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The Modified Gambling Motivation Scale: Confirmatory Factor Analysis and Links With Problem Gambling

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Abstract

The Gambling Motivation Scale (GMS), a scale based on self-determination theory, consists of seven motivations: to learn the game, to feel competent, to experience excitement, to socialize, to feel important, to win money, and to continue gambling aimlessly (Chantal, Vallerand, & Vallieres, 1994). The GMS has never been tested with confirmatory factor analysis to determine the appropriate structure of gambling motivation. In the present study, we developed the Modified Gambling Motivation Scale (MGMS) to improve the reading comprehension and psychometrics of the GMS. We also proposed a simpler interpretation of motivation scores than that applied to the previous scoring system. Confirmatory factor analysis, structural equation modelling, and measurement invariance were performed on the GMS and the MGMS, which suggested that six motivations were distinct and important to gambling behaviour: to experience an intellectual challenge (combined motivations to learn and to feel competent), to experience excitement, to socialize, to feel important, to win money, and to continue gambling aimlessly. This six-factor structure of gambling motivation aligns more closely with self-determination theory and removes problems with estimations in the seven-factor structure. The results showed that gamblers who were motivated to experience excitement and to socialize had more problem gambling than did other gamblers.

Keywords: gambling motivation, problem gambling, confirmatory factor analysis, structural equation modelling, criterion-related validity, measurement invariance, Modified Gambling Motivation Scale, Gambling Motivation Scale

Résumé

L'Échelle de motivation envers les jeux de hasard et d'argent, fondée sur la théorie de l'autodétermination, est constituée de sept motivations : apprendre le jeu, se sentir compétent, vivre une expérience excitante, socialiser, se sentir important, gagner de l'argent et continuer à jouer pour le simple plaisir (Chantal, Vallerand, et Vallières, 1994). La structure de l'échelle n'a jamais été soumise à des tests avec analyse

factorielle confirmatoire pour déterminer la structure appropriée de la motivation du jeu. Dans la présente étude, nous avons mis au point une échelle modifiée de motivation de jeu pour améliorer la compréhension de la lecture et la psychométrie de l'échelle. Nous proposons également une simplification de l'interprétation des pointages de motivation par rapport au système précédent. L'analyse factorielle confirmatoire, la modélisation de l'équation structurelle et l'invariance de mesure ont été réalisées sur les deux échelles de motivation, et les résultats démontrent que six motivations étaient distinctes et importantes pour le comportement du jeu. Il s'agissait des motivations relatives au défi intellectuel (combinées à des motivations d'apprendre et de se sentir compétent), de vivre une expérience excitante, de socialiser, de se sentir important, de gagner de l'argent et de continuer à jouer pour le simple plaisir. Cette structure de motivation envers les jeux à six facteurs correspond davantage à la théorie de l'autodétermination et supprime les problèmes d'estimation avec la structure à sept facteurs. Les résultats ont montré que les joueurs qui étaient motivés à vivre une expérience excitante et à socialiser avaient plus de problèmes de jeux compulsifs.

Introduction

People are motivated to gamble for various reasons, but which motivations can lead to problem gambling? Research suggests that emotions, social connections, monetary gain, self-worth, and intellectual challenge are commonly related to gambling behaviour (e.g., Chen, Wu, & Tong, 2015; Francis, Dowling, Jackson, Christensen, & Wardle, 2015; Lee, Chae, Lee, & Kim, 2007; Neighbors, Lostutter, Cronce, & Larimer, 2002; Stewart & Zack, 2008; Wu, Tao, Tong, & Cheung, 2012). Because gambling is a source of entertainment, people often use it to cope with negative feelings and to induce positive feelings such as excitement and thrills from winning money (Chen et al., 2015; Dechant & Ellery, 2011; Flack & Morris, 2015; Goldstein, Stewart, Hoaken, & Flett, 2014; Lister, Wohl, & Davis, 2014; McGrath, Stewart, Klein, & Barrett, 2010; Stewart & Zack, 2008; Wu et al., 2012). People can also be attracted to gambling because of its social aspects, such as spending time with friends (Dechant & Ellery, 2011; Flack & Morris, 2015; Francis et al., 2015; McGrath et al., 2010).

Throughout this paper, we refer generally to "problem gambling" rather than to more specific terms such as "pathological gambling," "gambling disorder," or "probable pathological gambling," in order to emphasize our dimensional, as opposed to categorical, approach. The *Diagnostic and Statistical Manual of Mental Disorders*, fourth edition (*DSM-IV*; American Psychiatric Association, 1994) and fifth edition (*DSM-5*; American Psychiatric Association, 2013) and the South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987) refer to these terms on the basis of

categorized symptom counts. Our analyses refer to problem gambling as a latent variable, without considering whether individuals reach a particular criterion.

