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ORIGINAL PAPER

Validation of the Revised Inventory of Gambling Motives, Attitudes, and Behaviours (GMAB-R) Among Chinese University Students

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Abstract The Inventory of Gambling Motives, Attitudes, and Behaviours (GMAB) has been shown to be a valid and reliable tool for measuring gambling cognitions and behaviors among both adult and adolescent gamblers. The present study aimed to validate its revised version (GMAB-R) with a sample of 427 university students in the Macao Special Administrative Region, China. The GMAB-R consists of six factors in the motivational domain, four in the attitudinal domain, and six in the behavioral domain. Our findings suggest that, after minor refinements, the psychometric properties of the GMAB-R remain satisfactory, and the inventory can be used among university students. The subscales in the attitudinal domain were found to be applicable to nongamblers as well. The GMAB-R can be used to facilitate future research in understanding emerging youth gambling and student gambling problems, as well as in prevention efforts.

Keywords GMAB, Scale validation, Chinese, Gambling, Motives, Attitudes, Behaviors

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Introduction

The Inventory of Gambling Motives, Attitudes, and Behaviours (GMAB) was designed to promote a greater understanding of gambling activities and cognitions among Chinese people, as well as to identify factors underlying three important domains of Chinese gambling: motives, attitudes, and behaviors (Tao et al. 2011). The GMAB was the first indigenously developed inventory to assess these three specific domains among Chinese gamblers, and the subscales of each domain were empirically constructed. The revised version of the measure, the GMAB-R, was developed based on standard validation procedures with a representative sample of Chinese adult gamblers (Wu et al. 2012). The GMAB-R has distinctive advantages in assessing Chinese gambling because it was developed indigenously and includes Chinese-specific gambling motives (e.g., learning), attitudes (e.g., fate and luck), and behaviors (e.g., superstitious behaviors). However, its applicability to university students, who are highly involved in gambling (Blinn-Pike et al. 2007; King et al. 2010), has yet to be tested. Identifying gambling motives, attitudes, and behaviors among university students is important with respect not only to gaining a greater understanding of the early stages of gambling and its impacts (Marmurek et al. 2014) but also to facilitating the development of preventive and treatment strategies (e.g., Dickson et al 2008).

University students are likely to be involved in gambling (Blinn-Pike et al. 2007; Ellenbogen et al. 2008; Huang et al. 2007; King et al., 2010). A study conducted in the United States with a representative sample reported that 75% of the university students participated in gambling between 2006 and 2007 (Barnes et al. 2010). University students are not only involved in gambling but also vulnerable to the harmful impacts of gambling (Derevensky and Gupta 2000; Dickerson and O'Connor 2006; Gupta and Derevensky 2000). The Hong Kong Caritas Addicted Gamblers Counseling Centre (2014) reported that more than half of the gamblers who received counseling services from 2003 to 2014 began gambling between the ages of 16 and 25. University students are especially at risk; they are more vulnerable to gambling problems than not only adults but also adolescents (Blinn-Pike et al. 2007).

The reasons for the greater vulnerability of young adult gamblers are not completely known. For example, some researchers have conjectured that young gamblers' vulnerability is due to cognitive factors (Griffiths 1990), such as the illusion of control that gambling has been suggested to bring them (Moore & Ohtsuka 1997), while others have argued that cognitive factors alone may be unable to account for gambling behaviors among university students. Lam and Ozorio's (2014) research demonstrated that gambling-related behaviors were not related to an illusion of control among students, and Williams, Connolly, Wood, and Nowatzki (2006) found that improved knowledge of the mathematics of gambling did not change gambling behaviors among university students. More research is warranted to gain a better understanding of university students' attraction to gambling (i.e., motives), perceptions of gambling (i.e., attitudes), and actions and feelings during gambling (i.e., behaviors) in a given cultural context.

