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Motives for online gaming questionnaire: Its psychometric properties and correlation with Internet gaming disorder symptoms among Chinese people

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Background and aims: Internet gaming disorder (IGD) imposes a potential public health threat worldwide. Gaming motives are potentially salient factors of IGD, but research on Chinese gaming motives is scarce. This study empirically evaluated the psychometric properties of the Chinese version of the Motives for Online Gaming Questionnaire (C-MOGQ), the first inventory that measures seven different gaming motives applicable to all type of online games. We also investigated the associations between various gaming motives and IGD symptoms among Chinese gamers. *Methods:* Three hundred and eighty-three Chinese adult online gamers (Mean age = 23.7 years) voluntarily completed our online, anonymous survey in December 2015. *Results:* The confirmatory factor analysis results supported a bi-factor model with a general factor subsuming all C-MOGQ items (*General Motivation*) and seven uncorrelated domain-specific factors (*Escape*, *Coping*, *Fantasy*, *Skill Development*, *Recreation*, *Competition*, and *Social*). High internal consistencies of the overall scale and subscales were observed. The criterion-related validity of this Chinese version was also supported by the positive correlations of C-MOGQ scale scores with psychological need satisfaction and time spent gaming. Furthermore, we found that high *General Motivation* (coupled with high *Escape* motive and low *Skill Development* motive) was associated with more IGD symptoms reported by our Chinese participants. *Discussion and conclusions:* Our findings demonstrated the utility of C-MOGQ in measuring gaming motives of Chinese online gamers, and we recommend the consideration of both its total score and subscale scores in future studies.

Keywords: gaming, motives, addiction, Internet, bi-factor modeling, scale validation

INTRODUCTION

Internet gaming is a common Internet activity, but excessive and prolonged Internet gaming leads to negative consequences, including poor real-life relationships and academic performance (Kuss, 2013). Internet gaming disorder (IGD) is an emerging mental disorder that poses a severe public health threat in many societies including China, given the high penetration rate of the Internet for entertainment purposes (American Psychiatric Association [APA], 2013). Research efforts to measure and identify risk factors for IGD among Chinese gamers are highly warranted. Investigations of motives for online gaming use are especially needed because they are significant cognitive determinants of addictive behaviors, including excessive gambling and gaming (King & Delfabbro, 2009; Király et al., 2015; Wu, Tao, Tong, & Cheung, 2012).

Gaming motives

Both qualitative and quantitative findings have shown that people report diverse reasons for their active engagement in gaming (Bartle, 1996; Frostling-Henningsson, 2009; Wan & Chiou, 2007; Yee, 2006a). Different approaches were used for categorizing those motives. For example, Bartle (1996) identified four types of multiplayer computer gamers by their motives (i.e., killers, achievers, socializers, and explorers). When Bartle's model was further tested, a five-factor model (i.e., relationship, manipulation, immersion, escapism, and achievement; Yee, 2006a) and a ten-factor model (with three higher-level factors: achievement, immersion, and social; Yee, 2006b) were identified among massively multiplayer online (MMO) role-playing game (RPG) players. Other studies (e.g., Fuster, Chamarro, Carbonell, & Vallerand, 2014; Kahn et al., 2015) also targeted players of primarily one type of online game, and hence it is unclear whether the models developed in those studies cover all possible motives of gaming (Demetrovics et al., 2011).

Based on a literature review and survey data, Demetrovics et al. (2011) developed the Motives for Online Gaming Questionnaire (MOGQ), which measures seven dimensions

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of gaming motives: *Escape* (escaping from reality), *Coping* (coping with stress and distress), *Fantasy* (in-game identities and experience), *Skill Development* (such as attention and coordination), *Recreation* (entertainment and enjoyment), *Competition* (challenging and competing with others), and *Social* (building and maintaining social relationships). MOGQ is the first instrument designed to measure the motives of online gamers from a broader age range. It covers the major gaming motives identified in previous research and shows high internal consistency.

Research on Chinese gaming motives is scarce, and we found only five published studies assessing Chinese gamers' motives for gaming (Hu & Yang, 2012; Kahn et al., 2015; Wan & Chiou, 2007; Yee, Ducheneaut, & Nelson, 2012; Zhang et al., 2013). These studies provided support to the multiple motivational approaches, but they suffered from methodological limitations in their scale validation, as summarized in Table 1.