Research suggests that both problem and non-problem gamblers gamble to win money, for chances to win large rewards, and to make money to fulfil obligations (Binde, 2013; Clarke et al., 2007). Problem gamblers, in particular, are more motivated to win money than are non-problem gamblers (Francis et al., 2015; Lee et al., 2007). For instance, problem (vs. non-problem) gamblers often fail to recognize the disadvantages of large rewards in the Iowa Gambling Task (IGT), a measure of risky behaviour and insufficient learning to recognize large losses associated with large rewards (Bechara, Damasio, Damasio, & Anderson, 1994). Instead, problem gamblers often focus too much on chances of winning large rewards and too little on chances of losing in the IGT (Lorains et al., 2014). Although research consistently shows that monetary gain commonly relates to gambling behaviour, some studies suggest that younger adults are more motivated to gamble for a monetary reason than are older adults (Canale, Santinello, & Griffiths, 2015; Neighbors et al., 2002). Other motivations to gamble include enhancing self-worth, learning, and intellectual challenge (Binde, 2013; Carruthers, Platz, & Busser, 2006; Chen et al., 2015; Lee et al., 2007; Thrasher, Andrew, & Mahony, 2011; Wu et al., 2012). For example, gamblers are sometimes attracted to sports betting because they can research information about teams and the odds of winning. They can also increase their self-esteem by appearing to be knowledgeable about games.

Assessing Gambling Motivations

Over time, researchers have developed various scales to measure gambling motivations. The scales consist of some overlapping gambling motivations but ignore other gambling motivations that have been observed in the literature. We investigated the Gambling Motivation Scale (GMS; Chantal, Vallerand, & Vallieres, 1994), which captures more distinct motivations to gamble and derives from self-determination theory (SDT). Other gambling motivation scales are the Gambling Motives Questionnaire (GMQ; Stewart & Zack, 2008), the Reasons for Gambling Questionnaire (RGQ; Canale et al., 2015), and the Reasons for Gambling Scale (RGS; Luceri & Vergura, 2015). The motivations included in these scales are presented in Table 1.

Scales other than the GMS have advantages but, crucially, capture fewer motivations. They exclude motivations to learn gambling-related games and to be socially recognized, either of which can act as a gateway to developing problem gambling later on. For example, the GMQ proposes that three motivations drive gambling behaviours: enhancement, coping, and social. Although the revised GMQ, the GMQ-Financial (GMQ-F), includes an additional financial motive that commonly reinforces gambling behaviour, it still lacks motives such as alleviating boredom and learning new skills (Binde, 2013; Chen et al., 2015; Clarke et al., 2007; Dechant, 2014; Dechant & Ellery, 2011; Lee et al., 2007; Linke et al., 2010; Wu et al., 2012).

Table 1
Comparisons of Scales With Different Gambling Motivations

Name in GMS	Name in MGMS	Description	GMQ-F	RGS	RGQ	GMS	MGMS	MGMS items
Intrinsic motivation								
Knowledge	Intellectual challenge	Desire to learn the game, to learn strategies in the game, and to feel competent in gambling activities				X	X	3, 6, 10, 15, 18, 19, 20, 24
Accomplishment						X	X	
Experience stimulation	Excitement	Desire to experience thrills and excitement induced from gambling	X	X	X	X	X	1, 12, 14, 28
Extrinsic motivation								
Identified regulation	Socialization	Desire to build relationships with others, to relieve boredom and negative feelings (coping), and to relax via gambling	X	X	X	X	X	4, 13, 17, 23
Introjected regulation	Social recognition	Desire to feel important and to increase self-esteem via gambling			X	X	X	2, 9, 16, 26
External regulation	Monetary gain	Desire to win money from gambling activities	X	X	X	X	X	8, 11, 22, 27
Amotivation	Amotivation	Continue to gamble even without a purpose or a reason				X	X	5, 7, 21, 25

Note. GMS = Gambling Motivation Scale; MGMS = Modified Gambling Motivation Scale; GMQ-F = Gambling Motives Questionnaire with a financial subscale; RGS = Reasons for Gambling Scale; RGQ = Reasons for Gambling Questionnaire.

Confirmatory factor analysis (CFA) was not performed to confirm the factor structure of the four motives to gamble in the GMQ-F, and only the social motive subscale contained items with negative factor loadings (Dechant, 2014). Although these negative loadings for the social motive subscale could indicate reverse scored items, the scores did not appear to be reversed (e.g., "because it makes a social gathering more enjoyable," "to be sociable"). The most serious consequence of these negative loadings could be inaccurate relationships among factors and inaccurate interpretations of gambling motives with other variables. In addition, one can imagine that people gamble to feel social connections and positive emotions, but the social motive was negatively related to enhancement, coping, and financial motives in the GMQ-F.

The RGQ and RGS also focus on emotional, social, and monetary reasons to gamble, but exclude the intrinsic motivation to learn the games, which may provide useful insights into the reasons behind gambling behaviour. In addition, the RGQ and RGS have not been compared to problem gambling psychometrically. This raises the question of whether these two scales measure gambling motivations that are related to problem gambling.

SDT Applied to Gambling Motivation

The GMS was developed by using SDT to assess gambling motivation (Chantal et al., 1994). SDT states that people are motivated to behave based on their need to be autonomous, competent, and related to others (Deci & Ryan, 2000; Ryan & Deci, 2000). If these fundamental needs are not satisfied, this can negatively affect personal well-being and development. *Autonomy* refers to the need to freely behave in a way that is consistent with personal growth. *Competence* is the need to control outcomes and achieve mastery,[1] and *relatedness* is the need for companionship or acceptance by others. For example, an individual may be motivated to play guitar. The desire to play guitar is autonomous if the behaviour results from an innate need for personal development of musical skill. The individual satisfies the need for competence if she or he successfully plays a difficult song.[1] The individual can also satisfy the relatedness need by playing guitar in a band.