Gambling Motives, Attitudes, and Behaviors

Motivation is considered to be the fundamental drive that impels people to engage in a specific behavior, such as gambling, even though primary motives to gamble may vary

highly across individuals. Along these lines, Tao et al. (2011) considered motivational factors as proximal factors for the instigation and maintenance of gambling behaviors. For instance, mood fluctuations were suggested to be a proximal motive for gambling among young adults (Goldstein et al. 2014), while winning money, enjoyment, social pleasures, excitement, and simply desiring something to do were identified as major motives for gambling among university students (Neighbors et al. 2002). In regard to the GMAB-R, Wu et al. (2012) identified six motivational factors (i.e., self-worth, monetary gain, sensation seeking, boredom alleviation, learning, and socialization) among Chinese adult gamblers. Given that gambling motives vary according to gender and age (Clarke 2004, 2008; Clarke et al. 2007; Stewart et al. 2008; Wu and Tang, 2011), these factors should be further empirically tested among Chinese university students, whose adulthood is still emerging.

According to the reasoned action approach (Fishbein and Ajzen 2010), attitudes are salient factors in explaining and predicting behavior. Previous research has also found gambling attitudes to be key predictors of gambling behaviors and problem gambling among students (Williams et al. 2006). However, gambling attitudes may be conceptualized differently by researchers, and different types of attitudes have been assessed in previous studies. For instance, Derevensky, Sklar, Gupta, and Messerlian (2010) surveyed 1,147 young people, and their findings showed that gambling advertisements enhanced attitudes towards gambling, because the young people were convinced that gambling presented an easy way to become wealthy. On the other hand, Gainsbury, Russell, and Blaszczynski (2014) found that when university students expressed negative attitudes toward gambling, they were less likely to engage in problem gambling behaviors. In evaluating the attitudinal aspect of gambling among Chinese adult gamblers, Wu et al. (2012) empirically found four factors in the GMAB-R: negative gambling consequences, technique, superstition, and fate and luck. Given that the GMAB-R assesses multiple types of gambling attitudes and some of them are significant correlates of problem gambling, the GMAB-R could be a useful tool for understanding the attitudinal characteristics of university-student gamblers or identifying potential problem gamblers among university students.

It is universally understood that people vary in their behavioral patterns; for example, regarding gambling, some people bet large, whereas some consistently place small bets. *The Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; American Psychiatric Association [APA] 2013) stipulates that certain behavioral patterns are symptoms of a gambling disorder, including lack of impulse control (Cheung 2014). Although Gupta and Derevensky (1998) found an association between youth problem gambling and illegal activities among 817 adolescent high school students, the "illegal act" criterion has been removed from the diagnostic criteria for gambling disorder (APA 2013). Gambling-related behaviors among Chinese university students were also found to negatively correlate to digit ratio (Lam and Ozorio 2014). Based on empirical tests (Tao et al. 2011; Wu et al. 2012), five factors of gambling behaviors were found among Chinese gamblers, namely impaired control (e.g., gambling despite adverse consequences), gambling involvement (e.g., high frequency or large bet size), arousal reaction (e.g., arousal shown while winning or losing), superstitious behavior (e.g., wearing charms or performing some rituals), and controlled gambling (limiting the amount of money and time spent). Wu et al. (2012) suggested that the behavioral scale of the GMAB-R may be useful in classifying gambler types. Given legal restrictions (e.g., individuals below the age of 21 years are forbidden to enter casinos

in Macao) and age-related preferences (e.g., social gaming), it is warranted to evaluate whether the behavioral scale of the GMAB-R is a valid tool in understanding university students' gambling behaviors.

Gambling in Macao

As the only city in China that operates casinos legally, Macao has 35 casinos and other gambling facilities, such as horse racing, *pacapio* lottery, and greyhound racing, all within an area of only 30.3 km^2 (Macau Statistics and Census Services 2015). The gross revenue from gambling (US$33 billion) ranked first in the world, and in 2013 the industry employed more than 15% of the working population (Macau Statistics and Census Services 2015). According to Wu, Lai, and Tong (2014), the prevalence of gambling disorders in Macao is approximately 2.1% among adults. They found that being male and having a low level of education—but not age—were associated with gambling-disorder symptoms.

The total population in Macao was 636,200 in 2014 (Census and Statistics Bureau 2015), while the university enrollment in 2012–2013 was 29,521 (Tertiary Education Services Office of the Government of the Macao SAR 2014). It should be noted that although citizens must be at least 21 years of age to enter a casino, younger people can still engage in other forms of gambling, such as mahjong. Given the high accessibility of gambling and local gambling culture in Macao for university students, Macao is an ideal location to evaluate university students' gambling motives, attitudes, and behaviors. Unfortunately, there is limited research in this area, probably due to lack of a validated instrument.