The first aim of this study was to test the psychometric properties of the Chinese version of MOGQ (C-MOGQ) by replicating its seven-factor structure and high internal consistencies of the subscales among Chinese adult online gamers. The criterion-related validity of C-MOGQ was also examined by testing the correlations of C-MOGQ factors with psychological need satisfaction.

Psychological need satisfaction and gaming motives

Self-determination theory (SDT; Ryan & Deci, 2000a) presumes that people possess three basic psychological needs: competence, autonomy, and relatedness, and that they are motivated to engage in a behavior due to the expected or actual gratification of those needs via that behavior. This macro-theory of human motivation has been used to explain positive correlations between gaming motives and gaming intention/behaviors (King & Delfabbro, 2009; Ryan, Rigby, & Przybylski, 2006; Wu, Lei, & Ku, 2013). For instance, Ryan et al. (2006) found that in-game relatedness was positively correlated with social gaming motives in a survey among MMO gamers. We hypothesized positive correlations between in-game need satisfaction and gaming motives assessed by the C-MOGQ, specifically between (a) Competition motive and competence, and (b) Social motive and relatedness.

IGD and gaming motives

Previous research has shown significant associations between gaming motives and problem gaming symptoms in Western populations (Blinka & Mikuška, 2014; King & Delfabbro, 2009; Király et al., 2015). For example, MOGQ subscale scores differentiated probable problem gamers from non-problem gamers among Korean adults (Kim et al., 2016). Some studies, however, found particular motives (e.g., achievement and escapism) to be more salient correlates of weekly gaming hours and problem gaming than other motives among Western MMORPG players (Billieux et al., 2011; Dauriat et al., 2011; Yee, 2006a). As correlations between gaming motives and gaming addiction had not yet been tested and reported among Chinese gamers, this study also aimed to identify significant motives that were positively associated with Chinese gamers' IGD symptoms.

The present study

A valid C-MOGQ can facilitate future research on Chinese gaming motives and related cross-cultural comparisons. This study first tested the factor structure, reliability, and validity of the 27-item C-MOGQ among Chinese adult online gamers. We then examined the associations between gaming motives and IGD symptoms. The findings should provide useful information for IGD prevention among Chinese online gamers.

METHODS

Procedures and participants

Consistent with Demetrovics et al. (2011), we used an online survey to reach the target participants (i.e., ≥18-year-old online gamers). A convenient sample of participants was recruited via invitation messages posted at social networking sites (e.g., Facebook and Weibo) and popular Chinese online forums of gaming in Hong Kong, Macau, Taiwan, and Mainland China in December 2015.

Without any monetary/material incentives, 1,096 potential participants voluntarily started the questionnaire survey. Among them, 690 and 481 participants completed 40% and 100% of the entire questionnaire, respectively. Among those who fully completed the questionnaire, 26 cases with inconsistent response patterns and 69 cases who reported age as either <18 years or missing were excluded from subsequent analyses. The final sample was 383 Chinese adults (209 males, 54.6%; 174 females, 45.4%) between 18 and 82 years of age ($M = 23.7$, $SD = 6.7$). About half ($n = 191$) of the participants were students and 43.1% ($n = 165$) were either full-time or part-time employees. The majority indicated that they used the Internet for more than 10 years (56.7%) and mainly played MMO games (54.6%) in the previous 12 months.

Measures

The participants filled out an anonymous, structured questionnaire composed of the validated inventories and background information items (gender, age, and employment status). The original English items of the measures for gaming motives, psychological need satisfaction, and IGD symptoms were translated into both traditional and simplified Chinese by two professional translators following standard translation and back-translation procedures (Brislin, 1970). Two bilingual psychologists checked the face validity of the translated items and confirmed no significant discrepancies from the original items.

Gaming motives. The 27-item MOGQ was used to assess what motivates online gamers to play the games, with a 5-point Likert scale, ranging from 1 = *almost never* to 5 = *almost always/always*.

Psychological need satisfaction among gamers. Three subscales (i.e., autonomy, competence, and relatedness) of