These needs relate to intrinsic and extrinsic motivations that initiate behaviour. *Intrinsic motivation* refers to a desire to engage in activities for personal development or growth. *Extrinsic motivation* refers to a desire to engage in activities because of external influences such as money and social factors. According to SDT, intrinsic motivation to engage in activities is more beneficial for well-being than is extrinsic motivation because people seek challenges and novelty for their personal growth, which positively relates to their well-being. *Amotivation* is a lack of intention to act. It is neither intrinsic nor extrinsic. For example, an amotivated individual may act without intention or purpose behind the act. From the theory and literature on gambling motivation, previous researchers suggested seven gambling motivations, ordered from the most autonomous (*self-determined* or intrinsic in SDT) to the least

autonomous (*non-self-determined*, or extrinsic in SDT; Chantal & Vallerand, 1996; Chantal et al., 1994; Chantal, Vallerand, & Vallieres, 1995).

Intrinsic motivation *toward knowledge* captures a drive to learn or explore new games and strategies. Intrinsic motivation *toward accomplishment* refers to receiving pleasure from achievements in gambling activities such as enjoyment in testing abilities and controlling the games. Intrinsic motivation *toward experience stimulation* refers to deriving excitement from gambling activities, such as experiencing thrills or strong sensations from the games. Extrinsic motivation *toward identified regulation* refers to relaxing, escaping from stress, and socializing via the gambling activities. Extrinsic motivation *toward introjected regulation* refers to self-esteem and self-worth enhancements. These enhancements are accomplished through betting greater amounts of money in order to feel important among peers. Extrinsic motivation *toward external regulation* refers to pleasure in pursuing monetary rewards. In addition to these intrinsic and extrinsic motivations to gamble, individuals sometimes gamble without a sense of purpose, or with amotivation (Chantal & Vallerand, 1996; Chantal et al., 1995).

Previous studies have used the GMS to show specific motivations related to certain gambling activities (e.g., skill-based gambling and luck-based gambling) and problem gambling (Carruthers et al., 2006; Chantal & Vallerand, 1996; Chantal et al., 1995; Clarke, 2004, 2005; Neighbors & Larimer, 2004). However, the GMS has been criticized for the lack of CFA to test whether its motivations are distinct and necessary to measure the gambling motivation (Luceri & Vergura, 2015). In the current study, we fill this gap by performing CFA to examine the gambling motivation structures and by performing structural equation modelling (SEM) to examine the criterion-related validity of gambling motivation and problem gambling constructs. This allows for a more sophisticated examination of how well gambling motivations predict problem gambling than has been previously reported.

Across various scales of gambling motivation, the GMS, which is built upon a motivational theory, can provide better insight into gambling motivation than can other scales that focus less on motivation. The GMQ-F, RGS, and RGQ are derived from operant conditioning theory and primarily examine the need to regulate emotions. This need is manifested in avoiding negative emotions and seeking positive emotions via the entertainment and social aspects of gambling. In addition, operant conditioning and the need to regulate emotions via gambling align more with extrinsic motivation than other types of motivation, resulting in an incomplete conceptualization of gambling motivation. In contrast, the GMS is derived from SDT, which focuses on intrinsic motivation, extrinsic motivation, and amotivation. This focus on motivations results in more distinct gambling motivations in the GMS than those in the other scales. The GMS also measures intrinsic motivation to gamble such as for the intellectual challenge. The use of a gambling motivation scale that emerges from a motivational theory and measures a more defined spectrum of gambling motivations can improve the understanding of gambling motivations and gambling severity across gambling activities.

The Present Study

The present study had four aims. First, we developed the Modified Gambling Motivation Scale (MGMS), an adaptation of the GMS (Chantal et al., 1994), as an alternative scale to measure gambling motivation. Previous research found that problem gamblers are less educated than non-problem gamblers (Abbott & Volberg, 1996; Lorains et al., 2014; Volberg, 1994), making it worthwhile to improve the language comprehension of the GMS. The MGMS clarifies the language used in the GMS items and GMS Likert scale by rephrasing the items and the anchors to simplify the language. For instance, one item of the GMS reads, "For the feeling of efficacy that I get when I play my favorite game." The meaning of the word "efficacy" may be vague and people may respond to the item by using different definitions of the word. The MGMS changes this item to read, "I feel competent when I gamble." The GMS and MGMS items are presented in Appendix A and Appendix B, respectively. We expected to improve the language comprehension of the GMS with the MGMS.

The second purpose was to assess gambling motivation from the framework by Chantal et al. (1994). Four measurement models were tested: a seven-factor model, a six-factor model, a one-factor model, and a two-factor model. Previous research has supported this seven-factor structure of the GMS with exploratory factor analysis (Chantal et al., 1994), but not with CFA. We performed CFA to test the previously proposed structures (i.e., the seven-factor model and the two-factor model) and our hypothesized structures of the GMS, specifically the six-factor model and the one-factor model.