We hope that our study will assist future researchers in further investigations in the area of gambling in the Chinese student population. Although previous studies have consistently demonstrated that the GMAB-R has good psychometric properties among Chinese adult gamblers (Wu et al. 2012, 2013), its validity and applicability among university students is unknown, and hence a validation study is needed. In this study, we evaluated the psychometric properties of the GMAB-R with a university-student sample.

Method

Participants and Procedures

A total of 427 Chinese undergraduate students, aged 17 to 24 years ($M = 19.04$, $SD = 1.10$), were recruited to participate in the study. Among the 427 participants, 241 were female and 186 were male. The majority of the sample were first-year students (78.0%; $n = 333$), while 17.3% ($n = 74$) were second year, 2.3% ($n = 10$) were third year, and 2.3% ($n = 10$) were fourth year. Of the sample, 216 participants (50.7%) indicated they had gambling experiences, and these were categorized as gamblers. Among the gamblers, 110 (50.9%) were male and 106 (49.1%) were female, with ages ranging from 17 to 24 years ($M = 19.13$, $SD = 1.12$). Among the 216 gamblers, 66.7% ($n = 144$) were local Chinese and 33.3% ($n = 72$) were nonlocal Chinese. Among the entire sample, a total of 41 students (9.8%) were at or above the legal age for gambling (21 years old). Among the 216 identified gamblers, 22 (10.2%) were at or above the legal age for gambling. Types of gambling that were most commonly reported by participants were mahjong (56.2%) and poker (34.7%). The participants were recruited via a participant pool in the psychology department of a public university in Macao. Approval of the procedures and measures for this study was obtained from the participant-pool ethics committee. Participants were

given rights of withdrawal and gave their written consent prior to participating. All participants took part voluntarily to gain course credit for the psychology course in which they were enrolled.

Instruments

The GMAB-R

There are six motive subscales (25 items), four attitude subscales (20 items), and five behavior subscales (18 items). The motive and attitude items are rated and scored on a 5-point Likert scale, ranging from 1 (*strongly agree*) to 5 (*strongly disagree*). The items in the behavior subscales are rated and scored on 4-point Likert scale, from 1 (*never*) to 4 (*always*). The reliability of the GMAB-R from previous research ranged from .66 to .84 for the motivational domain, from .53 to .80 for the attitudinal domain, and from .46 to .76 for the behavioral domain. Associations for each subscale with gambling urge and gambling problem were tested to demonstrate the validity of the GMAB-R (Wu et al. 2012).

The South Oaks Gambling Screen

The 20-item South Oaks Gambling Screen (SOGS; Lesieur and Blume 1987) was used to assess the extent of disordered gambling among participants with gambling experience. Good reliability and validity has been shown in another Chinese university-student sample (Tang and Wu 2009). Participants who reported having gambled in the past were asked to provide either yes (1) or no (0) responses to each item. After recoding, a higher total score represents a more severe gambling problem. Cronbach's α of the SOGS in the current study is .729. In the current study, there were 25 students who scored 5 or above on the SOGS, which accounted for 12.7% of the valid cases among the gamblers.

The Gambling Urge Scale

The Gambling Urge Scale (GUS; Raylu and Oei 2004) was used to assess the strength of participants' impulse to gamble (e.g., "I want to gamble so bad that I can almost feel it"). The GUS includes six items and is rated and scored using a 7-point Likert scale, from 0 (*strongly disagree*) to 6 (*strongly agree*). Cronbach's α of the GUS in the current study is .976. The GUS was administered to both gamblers and nongamblers in our sample, as the GUS score was thought to be related to the attitude scale of the GMAB-R.

Demographics

Participants were asked to provide demographic information, including gender, study year, age, and birthplace. Participants with gambling experiences were also asked to provide information on the types of games in which they participated.