Table 1. Summary of measurement tools for gaming motives of Chinese people

Studies	Sample	Study design	Measurement	Motive factors	Model fits	Major limitation(s) in validation process
Wan and Chiou (2007)	199 adolescent gamers	Survey	Self-constructed Online Gaming Motivation Scale (19 items)	Two factors: intrinsic and extrinsic	CFA: $\chi^2(151) = 282.37$, $\chi^2/df = 1.87$, GFI/AGFI/NFI/NNFI = .90 to .95, RMSEA = .05	No alternative model was tested; no criterion-related validity was examined; factor loadings were not provided
Hu and Yang (2012)	361 college students	Survey (at campus)	Motivation Questionnaire for College Students Participating in Online Games (12 items)	Four factors: enjoyment, needs to experience achievement, social interaction, and escaping from reality	CFA: $\chi^2/df = 1.94$, GFI/AGFI/NFI/CFI/IFI/TLI = .93 to .96, RMSEA = .05	No alternative model was tested; no criterion-related validity was examined
Yee et al. (2012)	645 World of Warcraft players	Online survey	Yee's Motivations for Play in Online Game Scale (38 items)	Three factors: achievement, social, and immersion	CFA: $\chi^2(51) = 140.88$, $p < .001$, CFI = .95, RMSEA = .05, SRMR = .04	Only players of a specific game were involved; no alternative model was tested; factor loadings were not reported
Zhang et al. (2013)	1,523 university gamers	Survey (in class)	Yee's Motivations for Play in Online Game Scale (37 items)	Three factors: achievement, social, and immersion	CFA: $\chi^2(648) = 5{,}976.32$, $\chi^2/df = 9.22$, NFI/CFI/IFI = = .94, RMSEA = .090	One-factor model was not tested and compared with the proposed models; criterion-related validity was examined only on weekly gaming time
Kahn et al. (2015)	18,819 Chevaliers' Romance 3 players	Online survey	Trojan Player Typology (15 items)	Six factors: socializers, completionists, competitors, escapists, story-driven, and smarty-pants	CFA: $\chi^2(75) = 8{,}478.58$, $p < .001$, $\chi^2/df = 113.05$, CFI = .93, RMSEA = .07, SRMR = .07	Only players of a specific game were involved; no alternative model was tested; three factors were assessed by two-item subscales; α of two subscales was smaller than .70

Note. df = degrees of freedom. GFI = goodness of fit index. AGFI = adjusted goodness of fit index. NFI = normed fit index. NNFI = non-normed fit index. CFI = comparative fit index. IFI = incremental fit index. TLI = Tucker–Lewis index. RMSEA = root mean square error of approximation. SRMR = standardised root mean square residual.

the 21-item Player Experience of Need Satisfaction (PENS; Ryan et al., 2006) were used to evaluate online game playing satisfaction. Participants rated responses on a 7-point scale, where 1 = *do not agree* to 7 = *strongly agree*. Higher scores indicated greater satisfaction of psychological needs. The internal consistency for in-game competence, in-game autonomy, and in-game relatedness in this study was αs = .93, .92, and .54, respectively.

IGD symptoms. The nine symptoms of IGD listed in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; APA, 2013) were used to evaluate participants' IGD severity. Participants were asked to indicate whether each of these symptoms could describe their own condition in the past 12 months (0 = no, 1 = yes). Internal consistency (KR-20; Kuder & Richardson, 1937) of these items was .82. A cutoff of 4 was suggested in Ko et al.'s (2014) study, which examined the diagnostic validity of the DSM-5 IGD items on a sample of Taiwanese young adults.

Internet gaming behaviors. Participants were asked to state how much time they spent on playing Internet games on a daily basis (i.e., gaming time; 1 = *less than an hour* to 6 = *eight hours or more*) and the primary game type (MMO games, single-player games, and others) in the previous 12 months.

Statistical analysis

We first conducted confirmatory factor analyses (CFA) for testing the MOGQ items with original seven-factor, one-factor, and second-order factor models using Mplus 7.4 (Muthén & Muthén, 1998–2015) with the robust weighted least squares estimation, which performs well for categorical indicators (e.g., Finney & DiStefano, 2013). An alternative bi-factor model was considered with a general factor subsuming all 27 MOGQ items and seven *uncorrelated* domain-specific factors, which explain the leftover associations among the items. Bi-factor modeling can separate the predictive powers of domain-specific factors to external criteria above and beyond the general factor (Chen, West, & Sousa, 2006; Reise, Moore, & Haviland, 2010). For example, a bi-factor model allows an investigation of whether a higher Social motive score predicts greater or fewer Internet addiction symptoms, assuming that the general gaming motivation stays unchanged.

