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FULL-LENGTH REPORT

A latent profile approach for classifying internet gamers based on motives for online gaming

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ABSTRACT

Background and aims: Online gaming motives have proven to be useful in differentiating problematic engagement in online gaming. However, the mixture modeling approach for classifying problematic subtypes based on gaming motives remains limited. This study attempted to differentiate heterogeneous online gamers into more homogenous subtypes based on gaming motives using latent profile analysis (LPA). We also compared various psychological and gaming/leisure related variables across the derived profiles. *Methods:* A total of 674 Korean online game users (mean age = 21.81 years, male = 76%) completed self-report questionnaires, including the Korean version of the Motives for Online Gaming Questionnaire (K-MOGQ). After the LPA, the relationships between latent profile membership and auxiliary variables were explored. *Results:* Four latent profiles were identified, that were further classified into one problematic (*highly motivated-dissatisfied gamer),* one highly engaged (*highly motivated-satisfied gamer*), and two casual (*moderately-motivated casual gamer* and *lowly-motivated casual gamer*) gamer profiles. Inter-profile comparisons revealed that *highly motivated-dissatisfied gamer* had the most pathological profile, characterized by high Internet gaming disorder (IGD) tendency, neuroticism, and impulsivity, but the lowest recreation motive. While *highly motivated-satisfied gamer* also demonstrated a heightened IGD tendency, they showed positive patterns of psychological and gaming/leisure-related variables, which indicated they could be better considered as high engaged instead of problematic gamers. *Discussion and conclusions:* These results indicate that the recreation motive, in addition to fantasy or escape motives, is an important factor in differentiating maladaptive online gamers. Classifying online gamers based on gaming motives can contribute to a clearer conceptualization of heterogeneous gamers, paving the way for individualized assessment and treatment planning.

KEYWORDS

internet gaming addiction, gaming motives, neuroticism, impulsivity, latent profile analysis

INTRODUCTION

Problematic engagement in online gaming is an emerging public mental health issue in many countries (King et al., 2019; King, Koster, & Billieux, 2019; Young, 1998). Moreover, emphasis on social distancing and stay-at-home during the COVID-19 pandemic has globally increased consumption of digital entertainment, especially online gaming (King, Delfabbro, Billieux, & Potenza, 2020). In fact, online gaming can be a fun and healthy leisure activity for most individuals, especially the youth, providing positive experiences such as socializing, sense of achievement, and relieving loneliness, stress (Granic, Lobel, & Engels, 2014; Snodgrass et al., 2017). However, a minority of people are drawn to excessive and maladaptive usage of online gaming, which can be expressed as preoccupation, impaired control despite psychosocial problems, or poor lifestyle (e.g., diet, sleep, physical activity) outcomes (Chan et al., 2022; Snodgrass et al., 2017), culminating in behavioral addiction

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called Internet gaming disorder (IGD; American Psychiatric Association [APA], 2013) or gaming disorder (GD; World Health Organization [WHO], 2019). Therefore, it is not appropriate to over-pathologize all online game players as homogenous problematic gamers (Billieux, Schimmenti, Khazaal, Maurage, & Heeren, 2015; King, Koster, & Billieux, 2019), as studies have focused on individual characteristics that can differentiate disordered online gamers from normal, highly engaged recreational gamers.

Online gaming motives, that is, reasons for playing online games, have proved to be useful for differentiating problematic engagement in online gaming. Personality traits, such as neuroticism and impulsivity, implicated in IGD literature (King et al., 2019; King, Koster, & Billieux, 2019; Şalvarlı & Griffiths, 2019), are better conceptualized as non-specific, distal factors that can act through other specific, proximal factors, such as gaming motives, as in the case of other substance and behavioral addictions (Canale, Vieno, Griffiths, Rubaltelli, & Santinello, 2015; Kuntsche, Knibbe, Gmel, & Engels, 2006). Previous research has shown that escape (playing to avoid real world problems, e.g., because gaming makes me forget real life), fantasy (playing to try new identity in virtual space, e.g., because I can do things that I am unable to do or I am not allowed to do in real life), and coping (playing to cope with distress, e.g., because gaming helps me get into a better mood) motives are more related to IGD than are social or recreational motives (Ballabio et al., 2017; Bányai, Griffiths, Demetrovics, & Király, 2019; Chang & Lin, 2019; de Hesselle, Rozgonjuk, Sindermann, Pontes, & Montag, 2021; Kim & Kang, 2021; Király et al., 2015; Kircaburun et al., 2020; Marino et al., 2020; Montag et al., 2019; Šporčić & Glavak-Tkalić, 2018). Moreover, gaming motives demonstrated significant mediating roles in a variety of relationships with IGD, including psychiatric symptoms (Ballabio et al., 2017; Bányai, et al., 2019; Király et al., 2015; Montag et al., 2019), self-concept clarity (Šporčić & Glavak-Tkalić, 2018), social anxiety (Marino et al., 2020), and emotional intelligence (Kircaburun et al., 2020).