Results

Confirmatory Factor Analysis (CFA)

To conduct the CFA, we used Amos 22. We considered a model acceptable and preferable if (a) the comparative fit index (CFI) was greater than .90 (Bentler 1992), (b) the root-mean-

Table 1 Factor Loadings of the Items in the GMAB-R Motivational Domain Based on the Gamblers

Motives	α	Factor loading (O)	Factor loading (M)
Factor 1 (M-SW) Self-Worth	.774		
Proving expertise		.561	.518
Actualizing ambition		.546	.513
Utilizing ability		.606	.599
Learning more to work at casino		.556	.556
Being recognized and admired while winning		.669	.633
Being oneself		.723	.678
Factor 2 (M-MG) Monetary Gains	.754		
Winning money for expenses		.685	.680
Chasing money		.748	.738
Money to buy things		.628	.638
Large jackpot		.579	.581
Factor 3 (M-SS) Sensation Seeking	.863		
Feeling excited		.632	.641
Feeling happy		.671	.675
More fun than other activities		.836	.851
Excitement seeking		.827	.829
Reducing pressure		.691	.658
Enjoying the process of decision-making		.677	.642
Factor 4 (M-BA) Boredom Alleviation	.793		
Passing time		.804	.805
Boredom relief		.702	.701
Relaxation		.727	.726
Factor 5 (M-L) Learning	.692		
Widening experience and horizon		.662	.657
Learning different games		.500	.500
Learning more		.795	.800
Factor 6 (M-S) Socialization	.752		
Meeting friends		.894	.926
Being with friends		.959	.923
Playing with relatives/friends in holidays		.401	.448

Note. O = original model without modification; M = modified model with added covariances

square error of approximation (RMSEA) was less than .08 (Browne and Cudeck 1993), and (c) the value of χ^2/df was less than 2 (Byrne 1991). A factor indicator was accepted if the factor loading was greater than .30 (Hair et al. 2010).

Factor Structure of Motivational Domain

The model for the motives was first examined. For gamblers, the original model without any postulated covariance was tested with CFA, using Amos 22, with $\chi^2/df = 2.14$, CFI = .863, RMSEA = .073. The CFA result showed a marginally acceptable model fit. Based on the suggestions in the modification indices, five unique factor covariances were released (i.e., "providing expertise" with "actualizing ambition," "being recognized and admired while winning" with "being oneself," "winning money for expenses" with "large jackpot," "reducing pressure" with "enjoying the process of decision-making," and "meeting friends"

Table 2 Factor Loadings of the Items in the Original GMAB-R Attitudinal Domain Based on the Gamblers

Attitudes	α	Factor loading (O)	Factor loading (M)
Factor 1 (A-NCG) Negative Consequences of Gambling	.774		
Negative impacts on family		.581	.601
Less communication with family		.426	.458
Losing temper		.407	.428
Prohibition among adolescents		.495	.495
Negative impacts of gambling		.740	.775
Gambling addiction is throwing money away		.796	.730
The casino (i.e. house) has advantage over players		.675	.596
Factor 2 (A-T) Techniques	.859		
Skills		.606	.605
Experience		.794	.794
Investigation		.851	.852
Good instinct		.600	.601
Outcomes depends on skills		.740	.739
Intelligence		.655	.654
Factor 3 (A-S) Superstition	.810		
Specific location		.635	.637
Special numbers, colors or clothing		.722	.714
Lucky days		.745	.745
Divine blessing		.791	.797
Factor 4 (A-FL) Fate and Luck	.452		
Chance		.395	.373
Luck		.365	
Fate		.614	682

Note. O = original model without modification; M = modified model with added covariances. The inter-item correlation for Factor 4 fate and luck after the deletion of A-FL-2 is .398.

with "playing with relatives/friends in holidays"). The resulting model was satisfactory, with $\chi^2/df = 1.827$, CFI = .903, RMSEA = .062. All factor loadings are reported in Table 1.

Factor Structure of Attitudinal Domain

For gamblers, the original four-factor attitudes model was tested, with $\chi^2/df = 2.355$, CFI = .851, RMSEA = .079. After consulting the modification indices, we removed the item "luck" in the factor of fate and luck and added one covariance between the items: "gambling addiction is throwing money away" and "the casino has advantage over players." The modified model was found to be satisfactory, with $\chi^2/df = 1.976$, CFI = .900, RMSEA = .067. Factor loadings and reliability are reported in Table 2.