We hypothesized that the six-factor model would be more theoretically consistent with SDT than would the seven-factor model. Motivations toward knowledge and accomplishment are theoretically similar to intrinsic regulation in SDT (i.e., intrinsic motivation) because they indicate an inherent interest in learning and achieving mastery at gambling. Excitement would be theoretically consistent with integrated regulation in SDT because of a motivation to experience extrinsic enjoyment from achieving goals (i.e., winning money in gambling). Socialization also satisfies personal goals (e.g., social connections or coping with negative feelings) and would conceptually align with identified regulation in SDT, which emphasizes satisfaction of personal goals and values. In addition, being socially recognized from winning rewards would correspond with the introjected regulation to improve self-esteem and ego in SDT. Winning or perceiving chances to win money would facilitate gambling behaviour and would coincide with a drive to act that is exerted by external rewards, as defined by external regulation in SDT. Lastly, amotivation aligns with non-regulation due to aimless gambling or a lack of control in gambling in SDT.

This six-factor model would also reduce the multicollinearity issue in the seven-factor model by combining motivations toward knowledge and accomplishment, as they were shown to be moderately correlated (r = .65) in the study by Chantal et al. (1994). Because these two motivations seem to measure a motivation to intellectually

overcome challenges in gambling, we attempted to combine them into a motivation of intellectual challenge, which has been suggested as a motivation to gamble and would align with intrinsic regulation in SDT (Binde, 2013; Ryan & Deci, 2000).

The one-factor model tested whether these six motivations could be grouped under a general construct of gambling motivation. The two-factor model tested whether the six motivations could be grouped into either self-determined motivation or non-self-determined motivation on the basis of previous research (Chantal et al., 1994; Wu & Tang, 2011). Motivations that are more autonomous and intrinsic were grouped in self-determined motivation, whereas motivations that are less autonomous and extrinsic were grouped in non-self-determined motivation.

The third purpose of the study was to test for the criterion-related validity of gambling motivation and problem gambling because these specific motivations have not been compared with problem gambling psychometrically. In addition, this structural model allowed us to examine the role of gambling motivation in problem gambling. The fourth purpose was to test whether the MGMS is equivalent to the GMS psychometrically by using measurement invariance. We hypothesized that if the MGMS is the same as, but easier to read than, the GMS, the MGMS could be a better measure of gambling motivation because its psychometrics are sound.

Method

Participants

Participants (N = 525) were recruited from the psychology research pool at the University of Georgia, in exchange for partial completion of a research requirement. The data of 37 participants were removed because of computer errors, and 86 were removed because of no gambling participation in the past 12 months. Analyses included the remaining 402 participants (61% male, 78% Caucasian, 10% Asian, 7% African American, 5% other races) ranging in age from 18 to 29 years (M = 19.37, SD = 1.38).

Measures

Gambling Motivation Scale (GMS). Participants rated 28 items by using a degree of correspondence for each item (1 = *does not correspond* to 7 = *corresponds exactly*). More details about the seven motivations and the complete GMS are presented in Table 1 and Appendix A, respectively. The GMS items include knowledge (e.g., "For the satisfaction of learning new ways of playing my favorite game"), accomplishment (e.g., "For the feeling of efficacy that I get when I play my favorite game"), excitement (e.g., "Because it is exciting to play for money"), socialization (e.g., "Because, for me, it is the best way to relax completely"), monetary gain (e.g., "To get rich"), social recognition (e.g., "Because it makes me feel like somebody important"), and amotivation (e.g., "I play for money, but sometimes I ask myself

what I get out of it") on 7-point Likert scales. Each set of four items measures each motivation subscale. The total GMS scores are highly consistent (α = .94).

Modified Gambling Motivation Scale (MGMS). Participants completed the 28 modified MGMS items by using a 7-point Likert scale (1 = *strongly disagree* to 7 = *strongly agree*). Unlike the seven motivations in the GMS, the MGMS measures six motivations: intellectual challenge (e.g., "I enjoy learning new strategies"), excitement (e.g., "It is exciting to gamble"), socialization (e.g., "It is the best way to relax"), monetary gain (e.g., "I play for money"), social recognition (e.g., "It makes me feel important"), and amotivation (e.g., "I play for money, but I sometimes wonder what I get out of gambling"). The explanation of each motivation and the complete MGMS are presented in Table 1 and Appendix B, respectively. Like those of the GMS, the internal consistencies of the MGMS total scores (α = .92) and the MGMS subscales are adequate and reported in Table 2.

We revised all 28 GMS items except Item 9 while keeping the meaning of items the same. Four items measure each of the five subscales: excitement, socialization, social recognition, monetary gain, and amotivation. Eight items of the MGMS measure intellectual challenge.

Previous researchers have proposed a formula for a self-determination index from the GMS, as shown below:

$$\left[\frac{2 \times (knowledge + accomplishment + excitement)}{3}\right] + socialization$$

$$- \left[\frac{(social\ recognition + monetary\ gain)}{2} + 2 \times (amotivation)\right]$$

This self-determination index is ambiguous and difficult to interpret because it is unclear why each subscale is weighed differently compared with the other subscales. According to the previous study (Chantal et al., 1995), higher scores on the index indicate higher self-determination to gamble, and lower scores indicate higher non-self-determination to gamble. However, this scoring system introduces problems. For example, a score of 0 is not meaningful. Gamblers who have high scores on both self-determination and non-self-determination can receive a score of 0 because the scores cancel each other out. Zero does not mean no self-determination in this case. Zero also does not necessarily indicate amotivation, and it is unlikely that a score of 0 would correspond with amotivation because the amotivation score is scored as a negative term in the formula. Researchers should cautiously interpret the results of previous studies that used this problematic formula (e.g., Carruthers et al., 2006; Chantal et al., 1995).