However, few studies have utilized a mixture modeling approach (latent profile analysis [LPA] or latent class analysis [LCA]) to differentiate problematic subtypes based on gaming motives, despite its usefulness in other addictions such as pathological gambling (Bosari et al., 2013; Foerster & Röösli, 2017; Khazaal et al., 2017). Mixture models aim to identify latent subgroups that are internally homogenous within the same group but distinct between different groups in terms of response patterns. The advantages of using these approaches over other classification methods are their flexibility in terms of data distribution and that they do not rely on the rigid assumptions of traditional methods (Magidson & Vermunt, 2004). After identifying latent classes or profiles, these models can accommodate auxiliary variables, such as covariates and distal outcomes, presumed to be antecedents or consequences of the latent components (Asparouhov & Muthén, 2014; Vermunt, 2010). Moreover, the classification of heterogeneous online gamers into more similar subtypes based on psychological processes can contribute to the development of effective and individualized treatment recommendations. For examples, if online gamers possess different underlying psychological mechanisms (e.g., neuroticism versus impulsivity) for developing and maintaining symptoms of problematic online gaming, the target for treatment (e.g., enhancing emotion regulation versus self-control capacity) should be adjusted accordingly (Billieux, Schimmenti, Khazaal, Maurage, & Heeren, 2015, Billieux et al., 2015; Brand, Rumpf, King, Potenza, & Wegman, 2020). To date, previous studies have examined the presence or extent of IGD along with other behavioral addictions (e.g., social media addiction), endorsement of IGD diagnostic criteria, and psychological symptoms, such as depression and anxiety (Carras & Kardefelt-Winther, 2018; Cerniglia et al., 2019; Deleuze et al., 2017; Lee et al., 2018) as parameters for clustering; while, few studies focused on online gaming motive.

To the best of our knowledge, Billieux, Schimmenti et al. (2015) and Billieux et al. (2015) were the first to utilize online gaming motives for a cluster analytic approach. In this study, the authors used a variety of psychological risk factors including the gaming motives measured by the French adaptation of Yee's (2006) Motivations to Play in Online Games Questionnaire (only achievement, socializing, role-playing and escapism motives were included for cluster analysis). In a sample of massive multiplayer online role-playing game (MMORPG) players, three problematic and two non-problematic clusters emerged. Of the problematic clusters, *Unregulated Escapers* consisted of gamers characterized by low achievement, high escapism motives, high impulsivity traits, and low self-esteem, who play online games to cope with negative affect. Gamers belonging to *Unregulated Achievers* showed high scores on achievement motives and all impulsivity facets, but were not interested in socializing or escaping. This cluster was conceptualized as problematic gamers with diminished self-control abilities, strongly driven by positive incentives such as excitement through winning. The third problematic cluster, *Hard-Core Gamers*, had the highest adverse outcomes related to gaming and was primarily motivated by both achievement and escapism. Unexpectedly, they possessed high self-esteem, which the authors tentatively interpreted as implying "potential denial of real life" (p. 248), as the virtual self could be boosted by in-game achievements. Similarly, Wang et al. (2021) identified three subgroups (*recreational, achievers, and escapers*) using gaming motives measured by the Chinese version of Yee's (2006) questionnaire and self-esteem. They showed that different motive groups were longitudinally associated with different psychosocial problems.

Although these were initial, yet meaningful attempts to classify heterogeneous problematic gamers based on gaming motives, these previous studies had several limitations that the present study aims to address. First, they did not consider an important personality trait, neuroticism, which demonstrated a fairly consistent, positive association with IGD among the Big five personality traits (Charlton & Danforth, 2010; Li, Zou, Wang, & Yang, 2016; Mehroof & Griffiths, 2010; Müller, Beutel, Egloff, & Wölfling, 2014; Peters & Malesky, 2008; Wittek et al., 2016) in comparing

the clusters. Second, they did not use a measure of problematic online gaming updated by the DSM-5 diagnostic criteria, which presents a unified operational definition of IGD in present times (Petry et al., 2014). Third, participants were recruited from only one game genre, MMORPG, which limits the generalizability of the sample. Fourth, it is doubtful whether the four gaming motives (Yee, 2006) used in previous studies encompass a full range of gaming motives in online gamers playing different game genres (Demetrovics et al., 2011). Finally, from a statistical point of view, Billieux, Schimmenti et al. (2015) and Billieux et al. (2015) used cluster analysis which is criticized as non-inferential. Instead, we conducted an LPA that offers a superior model-based solution compared to traditional cluster analysis because the choice of cluster is less arbitrary by utilizing objective statistical indices (Vermunt & Magidson, 2002).