We also tested whether we could apply the gambler attitude model to nongamblers. The model was found to be marginal, with $\chi^2/df = 2.509$, CFI = .833, RMSEA = .085. The item "less communication with family" was removed from the factor of negative consequences of gambling, due to low factor loading. Four unique covariances were released following the modification indices (i.e., "gambling addiction is throwing money away" with "the casino has advantage over players," "skills" with "experience," "skills" with "intelligence," and "outcomes depend on skills" with "intelligence"). The resulting model was satisfactory, with $\chi^2/df = 2.099$, CFI = .900, RMSEA = .073. The factor loadings of the modified model are reported in Table 3.

Table 3 Factor Loadings of the Items in the Original GMAB-R Attitudinal Domain Based on the Nongamblers

Attitudes	α	Factor loading (O)	Factor loading (M)
Factor 1 (A-NCG) Negative Consequences of Gambling	.787		
Negative impacts on family		.628	.621
Less communication with family		.329	
Losing temper		.565	.567
Prohibition among adolescents		.568	.572
Negative impacts of gambling		.729	.746
Gambling addiction is throwing money away		.725	.692
The casino (i.e. house) has advantage over players		.698	.676
Factor 2 (A-T) Techniques	.863		
Skills		.641	.637
Experience		.812	.844
Investigation		.856	.872
Good instinct		.661	.648
Outcomes depends on skills		.674	.644
Intelligence		.646	.578
Factor 3 (A-S) Superstition	.769		
Specific location		.592	.587
Special numbers, colors or clothing		.772	.767
Lucky days		.625	.636
Divine blessing		.714	.714
Factor 4 (A-FL) Fate and Luck	.428		
Chance		.477	.406
Luck		.442	
Fate		.450	.515

Note. O = original model without modification; M = modified model with added covariances. The Cronbach's alpha for Factor 1 negative consequences of gambling after the deletion of A-NCG-2 is .806. The inter-item correlation for Factor 4 fate and luck after the deletion of A-FL-2 is .338.

Factor Structure of Behavioral Domain

Based on the modification indices, we released three unique factor covariances (i.e., "having deteriorating relationship with family" with "gambling till the last dollar is gone," "borrowing money" with "persistence after winning," and "gambling till the last dollar is gone" with "chasing when you lose") and deleted two items, namely "gamble regularly" and "gamble when happy." The goodness-of-fit modified model was satisfactory, with $\chi^2/df = 1.879$, CFI = .910, RMSEA = .064. Factor loadings are reported in Table 4. For gamblers, the original five-factor behavior model was tested with CFA, with $\chi^2/df = 2.366$, CFI = .842, RMSEA = .080. The result showed a marginally acceptable goodness of fit.

The resultant GMAB-R item pool for university students contains six motive subscales, four subscales for gamblers and four for nongamblers in the attitudinal domain, and five behavior subscales. The motivational domain comprises self-worth, with four items; monetary gains, with four items; sensation seeking, with six items; boredom alleviation, with three items; learning, with three items; and socialization, with three items. The four subscales for gamblers in the attitudinal domain are fate and luck, with two items; negative consequences of gambling, with seven items; techniques, with six items; and superstition, with four items. The four attitude

Table 4 Factor Loadings of the Items in the Original GMAB-R Behavioural Domain Based on the Gamblers

Behaviors	α	Factor loading (O)	Factor loading (M)
Factor 1 (B-IC) Impaired Control	.670		
Having deteriorating relationship with family		.519	.489
Gambling till the last dollar is gone		.451	.376
Borrowing money		.670	.639
Chasing when you lose		.548	.477
Persistence after winning		.589	.556
Factor 2 (B-GI) Gambling Involvement	.753		
Gambles always		.440	.464
Gambles regularly		.560	
Gambles with a great deal of money		.567	.552
Gambles when happy		.600	
Playing various games		.665	.666
Spending less tie with friends		.735	.744
Factor 3 (B-AR) Arousal Reaction	.666		
Vigorous reaction when winning		.853	.855
Vigorous reaction when losing		.589	.588
Factor 4 (B-SB) Superstitious Behaviors	.554		
Collecting charms		.538	.531
Special behavioral rituals		.523	.527
Investigation for winning		.606	.612
Factor 5 (B-CG) Controlled Gambling	.592		
Small bet size		.538	.537
Having control over the bet size and time spent		.787	.789

Note. O = original model without modification; M = modified model with added covariances. The Cronbach's alpha for Factor 2 gambling involvement after the deletion of B-GI-2 and B-GI-4 is .678.

subscales for nongamblers are fate and luck, with two items; negative consequences of gambling, with six items; techniques, with six items; and superstition, with four items. The five behavior subscales are impaired control, with five items; gambling involvement, with four items; arousal reaction, with two items; superstitious behavior, with three items; and controlled gambling, with two items.