The measurement models were evaluated using the likelihood ratio χ^2 test, the comparative fit index (CFI > .95 indicating adequate fit), Tucker–Lewis index (TLI > .95 indicating good fit), the root mean square error of approximation (RMSEA < .08 indicating acceptable fit; Hu & Bentler, 1999), and the weighted root mean square residuals (WRMR, with WRMR < 1.00 indicating good fit; Yu, 2002). We also tested whether the bi-factor model improved over a more parsimonious second-order factor model. To compare the bi-factor model and the correlated factor model, which are not nested, we selected the model with *smaller values* on the Akaike information criteria (AIC) and the Bayesian information criteria (BIC), under maximum likelihood estimation with numerical integration.

The reliability of each MOGQ factor was then computed. With a bi-factor model, we used coefficient omega hierarchical (ω_h; McDonald, 1999) to measure the reliability for the general factor, as ω_h uses structural equation modeling factor loadings and generally outperforms the commonly used coefficient alpha, which assumes a tau-equivalent measure (i.e., equal loadings in CFA; Zinbarg, Revelle, Yovel, & Li, 2005). In addition to Cronbach's alphas [*Cronbach's alpha makes the assumption of a tau-equivalent measure (i.e., equal loadings in CFA), and thus it is not a suitable measure of reliability for the MOGQ items. However, we still computed alphas for the total score and for the subscales to be compatible with other literature*], we reported coefficient omega (ω) for the reliabilities of the subscales, which reflects the stability of both the general and the specific factors in the items (Reise, 2012). We considered reliabilities above .80 to be good (Carmines & Zeller, 1979). To evaluate criterion validity, we also reported the variation of each MOGQ factor across demographic groups as well as its associations with gaming time and PENS subscale scores.

To achieve the second goal of this study, we used structural regression analyses to examine the variance explained in IGD total score by the MOGQ factors, and presented the profile of MOGQ factor scores for the groups with IGD scores <5 and ≥5. In addition, we compared the profiles of MOGQ factors across gender, age, employment status (binary: full-time/part-time vs. student), and primary game type (binary: single-player or multiplayer). As the latent factors do not have intrinsically meaningful units, the demographic differences were reported in standardized units, with either Cohen's *d* for binary covariates or R^2 for ordinal or continuous covariates.

Ethics

Participants completed an anonymous online survey using Qualtrics (www.qualtrics.com) after reading the study purpose and rights of participation and giving their informed consent to participate. The study procedures were carried out in accordance with the Declaration of Helsinki. Ethical approval was obtained from the University of Macau.

RESULTS

There were no missing data in the data set for the variables we analyzed; however, for primary game type ($n = 355$) we only compared participants who most frequently played single-player games with those who played multiplayer games, and for employment status ($n = 356$) we only compared participants who were employed full-time/part-time to students.

Factor structure of MOGQ

The model fit for the seven-factor CFA model was not satisfactory: $\chi^2(df = 303) = 1{,}433.93$, $p < .001$, RMSEA = .099, 90% confidence intervals (CI) [.094, .104], CFI = .934, TLI = .924, WRMR = 1.548. There was a Heywood case where the standardized loading for Item 21 was larger than 1.0, and large modification indices (MIs > 100) suggested that Item 21 might be loaded on multiple factors, indicating

Table 2. Model fit of the measurement models for MOGQ items

Model	*df*	χ^2	RMSEA	90% CI	CFI	TLI	WRMR	AIC	BIC
One-factor	324	3,567.1	.162	[.157, .166]	.811	.795	2.895	25,469	26,002
Seven-factor	303	1,433.9	.099	[.094, .104]	.934	.924	1.548	23,956	24,572
Original seven-factor with four error covariances	299	1,390.9	.098	[.092, .103]	.936	.925	1.517	23,946	24,578
Second-order CFA	317	1,529.6	.100	[.095, .105]	.929	.922	1.726	24,169	24,729
Bi-factor CFA	297	1,176.6	.088	[.083, .093]	.949	.939	1.444	23,883	24,522
Modified bi-factor CFA	297	1,106.9	.084	[.079, .090]	.953	.944	1.389	23,855	24,494

Note. *df* = degrees of freedom. CFI = comparative fit index. TLI = Tucker–Lewis index. RMSEA = root mean square error of approximation. WRMR = weighted root mean square residual. AIC = Akaike information criteria. BIC = Bayesian information criteria.