In summary, the main objective of the current study was to differentiate heterogeneous online gamers into distinct subtypes of problematic or recreational gamers, based on gaming motives using an LPA. To clarify the characteristics of each profile, we comprehensively compared a wide array of variables associated with IGD. More specifically, psychological (neuroticism, positive and negative urgency, positive and negative affect), demographics (e.g., gender, occupation), and gaming/leisure-related variables (e.g., weekly and maximum time spent on gaming, overall satisfaction with leisure activity, and the ratio of gaming in the entire leisure activity) were compared across the derived profiles.[1]

METHODS

Participants

Korean Internet game users participated in this study through an online survey from June to October 2016. A convenient sample of participants was recruited through advertisement posted in online bulletin board of major online gaming forums as well as universities located in the greater Seoul area, Gyeonggi, and Chungcheong provinces in South Korea. After informed consent, participants, who had a lifetime experience of online gaming, completed a survey package of self-report questionnaires, including gaming motives, demographics, gaming/leisure-related variables, and other psychological measures (mean completion time: about 30 min). After excluding cases due to missing values, the final sample consisted of 674 internet gamers whose mean age was 21.81 (SD = 3.84 years, range = 17–42), and 76.0% were male (n = 512) (Table 1).

Measures

Demographics and gaming/leisure-related variables. The participants were asked to report their age, gender, and occupation. Information regarding gaming-related variables was also gathered in single-choice questions: age when they first started gaming, weekly amount of time spent on gaming, number of days of gaming per week, game genre ("What kind of online game genre do you enjoy the most? MMORPG, First-Person Shooter; FPS, Real Time Strategy; RTS, Multiplayer Online Battle Arena; MOBA, or Other."),

Table 1. Sample characteristics (N = 674)

		Mean	SD	N (%)
Age		21.81	3.84	
Age at first gaming		9.22	3.73	
Number of days gaming per week		4.27	2.26	
Weekly gaming time (hour)		9.16	11.21	
Gender	Male			512 (76.0)
	Female			162 (24.0)
Occupation	High school student			73 (10.8)
	University student			463 (68.7)
	Employed			59 (8.8)
	Unemployed			59 (8.8)
	Etc.			20 (3.0)
Game genre	MMORPG			174 (25.8)
	FPS			215 (31.9)
	RTS			28 (4.2)
	MOBA			95 (14.1)
	Sports game			28 (4.2)
	Puzzle game			68 (10.1)
	Etc.			66 (9.8)
Gaming day	Weekdays			66 (9.8)
	Weekends			192 (28.5)
	Unspecified			416 (61.7)
Gaming place	Own room			381 (56.5)
	Other places inside home (e.g. living room)			54 (8.0)
	PC gaming site			220 (32.6)
	Etc.			19 (2.8)
Gaming alone	Yes			286 (42.4)
	No			388 (57.6)

Note. MMORPG = massive multiplayer online role-playing game; FPS = First-Person Shooter; RTS = Real Time Strategy; MOBA = Multiplayer Online Battle Arena.

[1]In common, the main purpose of these auxiliary variables was to provide evidence for interpreting functional or adaptive level of the derived profiles. Positive and negative affect were included, as the valence of affect can matter in defining adaptation versus maladaptation. For example, excess of negative affect in combination with decreased positive affect may point to poor adaptation or mental health problem. Leisure-related variables were included, since they can be used to explore whether participants made good use of online gaming as leisure activity or not, based on studies reporting that IGD can be predicted by leisure and recreation experience (Festl, Scharkow, & Quandt, 2013; Lee et al., 2020; Lyu, 2017). If a profile demonstrated high preference for gaming without alternative leisure activities and low leisure satisfaction, it would not be plausible to interpret this profile as a group of adaptive online gamers.

gaming days ("What day do you play online game the most? Weekdays, Weekends, or Unspecified.") and place ("Where do you play online game the most? Own room, other places inside home [e.g., living room], PC gaming site, or Other."), whether gaming alone ("With whom do you play online game the most? Playing alone physically, online friends, offline friends, family, or Other."), overall leisure satisfaction, and types and frequency of leisure ("What kind of leisure activity do you participate the most?"). We used six items assessing types of leisure (sports, hobbies, social activities, going to a(*n*) movie/concert/exhibition, tour/sightseeing, playing games except internet gaming [e.g., board game]). The items were rated on a 5-point Likert scale (from 1 = never, to 5 = almost always).