Reliability After Modification

We tested the internal consistency of each subscale in the final model using SPSS 22. For both gamblers and nongamblers, the scales showed good to excellent internal consistency. For gamblers, the motives subscales showed αs ranging from .692 to .863, and the attitude subscales (i.e., negative consequences of gambling, techniques, and superstition) all showed good internal consistency, with αs from .774 to .859. The interitem correlation of the two-item attitude subscale, fate and luck, was .398. In the behavioral domain, impaired control, gambling involvement, and arousal reaction displayed good internal consistency, with αs ranging from .666 to .753; however, the subscales for superstitious behaviors and controlled gambling exhibited relatively low internal consistencies, with αs of .554 and .592, respectively. For nongamblers, most attitude subscales (negative consequences of gambling, techniques, and superstition) showed good internal consistency (αs from .769 to .863), while

Table 5 Correlation Matrix for All the Variables of the Gamblers Sample (N = 216)

Var.	G	Y	A	BP	M-SW	M-MG	M-SS	M-BA	M-L	M-S	A-NGC	A-T	A-S	A-FL	B-IC	B-AR	B-SB	B-CG	B-GI	GUS
Y	.092	—																		
A	.040	.511**	—																	
BP	.082	.124	.083	—																
M-SW	−.257**	.017	.012	.007	—															
M-MG	−.314**	.008	.018	−.054	.743**	—														
M-SS	−.207**	−.063	−.072	.142	.607**	.553**	—													
M-BA	−.021	.006	−.037	.039	.431**	.409**	.564**	—												
M-L	−.126	−.018	−.128	−.010	.514**	.346**	.505**	.521**	—											
M-S	−.059	−.081	−.075	−.093	.411**	.317**	.480**	.603**	.369**	—										
A-NGC	.005	−.005	−.113	−.062	−.177*	−.125	−.075	.077	.041	−.154*	—									
A-T	−.139*	−.101	−.091	.112	.331**	.322**	.378**	.184*	.301**	.233**	−.047	—								
A-S	.055	−.074	−.069	.021	.306**	.322**	.291**	.252**	.196**	.280**	−.207**	.539**	—							
A-FL	.059	−.096	−.046	−.180**	.123	.218**	.138	.302**	.208**	.203**	.207**	.244**	.368**	—						
B-IC	−.120	−.037	−.054	−.008	.453**	.454**	.479**	.271**	.299**	.304**	−.061	.240**	.223**	.154*	—					
B-AR	−.017	−.035	−.091	−.210**	.274**	.366**	.280**	.227**	.237**	.210**	.007	.180*	.197**	.294**	.443**	—				
B-SB	−.160*	.078	.009	−.037	.507**	.485**	.405**	.214**	.251**	.232**	−.159*	.198**	.231**	.058	.613**	.347**	—			
B-CG	.077	.047	.038	.037	.004	.056	.156*	.138	.199**	.177*	.080	.139	.044	.084	.298**	.373**	.043	—		
B-GI	−.165*	.023	−.004	−.019	.476**	.421**	.419**	.209**	.230**	.183*	−.150*	.210**	.216**	.139	.727**	.382**	.627**	.206**	—	
GUS	−.169*	.009	.016	.000	.437**	.393**	.299**	.183*	.077	.224**	−.189**	.188**	.238**	.084	.336**	.058	.326**	−.110	.372**	—
SOGS	−.348**	−.122	−.032	−.028	.249**	.348**	.339**	.213**	.099	.140	.000	.052	.130	.133	.446**	.248**	.396**	.025	.393**	.217**

Note. ** Correlation is significant at the .01 level (2-tailed); *Correlation is significant at the .05 level (2-tailed). Var. = Variable; G = gender; Y = year of study; A = age; BP = birthplace (local and nonlocal); M = motives; A = attitudes; B = behaviors; SW = self-worth; MG = monetary gain; SS = sensation seeking; BA = boredom alleviation; L = learning; M-S = socialization; NCG = negative consequences of gambling; T = technique, A-S = superstition; FL = fate and luck; IC = impaired control; GI = gambling involvement, AR = arousal reaction; SB = superstitious behaviors; CG = controlled gambling.