potential model misfit. Freeing four pairs of unique factor covariances, similar to what Demetrovics et al.'s (2011) did, only resulted in a modest improvement in fit, $\chi^2(df = 299) = 1{,}390.95$, $p < .001$, RMSEA = .098, 90% CI [.092, .103], CFI = .936, TLI = .925, WRMR = 1.517. An alternative bi-factor model was then fitted to the model, and the results indicated improved fit: $\chi^2(df = 297) = 1{,}176.64$, $p < .001$, RMSEA = .088, 90% CI [.083, .093], CFI = .949, TLI = .939, WRMR = 1.444. As shown in Table 2, both the AIC and the BIC indicated that the bi-factor model should be preferred over the seven-factor model (ΔAIC = −73 and ΔBIC = −50), and both models showed better fit than the one-factor model. In addition, the bi-factor model showed better fit than the second-order factor model, $\Delta\chi^2(df = 20) = 365.53$, $p < .001$, ΔAIC = −286.4, ΔBIC = −206.9. Therefore, we concluded that the bi-factor model fit the data best and named the general factor as *General Motivation*.

In the bi-factor model, for Coping factor, Item 18 (*because it helps me channel my aggression*) showed a negative loading with a standardized coefficient of −0.27, and modification indices suggested that it might load on multiple domain-specific factors (MIs = 23.91 on Skill Development and 28.63 on Recreation). In addition, modification indices suggested that Item 4 (*because gaming helps me get into a better mood*) was associated with the Recreation factor (MI = 89.57). [*To further investigate whether such modifications were reasonable, we rerun the model with a bi-factor exploratory factor analysis (EFA) in Mplus by allowing all cross-loadings* (χ^2 *[df = 163, n = 383] = 253.99, p < .001, RMSEA = .038, 90% CI [.029, .047], CFI = .995, WRMR = 0.391), and used target rotation to make the factor structure as close to the simple structure as possible. Results confirmed that Item 18 was not strongly associated with any specific factor (all standardized loadings have absolute values <.20), whereas Item 4 was associated with both Coping and Recreation (standardized loadings = .27 and .32, respectively). Similar results were found when we tried EFA with seven correlated factors with target rotation.*] Dropping the loading of Item 18 on Coping and adding the cross-loading of Item 4 on Recreation resulted in improved model fit with $\chi^2(df = 297) = 1{,}106.91$, $p < .001$, RMSEA = .084, 90% CI [.079, .090], CFI = .953, TLI = .944, WRMR = 1.389 (see Table 2). Considering the positive factor loading of and construct representation by each item, no item was further removed or cross-loaded. Comparing all measurement models, we chose the modified bi-factor model, with the fitted model parameters shown in Table 3.

Reliability

The result of the modified bi-factor model, $\omega_h = .92$ ($\alpha = .95$), 95% CI [.907, .934], indicated that 92% of the variance in the sum score of MOGQ attributed to the true score variance of the General Motivation factor. The specific factors only accounted for a small proportion of variance: 0.6% for Escape ($\omega = .90$, $\alpha = .84$), 0.3% for Coping ($\omega = .89$, $\alpha = .84$, excluding Item 18), 0.7% for Fantasy ($\omega = .92$, $\alpha = .88$), 0.8% for Skill Development ($\omega = .91$, $\alpha = .88$), 1.4% for Recreation ($\omega = .90$, $\alpha = .83$), 0.9% for Competition ($\omega = .93$, $\alpha = .89$), and 1.2% for Social ($\omega = .94$, $\alpha = .90$). Therefore, the scale showed strong unidimensionality in our sample, with good reliability for the General Motivation factor and for the subscale scores. Other descriptive statistics (e.g., means, standard deviation, and kurtosis) of the MOGQ factors are reported in Table 4.

Criterion-related validity

Building from the bi-factor measurement model, we examined the correlations and the corresponding 95% CIs of each of the eight MOGQ factors with the three subscale scores of PENS and gaming time (Table 4). In particular, General Motivation was strongly associated with all five PENS subscale scores, *r*s = .55 to .63, as well as gaming time, $r = .59$. On the other hand, the specific factors, which are independent to the general factor, showed generally mild to modest correlations with the PENS subscales and gaming time, with relatively larger positive correlations (i.e., $r > .20$) between Recreation and in-game autonomy ($r = .26$), Competition and in-game competence ($r = .29$), Social and in-game relatedness ($r = .43$), and Social and in-game competence ($r = .20$). Gaming time was positively related to Social motive ($r = .22$), above and beyond its association with General Motivation.