Korean Motives for Online Gaming Questionnaire (K-MOGQ). The MOGQ is a self-report questionnaire that assesses motives for online gaming (Demetrovics et al., 2011). The validated K-MOGQ administered in this study (Kim & Kang, 2021) comprises 27 items rated on 5-point Likert scale (from 1 = almost never/never, to 5 = almost always/always). The K-MOGQ contains six factors (fantasy, escape, skill development, competition, recreation, and social motives). The internal consistency of each factor was consistently acceptable (McDonald's ω = 0.86 for fantasy, ω = 0.88 for escape, ω = 0.84 for skill, ω = 0.87 for competition; ω = 0.83 for recreation, and ω = 0.73 for social).

Korean Internet Gaming Disorder-20 test (K-IGD-20 test). The IGD-20 Test was developed to reflect the nine criteria of IGD as in the DSM-5 (Pontes, Király, Demetrovics, & Griffiths, 2014). The validated K-IGD-20 test was used in this study (Kim, 2016). Participants were asked to respond to 20 items that assessed gaming activities occurring over a 12-month period. The items were rated on a 5-point Likert scale (from 1 = strongly disagree, to 5 = strongly agree), with higher scores indicating a higher level of gaming activity. The internal consistency in this study was good (ω = 0.86).

International Personality Item Pool (IPIP) personality five-factor scale. Yoo, Lee, and Ashton (2004) selected 50 items that measured the Big Five personality traits from the IPIP (Goldberg, 1999). It consists of fifty items, with ten items per personality domain and is validated. In this study, we used ten items assessing only the neuroticism domain. The items were rated on a 5-point Likert scale (from 1 = never, to 5 = very much). Internal consistency was good in the present study (ω = 0.90).

Korean UPPS-P impulsive behavior scale. The UPPS-P is a 20-item questionnaire that evaluates five facets of impulsivity: negative urgency, positive urgency, lack of premeditation, lack of perseverance, and sensation-seeking (Cyders & Smith, 2007; Whiteside & Lynam, 2001). In the validated Korean UPPS-P administered in this study (Lim & Lee, 2014), we used only the negative urgency (12 items) and positive urgency (14 items) factors to measure impulsivity. The internal consistency values ranged from good (ω = 0.88 for negative urgency) to excellent (ω = 0.93 for positive urgency).

Korean version of the positive and negative affect Schedule (K-PANAS). The PANAS is a 20-item questionnaire that assesses positive and negative affect (Watson, Clark, & Tellegen, 1988). The validated K-PANAS was used in this study (Lee, Kim, & Lee, 2003). The items were rated on a 5-point Likert scale (from 1 = very slightly or not at all, to 5 = extremely). The internal consistency coefficient for positive affect was 0.87, and that for negative affect was 0.91.

Statistical analysis

This study used cross-sectional latent profile analysis. The analyses were performed with a two-fold aim: 1) to identify underlying profiles based on the mean scores of the six gaming motives, and 2) to assess the relationships between gaming motive profiles and other auxiliary variables. For the first aim, LPA models with one through seven profiles were fitted, and the results were compared to select the optimal number of profiles. Several information criteria (IC) (e.g., the Akaike information criteria [AIC] and the Bayesian information criteria [BIC]) and the Lo-Mendell-Rubin test (LMR-test) (Lo et al., 2001) were used to choose the best model among the competing models considered. Additionally, the R-squared entropy and classification error that measures the classification quality given in an LPA model and the substantive meaning of the profiles were also considered in selecting the final model for the interpretation.

After identifying the best-fitting LPA model, the relationships between gaming motive profiles and auxiliary variables expected to have a relationship with the respondents' latent profile membership were explored. Specifically, age, gender and job were employed as covariates to explain membership, while psychological variables, including neuroticism, positive/negative urgency, positive/negative affect, IGD, and gaming/leisure-related variables, were also incorporated as distal outcomes. Among several approaches for investigating the effects of auxiliary variables in the context of LPA, we utilized the three-step approach with Bolck-Croon-Hagenaars method (BCH method) (Bolck, Croon, & Hagenaars, 2004). This method carried out model selection and the evaluation of distal outcomes sequentially while considering the uncertainty of the assignment of individuals into latent profiles. The BCH method not only yields unbiased parameter estimates and their standard error estimates of auxiliary variables, but also successfully controls for the uncertainty of latent profiles under different conditions of variables' distribution, classification quality, relative latent profile size, and strength of association between latent profiles and the distal outcomes (Bakk & Kuha, 2021; Dziak et al., 2016).

Analysis was conducted using Latent gold 5.1, and all parameters were estimated by the maximum likelihood method with the EM algorithm (EM) and Newton-Raphson (NR) methods. 2000 random starts were used to avoid local

minimum, and convergence criteria were set to 0.01 and 1e-008 for EM and NR, respectively.