Table 6 Correlation Matrix for All the Variables in Attitudinal Domain of the Nongamblers Sample (N = 211)

	Gender	Education	Age	Location	NCG	Techniques	Superstition	Fate and Luck	GUS
Gender	—								
Education	.001	—							
Age	.059	.570**	—						
Location	.058	.183**	.236**	—					
NCG	.012	.034	.037	−.118	—				
Techniques	.058	−.050	−.052	.095	−.074	—			
Superstition	.029	−.082	−.004	−.028	−.149*	.630**	—		
Fate and Luck	.050	−.073	−.032	−.146*	.136	.297**	.385**	—	
GUS	−.094	−.049	−.025	−.129	−.225**	.083	.205**	−.004	—

Note. ** Correlation is significant at the .01 level (2-tailed), * Correlation is significant at the .05 level (2-tailed). NCG = negative consequences of gambling; GUS = Gambling Urge Scale.

the interitem correlation of the two items of the fate and luck subscale was .338. The low reliabilities in some subscales are plausibly due to small scale size.

Convergent Validity After Modification

To evaluate the convergent validity of the subscales, we tested the relations between our models, the SOGS, and the GUS (Table 5). The SOGS was significantly correlated with most of the motive subscales (rs = .213 to .348, ps $< .01$), except learning ($r = .099$, $p = .194$) and socialization ($r = .140$, $p = .067$), and significantly correlated with most of the behavior subscales (rs = .217 to .446, $p < .01$) except controlled gambling ($r = .025$, $p = .733$). The SOGS was not significantly correlated with any gambling-attitudes subscales (rs = .001 to .133, ps $> .05$). As expected, the GUS was negatively correlated with the negative consequences of gambling ($r = -.189$, $p <. 01$). The GUS was significantly correlated with most of the motives subscales (rs = .183 to .437, ps $< .01$ to .05), except for learning ($r = .077$, $p = .301$), and was significantly correlated with most of the attitude subscales (rs = −.189 to .238, $p < .01$) except for fate and luck ($r = .084$, $p = .233$). The GUS was also significantly correlated with most of the behavior subscales (rs = .326 to .372, $p < .01$ to .05), except for arousal reaction ($r = .058$, $p = .415$) and controlled gambling ($r = -.110$, $p = .121$). A correlational matrix for all the variables of the gamblers sample is presented in Table 5.

For nongamblers, the GUS was significantly correlated with negative consequences of gambling ($r = -.225$, $p < .01$) and superstition ($r = .205$, $p < .01$; see Table 6). Other attitude subscales were not significantly correlated with the GUS. Correlations between the variables in the attitude domain of the nongamblers sample can be seen in Table 6.

Gender Difference

For both gamblers and nongamblers, age had no significant correlation with any of the GMAB-R subscales (ps $> .05$). Compared to female students, male students had stronger motives in terms of self-worth, $F(1, 182) = 12.865$, $p < .001$; monetary gain, $F(1, 183) = 20.021$, $p < .001$; and sensation seeking, $F(1, 183) = 8.224$, $p < .01$; and stronger beliefs in

Table 7 Significant Gender Differences on Scores of Gambling Related Scales

		M		ANOVA results		
Domain/ Scales	Subscales	Male	Female	*F*	*df*	*p*
Motives	Self-worth	11.97	10.02	12.865	1, 182	< .001
	Monetary gain	9.22	7.21	20.021	1, 183	< .001
	Sensation seeking	15.14	13.09	8.224	1, 183	< .01
Attitudes	Techniques	18.25	16.81	4.018	1, 204	< .05
Behaviors	Superstitious behaviors	4.43	3.92	5.158	1, 197	< .05
GUS		8.76	7.39	6.080	1, 206	< .05
SOGS		2.38	0.89	26.657	1, 194	< .001

techniques, $F(1, 204) = 4.018$, $p < .05$, and superstitious behaviors, $F(1, 197) = 5.158$, $p < .05$ (Table 7). For nongamblers, gender was not associated with any of the attitude subscales.