Table 2
Pearson Correlations of Problem Gambling and Motivations From the Modified Gambling Motivation Scale

	1	2	3	4	5	6	7	8	9	10
1. Self-determined	*(.91)*									
2. Non-self-determined	.60***	*(.85)*								
3. DIGS	.47***	.46***	*(.89)*							
4. Gambling motivation	.89***	.90***	.52***	*(.92)*						
5. Amotivation	.36***	.76***	.33***	.63***	*(.86)*					
6. Intellectual challenge	.83***	.50***	.29***	.74***	.27***	*(.88)*				
7. Excitement	.87***	.51***	.41***	.77***	.27***	.66***	*(.78)*			
8. Socialization	.78***	.49***	.46***	.71***	.35***	.43***	.50***	*(.82)*		
9. Social recognition	.65***	.73***	.38***	.78***	.35***	.60***	.51***	.52***	*(.76)*	
10. Monetary gain	.38***	.77***	.33***	.65***	.35***	.29***	.38***	.26***	.36***	*(.86)*

Note. Internal consistencies are reported on the diagonal. All of the MGMS total scores and subscale scores were calculated by using the new scoring formulas. Self-determined motivation is an average of intellectual challenge, excitement, and socialization. Non-self-determined motivation is an average of social recognition, monetary gain, and amotivation. Problem gambling is measured by the Diagnostic Interview for Gambling Severity (DIGS). Gambling motivation is the total score of the Modified Gambling Motivation Scale.
***$p < .001$.

New scoring system for the MGMS. Because of the ambiguity of the self-determination index, we proposed a simpler and more applicable formula for the total gambling motivation scores. The intellectual challenge score is an average of its eight items. A score of the other five motivations is an average of their respective four items. The total gambling motivation score is the sum of the averages of the six subscales, resulting in a range of 0-42. Higher scores indicate greater motivation to gamble for a specific reason or greater motivation to gamble in general. Each subscale score ranges from 0 to 7. This new formula introduces a simpler calculation and interpretation of the scores, while allowing researchers to assess specific motivations or a general motivation to gamble.

Diagnostic Interview for Gambling Severity (DIGS; Fortune & Goodie, 2010; Winters, Specker, & Stinchfield, 2002). DIGS scores are calculated from 18 items that measure nine gambling symptoms on a Likert scale (1 = *false*, 2 = *somewhat true*, and 3 = *very true*) that are based on the gambling disorder criteria in the *DSM-5*. We used the DIGS measure by Winters et al. (2002), as modified by Fortune and Goodie (2010), which captures 10 gambling symptoms according to *DSM-IV* criteria. However, to reflect these criteria, we omitted the questions related to illegal acts and calculated the DIGS scores by using the remaining 18 items related to nine symptoms: a need to increase betting to achieve the same excitement, irritability when cutting down on gambling, losing control, preoccupied with gambling, escaping from negative emotions via gambling, chasing after losses, lying, jeopardizing significant relationships or work because of gambling, and relying on others to relieve desperate financial situations from gambling. Each gambling symptom is measured by a set of two items. For each set of items, participants scored 0 if they responded with a combination of false and false, or 1 with any other combination. In the present study, a problem gambling construct was assessed via the DIGS in the predictive model.

South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987). Participants rated 20 items on 2-, 3-, and 4-point scales to assess their risk of pathological gambling. This scoring system is taken from Lesieur and Blume (1987) and has a range of 0-20. In the original formulation, gamblers whose scores are 3-4 are deemed problem gamblers, and those with scores $\geqslant 5$ are deemed probable pathological gamblers.

Demographic questionnaire. The demographic questionnaire measured age, gender, education, race, marriage, gambling activities (e.g., "Played cards for money with friends?" or "Bet on the outcome of a sporting event?"), and gambling frequency ("How many times do you gamble?"). Participants rated how often they participated in gambling activities (1 = *never*, 2 = *less than monthly*, 3 = *monthly*, 4 = *weekly*, 5 = *daily*) and how frequently they gambled in the past 12 months (1 = *never gamble*, 2 = *once a year*, 3 = *once a month*, 4 = *once a week*, 5 = *two to three times a week*, 6 = *four to five times a week*, 7 = *more than five times a week*).

Procedure

Each participant signed a consent form and responded to the GMS, a demographic questionnaire, the DIGS, the SOGS, and the MGMS at a computer station, in that

order. Participants were debriefed at the end of the experiment. The two gambling motivation scales were counterbalanced.

Analytic Plan

To test the first purpose of the study, Flesch Reading Ease (Flesch, 1948) and Flesch-Kincaid Grade Level scores (Kincaid, Fishburne, Rogers, & Chissom, 1975) were used to compare the reading comprehension of the MGMS with that of the GMS. The readability statistics in Microsoft Word produced these reading ease and reading level scores. For the second purpose, CFA was used to test the structures of the gambling motivation construct with four measurement models: the seven-factor model, the six-factor model, the one-factor model, and the two-factor model. For the third purpose, SEM was used to test one structural model (the predictive model) for criterion-related validity. The predictive model tested the effects of six specific motivations on problem gambling (measured with the DIGS) at a latent level. For the fourth purpose, measurement invariance was performed to test the equality of the gambling motivation structure between the GMS and the MGMS.