Ethics

Participants were invited to participate through a notice advertising the study. Online informed consent document provided potential participants with information they need to make a decision to volunteer for this study (e.g., purpose and procedure of the study, voluntariness of consent, confidentiality, anonymity, right for withdrawal, and termination at any time during participation etc.). By clicking a box on a screen at the end of the online document, they consented to participate in the study. All procedures and materials were approved by the institutional review board of Seoul National University (IRB No. E1605/002-002).

RESULTS

Latent profile analysis

An LPA was conducted to identify respondents' underlying gaming motive profiles (Table 2). The IC values continued to decrease as the number of profiles increased, showing the lowest values in the model with the maximum number of profiles (i.e., 7-profile model). Such a decreasing pattern in IC values is often found in situations such as the violation of the local independence assumption, that is, profile indicators are correlated given profile memberships (e.g., Oberski, van Kollenburg, & Vermunt, 2013). Then, the number of profiles can be selected as an elbow point (Nylund et al., 2007; Petras & Masyn, 2010), which shows a relatively large decrease in the values instead of the minimum. The changes in the IC from four to five profiles were much smaller than those in the other changes, which can be considered as an evident elbow point. The LMR-test also indicated that the 4-profile model fit better than the 5-profile model, evidenced by the insignificance of the LMR-test statistic ($P = 0.223$). In addition, the criteria related to classification quality preferred the 4-profile model, which showed the highest R-squared entropy and the lowest classification error.

When careful consideration was given to the interpretability of the solutions, the 4-profile model was superior to the others in explaining the heterogeneity. Moreover, the model with five profiles produced at least one profile including less than 1–5% of the respondents. Therefore, based on the elbow point observed in the IC plots, LMR-test, the classification quality in the form of R-squared entropy and classification error, and the interpretability of the solutions, we chose the 4-profile model as the final model.

The latent profile probabilities (i.e., profile sizes), along with the mean scores of gaming motive within each profile, are given in Table 3 and Fig. 1. Each latent profile was labelled based on the pattern of gaming motive scores.

Profile 1 included 28.14% ($n = 198$) of respondents whose motive levels were generally higher than those of other profiles across all motives with the highest recreation motive; thus, it was labeled *highly motivated-satisfied gamer*. Profile 2 comprised 18.03% ($n = 117$) of the respondents, and their fantasy and escape motives were as high as Profile 1, but the

Table 2. Fit statistics to identify optimal number of latent profiles

Model	Npar	LL	BIC	AIC	AIC3	CAIC	SABIC	Class. err	Entropy	LMRT
1-Cluster	12	−10592.7	21348.3	21235.5	21260.5	21373.3	21268.9	0.000	1.000	–
2-Cluster	25	−10371.4	20990.3	20818.8	20856.8	21028.3	20869.6	0.012	0.940	0.000
3-Cluster	38	−10194.9	20722.0	20491.9	20542.9	20773.0	20560.1	0.098	0.810	0.005
4-Cluster	51	−9944.6	20306.1	20017.2	20081.2	20370.1	20102.9	0.100	0.841	0.049
5-Cluster	64	−9931.6	20364.6	20017.1	20094.1	20441.6	20120.1	0.103	0.840	0.233

Note. Npar = a number of estimated parameters; LL = log likelihood; BIC = Bayesian information criterion; AIC = Akaike information criterion; AIC3 = Akaike information criterion with 3 as penalizing factor; CAIC = consistent Akaike information criterion; SABIC = sample-size adjusted Bayesian information criterion; Class. Err = classification error; LMRT = *P*-values of Lo-Mendell-Rubin Adjusted Likelihood Ratio test.

Table 3. Relative profile sizes, the mean scores of gaming motive within each latent profile

Label (relative size)	Highly motivated-satisfied gamer ($n = 198$, 28.14%)	Highly motivated-dissatisfied gamer ($n = 117$; 18.03%)	Moderately-motivated casual gamer ($n = 246$; 36.63%)	Lowly-motivated casual gamer r ($n = 113$; 17.19%)	Averaged scores ($n = 674$; 100%)
Latent profile indicators					
Fantasy	2.84	2.98	1.87	1.13	2.21
Escape	3.11	3.17	2.34	1.63	2.58
Skill development	3.22	3.13	2.05	1.42	2.46
Competition	3.56	3.19	2.55	2.05	2.86
Recreation	4.82	3.64	4.03	3.72	4.13
Social	2.60	2.82	1.88	1.00	2.10

Note. Values indicate averaged scores of the items on a 5-point Likert Scale measuring gaming motives across latent profiles.