Associations with IGD symptoms

A structural regression was conducted with the Rasch score of IGD symptoms regressed on the eight MOGQ factors. [*A Rasch model fit the IGD items well,* χ^2 *(df = 35, n = 383) = 60.61, p = .005, RMSEA = .044, 90% CI [.024, .062], CFI = .981, WRMR = 1.087.*] One advantage of the bi-factor model is that the general factor and the seven specific factors are all orthogonal, eliminating the issue of multicollinearity. Unsurprisingly, General Motivation was the largest predictor of IGD symptoms, β (standardized path coefficient) = .45,

Table 3. Standardized factor loadings for the bi-factor model

	General		Escape		Coping		Fantasy		Skill Development		Recreation		Competition		Social	
Item	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
2	.73	.03	.19	.05												
9	.73	.03	.50	.06												
16	.65	.03	.64	.08												
23	.80	.02	.12	.04												
4	.65	.03			.29	.05					.30	.04				
11	.78	.02			.45	.05										
18	.78	.02														
25	.79	.02			.41	.05										
6	.69	.03					.25	.05								
13	.76	.03					.50	.04								
20	.77	.03					.49	.04								
27	.77	.02					.39	.04								
5	.68	.03							.45	.04						
12	.72	.03							.46	.04						
19	.75	.02							.36	.04						
26	.72	.03							.54	.04						
7	.33	.05									.73	.04				
14	.45	.04									.81	.03				
21	.67	.03									.54	.03				
3	.68	.03											.48	.04		
10	.66	.03											.55	.03		
17	.82	.02											.30	.03		
24	.75	.03											.54	.03		
1	.61	.04													.70	.03
8	.70	.03													.57	.03
15	.75	.03													.52	.03
22	.71	.03													.38	.03

Note. $p < .01$ for all coefficients.

Table 4. Correlations of MOGQ factors with gaming time and PENS factors

MOGQ Factor	*M* (*SD*)	Skewness (kurtosis)	Gaming time	Autonomy	Competence	Relatedness
General Motivation	2.61	0.29	.59**	.63**	.62**	.55**
	(0.84)	(−0.49)	[.5, .67]	[.54, .70]	[.54, .69]	[.45, .63]
Escape	2.46	0.53	.03	−.10	−.04	−.13
	(1.02)	(−0.45)	[−.11, .16]	[−.21, .04]	[−.16, .08]	[−.27, .00]
Coping	3.08	−0.09	−.14*	.11	−.01	−.01
	(1.08)	(−0.89)	[−.28, −.01]	[−.02, .23]	[−.13, .11]	[−.16, .13]
Fantasy	2.35	0.58	−.03	.17*	.10	.00
	(1.17)	(−0.79)	[−.18, .13]	[.00, .32]	[−.03, .25]	[−.15, .16]
Skill Development	2.45	0.37	−.04	.01	.09	.08
	(1.06)	(−0.68)	[−.18, .09]	[−.12, .16]	[−.03, .21]	[−.04, .22]
Recreation	3.69	−0.67	.09	.26**	.14**	−.04
	(0.94)	(−0.13)	[−.02, .21]	[.18, .35]	[.05, .24]	[−.14, .07]
Competition	2.34	0.45	.03	.00	.29**	−.04
	(1.11)	(−0.83)	[−.12, .17]	[−.14, .12]	[.17, .42]	[−.16, .09]
Social	2.19	0.58	.22**	.10*	.20**	.43**
	(1.14)	(−0.69)	[.10, .33]	[.00, .20]	[.11, .31]	[.33, .52]

Note. Item 4 was included in both the Coping and the Recreation subscale; Item 18 was excluded from the Coping scale. The numbers in square brackets are 95% confidence intervals obtained using bootstrapping with 2,000 bootstrap samples.
$^*p < .05$. $^{**}p < .01$.

95% CI [.36, .55], followed by Escape, $\beta = .30$, 95% CI [.18, .42], and a negative coefficient on Skill Development, $\beta = -.26$, 95% CI [−.40, −.14] ($ps < .001$). All other specific factors had $|\beta|s < .10$ ($ps > .10$), and together the eight MOGQ factors explained 37.6% of the variance (95% CI = [23%, .47%]) of IGD symptoms. The results were similar when we adjusted for age and gender ($\beta s = .43$, .33, and −.27 for General Motivation, Escape, and Skill Development,