Results

Sample Gambling Characteristics

The most frequent gambling activities on a weekly basis were betting on sports (35%), the lottery (14%), or bowling or golf (13%) and playing cards (6%). The frequency at which participants gambled varied (17% once a year, 24% monthly, 43% weekly, 14% two to three times per week, or 2% four times or more per week), but this frequency was not significantly skewed (skewness = 0.12, *SE* = 0.12) or kurtosed (kurtosis = -0.02, *SE* = 0.24).

The average DIGS score was 3.01 (*SD* = 2.49), with 60% of participants showing scores of 0-3 and 40% showing scores of 4-9. The distribution of DIGS scores was not normal, with a skewness of .63 (*SE* = 0.12) and a kurtosis of -.51 (*SE* = 0.24). The SOGS (*M* = 2.21, *SD* = 2.84) score distribution (skewness = 1.91, *SE* = 0.12; kurtosis = 3.86, *SE* = 0.24) was similar to that of the DIGS scores. In addition, the MGMS total scores (*M* = 23.64, *SD* = 5.50) ranged from 6 to 42 and were not normally distributed, with a skewness of -0.48 (*SE* = 0.12) and a kurtosis of 0.76 (*SE* = 0.24). Table 2 shows the correlations between the DIGS scores and the MGMS scores, which were calculated with our new scoring system.

Scale Reading Level

The Flesch Reading Ease (Flesch, 1948) and the Flesch-Kincaid Grade Level scores (Kincaid et al., 1975) showed that the MGMS was easier to read and required a lower reading level than did the GMS. The Flesch Reading Ease and the Flesch-Kincaid Grade Level reported scores of 84.1 and 3.6 for the MGMS and 77.9 and 5.0 for the GMS, respectively. The MGMS items (234 words, 906 characters,

8.3 words per item on average) were also briefer than the GMS items (294 words, 1,198 characters, 10.5 words per item on average). The internal consistencies of the MGMS (α = .92) and the GMS (α = .94) were also high. Because the reading level of the MGMS was lower and thus more broadly applicable than that of the GMS, the remaining analyses refer to the MGMS results.

Confirmatory Factor Analysis

Responses from 402 participants were analyzed for the factor structures of gambling motivation and criterion-related validity by using LISREL 9.1. To test the factor structures of gambling motivation, we used four measurement models by using CFA with maximum likelihood estimation. Although robust maximum likelihood (RML) could deal with non-normality, its standard errors and estimates were non-sensible. The reviewers agreed that maximum likelihood should be used in this study. The seven-factor model tested the original seven gambling motivations as first-order factors, which were intercorrelated. The other models consisted of six specific motivations that combined knowledge and accomplishment into an intellectual challenge in order to reduce multicollinearity and to be consistent with SDT. The six-factor model tested the six specific motivations as first-order factors, which were also intercorrelated. The one-factor model tested one second-order factor of general motivation consisting of six motivations. The two-factor model tested two second-order factors of self-determined motivation (consisting of intellectual challenge, excitement, and socialization) and non-self-determined motivation (consisting of social recognition, monetary gain, and amotivation).

Fit indices used in this study were as follows: comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), standardized root mean square residual (SRMR), Akaike information criterion (AIC), and Bayesian information criterion (BIC). We also used the chi-square test to measure the models' goodness of fit. Generally, a good model fit ranges from .95 to 1.00 and an adequate fit from .90 to .95 for the CFI and TLI (Hu & Bentler, 1998, 1999; Lance & Vandenberg, 2001). For the RMSEA and SRMR, a good fit is between 0.00 and 0.08, while an adequate fit is between 0.08 and 0.10 (Browne & Cudeck, 1992; Hu & Bentler, 1999; Kline, 2016; MacCallum, Browne, & Sugawara, 1996). A smaller AIC and BIC indicate a better fit and a simpler model (Kline, 2016; Raftery, 1995). Table 3 reports fit indices of the measurement models. An additional discussion of the chi-square test and fit indices occurs in Appendix C.

Although the seven-factor model appeared to best fit the data, the other three measurement models fit the data nearly as well as the seven-factor model. Specifically, the confidence intervals of RMSEAs among the four measurement models overlapped, indicating equally good fit, while other fit indices were nearly identical. We believed the six-factor model was the most appropriate for the gambling motivation structure because it aligned more closely with SDT and it eliminated a multicollinearity issue. When we performed CFA to test the seven-factor model with the GMS, motivations toward knowledge and accomplishment were nearly identical for both the GMS

(r = .92) and the MGMS (r = .87). These high correlations between motivations toward knowledge and accomplishment created problems with estimations (Joreskog, 1999). In addition, we believed they measured the same motivation because these highly correlated factors referred to intrinsic motivation to overcome intellectual challenge, which aligned with intrinsic regulation in SDT. Thus, combining the two motivations into an intellectual challenge factor in the six-factor model solved problems with estimations and allowed for a more consistent interpretation with SDT. Therefore, the six-factor model was preferred. The factor correlations of the seven-factor model and the six-factor model from the MGMS are shown in Tables 4 and 5, respectively.