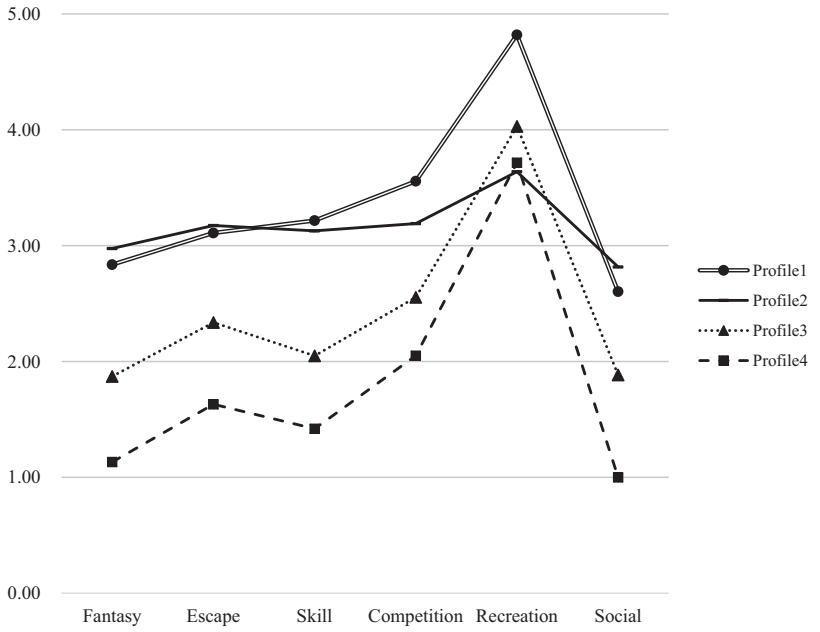

Fig. 1. The mean scores of six gaming motive within each latent profile

recreational motive level (mean score = 3.64) was the lowest among all profiles. Respondents in this profile seemed to engage in gaming not for recreation or satisfaction, compared to other profiles. Hence, Profile 2 was named *highly motivated-dissatisfied gamer*. Overall, Profiles 3 and 4 displayed lower levels of gaming motives than Profiles 1 and 2 did. In common, they were less motivated and suspected to play online games less, which provided a rationale for naming these profiles as casual gamers. Profile 3, which consisted of 36.63% (n = 246) of the respondents, was defined as *moderately-motivated casual gamer* because gaming motives were relatively higher than those of Profile 4. Finally, Profile 4 (17.19%, n = 113) was characterized by relatively lower overall motive scores than other profiles; therefore, it was referred to as *lowly-motivated casual gamer*.

To further delineate the characteristics of each profile, associations between latent profile membership and auxiliary variables were examined. The effects of the demographic covariates including gender and occupation were statistically significant (gender: χ^2 (3, N = 674) = 50.71, P < 0.001; occupation: χ^2 (3, N = 674) = 38.73, P < 0.001), while the age effect on profile membership was not significant. The results show that female respondents had a higher chance of belonging to casual gamer profiles (Profiles 3 and 4), whereas male respondents were evenly distributed across profiles. Moreover, high school students and unemployed respondents were more common in the highly motivated profiles (Profiles 1 and 2), whereas university students were more likely to be assigned to the casual gamer profile.

The association between latent profile membership and all psychological and gaming/leisure-related distal outcomes was statistically significant (Table 4). It may be noted that, the four latent profiles could be considered as one highly engaged (Profile 1), one problematic (Profiles 2), and two casual (Profiles 3 and 4) gamers. Although respondents in Profile 1 showed strong immersion into gaming, as evidenced by the longest weekly maximum gaming hours, the highest level of leisure-gaming proportion, and IGD tendency, they were low on neuroticism, high on positive affect and leisure satisfaction among all profiles, which suggest that they may not fall into the category of problematic profile. The prominent feature of Profile 2 was the diverse array of negative psychological problems, including IGD, neuroticism, impulsivity, negative affect, and the lowest leisure satisfaction level. Profile 3 and 4 demonstrated somewhat similar mean scores on psychological variables. Instead, they were more clearly differentiated by gaming- or leisure-related variables. While the respondents grouped into Profile 3 had modest scores on IGD, gaming hours, and leisure-gaming proportion, the respondents classified into Profile 4 were characterized by the lowest levels of these variables.