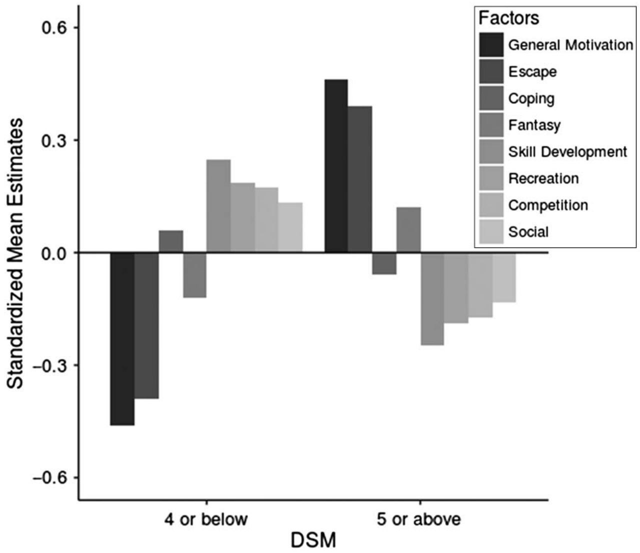

Figure 1. The standardized mean estimates of the eight MOGQ latent factors for participants with DSM score above and below the cutoff. For identification purposes, the sum of each pair of means is constrained to be zero, with the pooled standard deviation equal to one, so that the differences between the two groups can be interpreted as Cohen's d effect size

respectively, $ps < .001$; $|\beta|s < .10$ for all other factors, $ps > .10$). The MOGQ factor profiles for the group scoring 5 or above on IGD symptoms ($n = 64$) and those scoring 4 or below ($n = 319$) are shown in Figure 1.

Profiles of MOGQ across background groups

Likelihood ratio tests were performed to assess any demographic differences. To account for the fact that there are multiple MOGQ factors, the significance level was set to .01. Males scored significantly higher on General Motivation (Cohen's $d = 0.95$) but lower on Escape ($d = 0.62$). Age was positively related to Escape ($r = .19$), Fantasy ($r = .14$), and Skill Development ($r = .19$), but negatively related to General Motivation ($r = -.25$). [There was an outlier with age = 82 that exerted big impact on the correlations. The correlations for age reported were based on data excluding that participant.] Students were found to have higher General Motivation ($d = 0.42$) than employed participants. Those who primarily played single-player games had a higher score on Coping ($d = 0.53$) but a lower score on Competition ($d = 0.57$), Social ($d = 1.28$), and General Motivation ($d = 1.00$) than those who primarily played MMO games.

DISCUSSION AND CONCLUSIONS

In our Chinese gamer sample, CFA results showed that the bi-factor model with seven subfactors was superior to the original seven-factor, one-factor, and second-order factor models. Our bi-factor model suggests that an overall impetus for gaming (General Motivation) exists (explained 92% of the variance in C-MOGQ), while there are seven domain-specific factors captured seven qualitatively distinct gaming motives. These specific gaming motives showed differential associations with psychological need satisfaction and time spent gaming. In addition to General Motivation, Escape motive and Skill Development motive had significant incremental values in predicting IGD symptoms.

The bi-factor model allows estimation of a general dimension of gaming motivation that underlies all MOGQ items while also considering the multidimensionality of gaming motives, which is consistent with various motivation theories such as SDT (Ryan & Deci, 2000b). The bi-factor model highlights the commonality of all items (i.e., gaming motivation) instead of conceptualizing the items as distinct constructs. This general factor of motivation is theoretically consistent (Ryan, 1995) and empirically supported in previous motivation literature in various domains (e.g., Batey, Booth, Furnham, & Lipman, 2011; Gunnell & Gaudreau, 2015; Howard, Gagné, Morin, & Forest, 2016; Law, Shek, & Ma, 2011). The bi-factor model has been applied to understand the general and specific motives for physical activity (Gunnell & Gaudreau, 2015) and work (Howard et al., 2016). Although most of the previous research on gaming motives (Kuss, Louws, & Wiers, 2012; Yee, 2006a, 2006b) has not examined General Motivation, Demetrovics et al. (2011) observed a high correlation between the seven subfactors in the correlated factor model of MOGQ, indicating a potential general factor of gaming motivation assessed by MOGQ.

Despite the better fit of the bi-factor model of MOGQ over the seven-factor model with the Chinese data, two modifications regarding the Coping motive and its indicators would further improve the overall model fit. First, Item 18 (*because it helps me channel my aggression*), which originally was an indicator of Coping motive, was removed from that factor based on the results. Chinese gamers also seemed less likely to consider the coping effect of online gaming on their aggressive impulses – only 13% of our participants indicated that they played online games mostly to channel their aggression. Second, another indicator of Coping motive – Item 4 (*because gaming helps me get into a better mood*) – was found to load on both Coping and Recreation in this Chinese sample. So, this item reflected the gaming motive for not only coping with negative moods but also for more positive moods.