Structural Equation Modeling

To test the criterion-related validity of gambling motivation and problem gambling, we performed SEM with maximum likelihood estimation on a structural model to test which motivation constructs led to the problem gambling construct. It should be noted that robust maximum likelihood that deal with non-normality produced non-sensible standard errors and estimates. The reviewers agreed that maximum

Table 3
Fit Indices of Measurement Models for the Modified Gambling Motivation Scale

Model	χ^2	*df*	RMSEA	TLI	CFI	SRMR	AIC	BIC
			Est (LL, UL)					
1. Seven-factor	965.10***	329	0.069 (0.064, 0.074)	.95	.96	0.059	17265	17573
2. Six-factor	1100.45***	335	0.075 (0.071, 0.080)	.94	.95	0.071	17388	17672
3. One-factor	1173.37***	344	0.077 (0.073, 0.082)	.93	.94	0.079	17443	17691
4. Two-factor	1164.48***	343	0.077 (0.072, 0.082)	.93	.94	0.078	17436	17688

Note. RMSEA = root mean square error of approximation; Est = estimates of the RMSEA; LL = lower limit; UL = upper limit; TLI = Tucker-Lewis index; CFI = comparative fit index; SRMR = root mean square residual; AIC = Akaike information criterion; BIC = Bayesian information criterion.
***$p < .001$.

Table 4
Factor Correlations of the Seven-Factor Model

	1	2	3	4	5	6	7
1. Knowledge	–						
2. Accomplishment	.87**	–					
3. Excitement	.68**	.81**	–				
4. Socialization	.32**	58**	.63**	–			
5. Social recognition	.54**	.86**	.66**	.64**	–		
6. Monetary gain	.27**	.36**	.45**	.33**	.45**	–	
7. Amotivation	.16**	.40**	.34**	.42**	.44**	.39**	–

Note. The data are from the Modified Gambling Motivation Scale.
**$p < .01$.

Table 5
Factor Correlations of the Six-Factor Model

	1	2	3	4	5	6
1. Intellectual challenge	–					
2. Excitement	.75**	–				
3. Socialization	.43**	.62**	–			
4. Social recognition	.69**	.66**	.65**	–		
5. Monetary gain	.31**	.45**	.32**	.45**	–	
6. Amotivation	.27**	.34**	.42**	.44**	.39**	–

Note. The data are from the Modified Gambling Motivation Scale.
**$p < .01$.

likelihood should be used in this study. Adding support to the preference for the six-factor model over the seven-factor model, the use of seven motivations to predict problem gambling created problems with estimations, which disappeared when the six motivations predicted problem gambling. This predictive model is shown in Figure 1. Although the chi-square goodness-of-fit test showed a poor fit to the data, χ^2 (968) = 2527.41, $p < .001$, the fit indices indicated good fit (TLI = .94, CFI = .94, SRMR = 0.072, RMSEA = 0.063, 90% confidence interval [0.060, 0.066], AIC = 12724, BIC = 13175). We relied on fit indices more than chi-square goodness-of-fit tests because chi-square tended to be significant in large sample sizes. More details about fit statistics are discussed in Appendix C. Overall, this SEM model better fit the data than the measurement model of the six factors did and it explained 40.2% of the variance, suggesting meaningful relationships between gambling motivation and problem gambling.

Of the six motivations, only excitement (standardized coefficient = .24, $t = 2.08$, $p < .05$) and socialization (standardized coefficient = .35, $t = 3.87$, $p < .001$) predicted more problem gambling. The results suggested that people who gambled for excitement (e.g., pleasures and thrills) and socialization (e.g., improved social connections) had more problem gambling.

Measurement Invariance

Because the six-factor model was the preferred structure of gambling motivation, it was used to test whether the GMS and MGMS were the same psychometrically. The goodness-of-fit statistics for measurement invariance are presented in Table C1. Factor covariances of the GMS and the MGMS are also shown in Table C2. In general, chi-square difference tests were not reliable in determining invariance, and the uniqueness invariance test is difficult to achieve according to Vandenberg and Lance (2000). A more detailed discussion to determine the support of invariance tests is available in Appendix C. In the present study, fit indices such as RMSEAs and CFIs were similar across all invariance tests, suggesting an invariance between the GMS and the MGMS. The MGMS and the GMS had the same dimensional structure (configural invariance), had similarly strong links between the item scores