DISCUSSION AND CONCLUSIONS

This study aimed to 1) differentiate heterogeneous online gamers into distinct profiles of problematic and recreational gamers based on gaming motives, and 2) compare psychological and gaming/leisure-related variables across the derived profiles. Four latent profiles were identified as a result of LPA: highly motivated-satisfied gamer (Profile 1), highly motivated-dissatisfied gamer (Profile 2), moderately-motivated casual gamer (Profile 3), and lowly-motivated casual gamer (Profile 4). When the mean score of gaming motives was compared within each profile, recreation motive ranked the highest in all profiles, reflecting that the

Table 4. Associations between latent profile membership and auxiliary variables

Variable	Profile 1	Profile 2	Profile 3	Profile 4	χ^2 (*df*)	*P*
Demographic, %						
Gender						
Male	32.09%	23.41%	33.61%	10.89%	50.71 (3)	<0.001
Female	12.38%	10.69%	32.98%	43.95%		
Occupation						
High school student	41.61%	35.65%	14.48%	8.26%	38.73 (12)	<0.001
University student	18.87%	17.17%	38.94%	25.01%		
Employed	45.66%	21.00%	29.82%	3.52%		
Unemployed	42.61%	32.45%	22.34%	2.60%		
Etc.	72.45%	0.53%	19.40%	7.63%		
Psychological, M (SE)						
Neuroticism	25.64 (0.75)	29.07 (0.68)	26.80 (0.51)	27.22 (0.80)	11.63 (3)	<0.001
Positive urgency	26.18 (0.63)	29.74 (0.50)	26.26 (0.40)	26.64 (0.67)	32.38 (3)	<0.001
Negative urgency	29.34 (0.82)	33.70 (0.70)	28.58 (0.56)	28.27 (0.89)	36.92 (3)	<0.001
Positive affect	30.69 (0.69)	29.45 (0.68)	24.48 (0.52)	24.26 (0.68)	76.90 (3)	<0.001
Negative affect	20.73 (0.76)	26.72 (0.81)	18.58 (0.52)	18.51 (0.78)	75.15 (3)	<0.001
Internet Gaming Disorder, M (SE)						
K-IGD-20	50.52 (1.08)	53.10 (1.35)	43.84 (0.82)	36.47 (1.11)	127.01 (3)	<0.001
Gaming-related, M (SE)						
Weekly gaming time (hour)	13.97 (1.19)	9.78 (1.04)	6.68 (0.58)	5.90 (0.94)	35.97 (3)	<0.001
Maximum gaming time (hour)	13.37 (0.92)	12.01 (1.23)	8.32 (0.71)	6.84 (0.58)	42.85 (3)	<0.001
Leisure-related						
Leisure-gaming proportion, M (SE)	60.38 (1.97)	49.78 (2.74)	40.29 (1.91)	31.66 (2.65)	88.98 (3)	<0.001
Leisure satisfaction, %						
Very dissatisfied	0.08%	2.85%	1.57%	1.31%	160.81 (4)	<0.001
Dissatisfied	3.62%	14.07%	11.53%	10.84%		
Neutral	16.81%	30.77%	28.80%	28.14%		
Satisfied	43.94%	37.88%	40.49%	41.12%		
Very satisfied	35.55%	14.43%	17.61%	18.60%		

Note. K-IGD-20 = Korean Internet Gaming Disorder-20.

major reason for engaging in online gaming would be to enjoy as a leisure activity in most cases. However, recreation motive was specifically lowered in Profile 2, when the absolute value was compared across all the profiles.

According to the associations between latent profile membership and auxiliary variables, we classified these four latent profiles into one problematic (Profiles 2), one highly engaged (Profile 1), and two casual gamer groups (Profiles 3 and 4). Different from previous studies that classified profiles as problematic versus non-problematic groups of gamers (Billieux et al., 2015; Billieux, Schimmenti et al., 2015; Wang et al., 2021), we made additional distinction between highly engaged and problematic gamers, based on the critique that the IGD criteria may not be able to distinguish between problematic and highly engaged gamers (Castro-Calvo et al., 2021; Griffiths et al., 2016; Kardefelt-Winther et al., 2017). If evidence base for the IGD criteria is not yet robust, it might be premature to classify Profile 1 as totally problematic solely on the basis of IGD score.

Online gamers belonging to Profile 2 showed higher IGD tendencies and overall gaming motives than casual gamers. Although the overall level of gaming motives was higher than that of casual gamers with the exception of recreation motive, they did demonstrate higher fantasy and escape motives than casual gamers, consistent with previous studies that found escape and fantasy motives to be strongly associated with IGD (Ballabio et al., 2017; Bányai et al., 2019; de Hesselle et al., 2021; Kim & Kang, 2021; Wu, Lai, Yu, Lau, & Lei, 2017). In particular, the lowest recreation motive was a striking difference that differentiated Profile 2 from Profile 1 and other casual gamer profiles. This indicates that gamers belonging to Profile 2 don't enjoy playing online games too much, consistent with the finding that problematic gamers play to relieve dissatisfaction rather than pursue satisfaction (Wan & Chiou, 2006).