Discussion

The GMAB-R is an indigenous measure designed to identify gambling motives, attitudes, and behaviors of Chinese gamblers (Tao et al. 2011; Wu et al. 2012). The present study is the first to assess the validity and applicability of the GMAB-R in university-student gamblers. The factor structures of the three domains of the GMAB-R were generally replicated among our student participants; these major motives were also reported by university students in the West (e.g., competition/winning, money, excitement, boredom, and social reasons; Neighbors et al., 2002). Consistent with previous research among adolescents (Chen et al. 2014), the subscales of the GMAB-R showed acceptable internal consistencies. The significant bivariate correlations between the subscales of the GMAB-R and the SOGS or GUS also demonstrated the convergent validity of the GMAB-R.

Nevertheless, the current university-student version of the GMAB-R is not identical to the one developed for the general population. In particular, the item luck from the factor of fate and luck was removed. This difference may be related to the influence of education on traditional beliefs, and it presents an interesting avenue for future research. In addition, the items "gamble regularly" and "gamble when happy" were removed from the factor of gambling involvement in the behavior subscales. The removal of these two items may reflect the distinctive feature of university students. In Macao, only those 21 years old or above can enter casinos legally, although those who are younger may still engage in other forms of legal gambling. It is possible that some university-student gamblers might perceive that they could not gamble as often as they wanted, in particular if they preferred casino gambling; hence these items might not be good gambling-involvement assessment items for some young gamblers.

Because disordered gambling is associated with many negative consequences, including academic impairment, relational problems, and depression symptoms, high-risk gambling among university students has attracted increasing attention (Geisner et al. 2014). Gambling problems could consequently impair students' intellectual performance as well as their future (King et al. 2010). Youth gambling is emerging as a social problem in Chinese society (Wu and Lau 2014). With our findings showing that the SOGS was significantly

correlated with most of the motive and behavior subscales, the GMAB-R can be used for assessing the change in motives and attitudes that may develop into a gambling disorder in future longitudinal or intervention studies among university students.

From this perspective, the GMAB-R has practical value for developing preventive measures based on knowledge of gambling motives and attitudes. Male student gamblers had significantly higher scores in gambling-related motives and attitudes, and they had stronger gambling urges and more gambling behaviors as well (Tao et al. 2011; Wu et al. 2012). The GMAB-R may assist counselors in explaining such gender difference by exploring the underlying motives and attitudes of an individual so that a better intervention may be implemented. Practitioners can design specific interventions based on a student's specific gambling motives and attitudes. For example, interventions that are aimed to alter behavioral factors, such as working on an individual's self-control, may be able to help university students with their gambling problems (Cheung 2014). The GMAB-R provides a multiple dimensional assessment, which may also assist in the design of an intervention based on multiple approaches.

The current study has several limitations. We validated the GMAB-R with a university-student sample and aimed to assess the gambling behavior, attitudes, and motives of young adult gamblers. The current study did not include a representative sample. There are 10 tertiary educational institutions in Macao: six private and four public. Although the university from which we collected our sample is the largest and only comprehensive public university in Macao (Education and Youth Affairs Bureau 2015), our findings should be interpreted with caution as to whether they can be applied to all university students.

In addition, it is important to understand cultural differences in Chinese societies. Wan, Kim, and Elliot (2013) investigated the subcultural differences between mainland China, Taiwan, and Hong Kong, and they confirmed the existence of gambling-behavior variances among those subgroups. For example, some items of the scale may not be applicable to Chinese societies where gambling is illegal. The existing items in the GMAB-R may not cover some gambling cognitions or behaviors that are specific to youth. For example, given the robust impact of peers at this developmental stage, young people may have more peer-related beliefs and behaviors in regard to gambling than is reflected in this instrument. In future studies, it would be useful to investigate student-specific cognitive or behavioral domains of gambling that the GMAB-R may have overlooked.

In conclusion, the present study demonstrated that the GMAB-R represents a valid and reliable measurement tool for Chinese university students. It can be used in further studies to facilitate not only better understanding of Chinese youth gambling, but also the development of effective preventive measures for youth gambling problems.

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