousal* video game players reported lower Extraversion and higher Neuroticism than the *casual* video game players lends further support to the idea that heavy video game players tend to have a personality vulnerability for poor social skills (Chory & Goodboy, 2011) and exhibit poor behavioral control, especially in the case of *hardcore* and *arousal* gamers. We can postulate that *challenge* video game players mainly play to escape from negative affects (Neuroticism) and reinforce their social skills. Comparisons between the present findings and previous ones in the more specific domain of MMORPGs or violent video games suggest that domain-specific patterns are not totally reflected in the findings of domain-general studies. The exploratory data yielded by the present study will inform studies of adaptive or maladaptive outcomes of video gaming, based on personality variables such as the subdimensions of Narcissism.

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