Also, Profile 2 gamers reported poorer psychological characteristics, such as high neuroticism, impulsivity, and negative affect, consistent with the problematic profiles in previous research - *Unregulated Escaper* (Billieux et al., 2015; Billieux, Schimmenti et al., 2015), highly motivated escaper (Wang et al., 2021). This finding is in accordance with numerous prior studies that have found that various psychological problems are associated with pathological online gaming (Chew, 2022; Liao et al., 2020; Şalvarlı & Griffiths, 2019; Shin et al., 2019; Zemestani et al., 2021). Although Profile 2 gamers spent much time playing online games, they had the lowest leisure satisfaction and heightened level of negative affect. Combined with their unique combination of gaming motives, it appears that they initiated online gaming

to avoid real-world problems and cope with negative affect, rather than for fun, but consequently failed. Therefore, Profile 2 was deemed as *desperate but failed* escapers, the most pathological profile.

Meanwhile, members of Profile 1 also showed higher IGD tendencies and overall gaming motives than casual gamers, similar to Profile 2 gamers. They shared higher gaming motives including fantasy and escape with Profile 2, but their recreation motive was the highest among all the profiles, different from Profile 2. They reported the highest gaming time and gaming to leisure ratio, indicating their strong immersion in online gaming. However, they retained the highest level of leisure satisfaction and positive affect, and their impulsivity and neuroticism traits were not pronounced compared to recreational gamer profiles. In a sense, respondents in Profile 1 in our study were similar to *Hard-Core Gamers* (Billieux et al., 2015; Billieux, Schimmenti et al., 2015) or moderately motivated achievers (Wang et al., 2021). In contrast to Profile 2, they could be at least *satisfied escapers*, who succeeded in utilizing online gaming as leisure activity, finding temporary relief and gaining rewards in virtual world. Also, this is in line with the argument that heavy use itself is not a sufficient criterion for defining Internet gaming addiction and other addictions in general (Demetrovics, & Király, 2016).

Two casual gamer profiles showed lower levels of gaming motives and IGD tendency than problematic or highly-engaged gamers. They reported intermediate or low level of neuroticism, impulsivity, and negative and positive affect scores. These groups comprised a comparatively low proportion of high school students but a high proportion of university students. These findings are in accordance with those of previous studies that found younger age to be associated with a higher IGD tendency (Hawi, Samaha, & Griffths, 2018). Similarly, Billieux, Schimmenti et al. (2015) and Billieux et al. (2015) observed that *regulated recreational gamers* had low impulsivity traits, negative affect, and high self-esteem.

Taken together, this study demonstrated that online gaming motives can contribute to classifying heterogeneous gamers as pathological or healthy gamers. This also have both theoretical and clinical implications for assessment and personalized interventions for IGD. The development and examination of effectiveness of treatment of IGD is still limited, in part by unclear core psychopathology, inconsistency in operationalized definition and assessment (King et al., 2017; Wang, Ren, Long, Liu, & Liu, 2019). As Brand et al. (2020) argued, the process and symptoms of IGD "may be related, but may not be identical" (p. 52). Besides of symptom severity measured by IGD score, online gaming motive can be a core underlying process of what constitutes behavioral addiction and point to target for individualized treatment planning. As was the case in Profile 2, if online gamers demonstrate overall high motives but specifically low recreation motive, they are at increased risk for both IGD and adverse psychological outcomes. Moreover, gamers belonging to Profile 2 could benefit from an intervention program for cognitive restructuring of online gaming as recreational activity in addition to mood and impulsivity regulation or real-world social skills training.

This study has several limitations. First, we relied on self-report measures, which may be influenced by social desirability or response bias; therefore, diversification of data collection methods would be helpful. In particular, the utilization of clinician rating scales or behavioral assessments could reveal the multifaceted nature of this phenomenon in detail. Second, this study used cross-sectional latent profile analysis; however, further longitudinal research is needed to examine the causal relationships between personality traits, gaming motives, and addictive gaming behaviors. Third, we included online gamers who could not be clinically ascertained and majority of participants were man and young people in this study. Future studies should re-examine and compare various inter-profile factors in more representative or clinical samples to enhance the generalizability of the findings.

In conclusion, through LPA, the present study presents reliable and meaningful latent profiles of online gamers based on comprehensive gaming motives in a large sample of online gamers from diverse game genres. Interestingly, low recreation motives, in addition to the high fantasy and escape motives traditionally implicated in the existing literature, were a crucial factor in differentiating pathological online gamers. The profiles were related to differences in other psychological and gaming/leisure-related variables, which may aid in clear conceptualization and personalized approaches for assessment and intervention planning.

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