Chinese gamers were found to be driven to gaming (in terms of General Motivation) to satisfy their psychological needs. This positive relationship is anticipated by SDT, which postulates that need satisfaction provides energy and the direction in which to spend the energy (Deci & Ryan, 2011). Moreover, we found that satisfaction of a psychological need reinforces a particular type of gaming motive. For example, the strongest association found between in-game relatedness and Social motive suggested that those gamers who experienced high in-game relatedness would be guided by such satisfaction and strive for further building of relationships via gaming (i.e., Social motive). As hypothesized, in-game competence also showed high positive correlations with Competition motive. These findings support not only the criterion-related validity of C-MOGQ, but also the importance of psychological needs and related experience to gaming intention and persistence.,

Time spent gaming was also highly and positively associated with General Motivation assessed by C-MOGQ.

As shown in previous studies (Hu & Yang, 2012; Kuss et al., 2012), gamers with high motivation to play online games were more likely to spend more time on gaming. Moreover, we observed that Social motive, in addition to General Motivation, drove participants to spend longer periods of time daily on online gaming. This finding reflects the increasing importance of the social function of online gaming, particularly via mobile devices. Significant differences with respect to game type preferences were also shown. MMO game players reported higher gaming motivation in general, as well as Competition and Social motivation, but lower Coping motivation. Our results suggested that C-MOGQ relates to gaming behaviors, which is evidence for the validity of C-MOGQ from another perspective.

The General Motivation factor and other specific C-MOGQ motives explained 37.6% variance of IGD symptoms among Chinese online gamers. Király et al. (2015) similarly found all MOGQ motives positively correlated with problematic gaming but some motives such as Fantasy and Coping motives were non-significant predictors of problematic gaming when psychiatric symptoms were considered. Our results particularly showed that Escape and Skill Development motives had significant but opposite influences on IGD, after controlling for General Motivation. Consistent with other studies on MMO player samples (Billieux et al., 2011; Kuss et al., 2012; Li, Liau, & Khoo, 2011), our participants with higher desire to escape from real-life problems via online gaming reported more IGD symptoms (and were more likely to be classified as probable IGD). Escape was also a primary gaming motive commonly reported by addicts in previous qualitative studies (Allison, von Wahlde, Shockley, & Gabbard, 2006; Griffiths, 2010; Wan & Chiou, 2006), particularly via online role-playing environments that allow one to obtain and build new identities (Allison et al., 2006). Future intervention programs may involve identifying Chinese problem gamers' real-life problems and empowering them with adaptive strategies to deal with those problems. On the other hand, our findings showed that Skill Development motive was a potential protective factor against IGD. Online games may offer players perceptual and cognitive benefits, including improvement in attention and coordination skills (Green & Bavelion, 2003, 2006). Our findings suggest that gamers who play online games to improve these skills are not particularly vulnerable to IGD and thus lessen the concern for addictive potential of those online games designed for training or therapeutic purposes.

There are a few limitations in this study. First, we used a cross-sectional design for data collection, which does not allow for examination of test–retest reliability of C-MOGQ or strong inference concerning causal relationships between C-MOGQ scores, in-game need satisfaction, and IGD symptoms. Also, convenience sampling potentially limited the generalizability of our findings, and a replication study is preferred. Despite a satisfactory reliability reported by Chiang and Lin (2010), the internal consistency of the in-game relatedness scale was low in this study. It might result in an underestimation of related correlation results (e.g., Hunter & Schmidt, 2004), and hence results should be interpreted with caution.

This study provided evidence for C-MOGQ as a reliable and valid tool to measure Chinese gamers' overall and specific motives for online gaming. Based on the bi-factor model, we recommend the use of the whole C-MOGQ scale with consideration of both the total score and the subscale scores, rather than relying on only one or some subscales in future studies. Our findings may also help health professionals identify at-risk groups such as gamers with high gaming motivation (particularly coupled with high escapism), and facilitate their research efforts in targeting such motives and related concepts in prevention programs for IGD in Chinese communities.

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Authors' contribution: AMSW was the principal investigator of the project. She was responsible for the research conception and design, supervision, data interpretation, and manuscript writing. MHCL conducted the data analysis, interpreted the findings, and was involved in manuscript writing. SY was involved in literature search, project implementation, and manuscript preparation. JTFL participated in research conception and manuscript preparation. M-wL was involved in literature review and project implementation. All authors contributed to and approved the final manuscript.

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