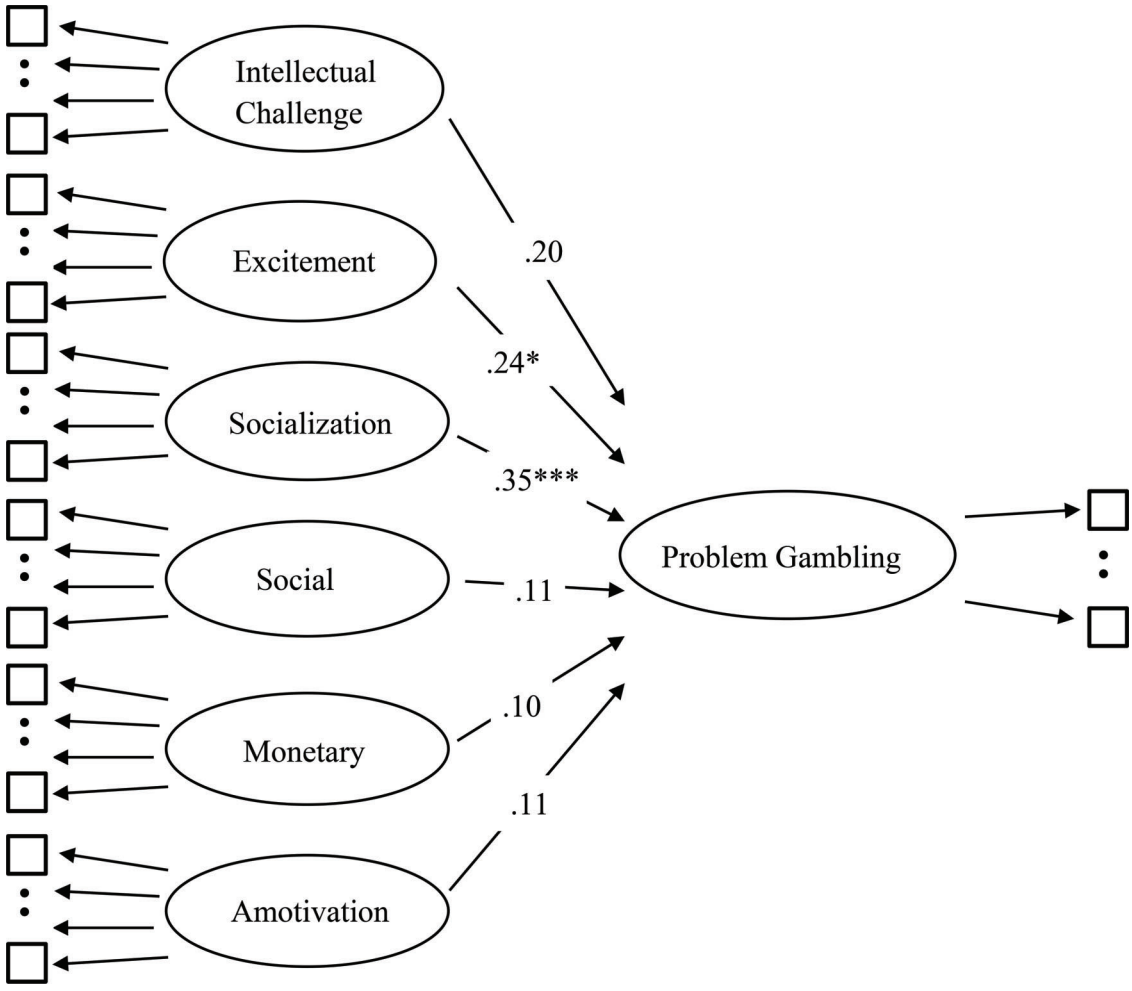

Figure 1. The predictive model showing the predictions of six gambling motivations for problem gambling. With the Modified Gambling Motivation Scale, eight items measure intellectual challenge and four items measure five other motivations. With the Diagnostic Interview for Gambling Severity, 18 items measure problem gambling. Each square indicates each item of a motivation.
*$p < .05$. ***$p < .001$.

and the gambling motivations (metric invariance), had the same level of measurement error (uniqueness invariance), were measured on similar scales (scalar invariance), and showed the same interrelatedness between measured factors (factor covariances). The measurement invariance suggested that the GMS and the MGMS were the same psychometrically, but the MGMS requires a lower reading level and less education than does the GMS.

Discussion

As determined by the four purposes of the current study, the MGMS appears to be a useful scale and compares favourably with existing scales, including the GMS. First, the Flesch Reading Ease and the Flesch-Kincaid Grade Level scores indicated that the MGMS items were easier to read and required a lower grade level to understand than did the GMS items. Second, CFA on the seven-factor, six-factor, two-factor,

and one-factor models with the MGMS demonstrated that the six specific motivations to gamble were validated and shown to be the most consistent with SDT, on which the scale was based. Despite slightly better fit indices of the seven-factor model, the seven-factor structure had problems with estimations, whereas the six-factor structure did not. This finding suggests that the six-factor structure contributes to the understanding of gambling motivation beyond the seven-factor structure by offering an alternative conceptual framework for gambling motivation and allowing gambling motivations to predict problem gambling.

Third, the present study assessed the criterion-related validity of the MGMS. The six motivation constructs were used to predict the problem gambling construct in the predictive model. Of the six motivations, excitement and socialization significantly predicted greater problem gambling, consistent with previous findings (Canale et al., 2015; Chen et al., 2015; Francis et al., 2015; Lee et al., 2007; McGrath et al., 2010; Neighbors et al., 2002; Stewart & Zack, 2008; Wu et al., 2012). This suggests that individuals with more problem gambling gamble because they want to improve social connections, relieve negative feelings, and feel pleasure. In addition, the GMS and MGMS findings may be relatable to the GMQ findings, as the three factors of the GMQ can plausibly be mapped onto the two factors of the GMS (i.e., GMQ enhancement to MGMS excitement, and GMQ coping and social motives to MGMS socialization). According to SDT, these desires to feel excited and satisfy social needs from gambling are aligned with integrated regulation and identified regulation, respectively. When individuals are motivated by external stimuli such as gambling, these motivations negatively affect well-being (Ryan & Deci, 2000). This may explain why relying on gambling to improve mood and connect with others leads to poor well-being, and in this case, to more problem gambling.

Fourth, the MGMS is a good measure of gambling motivation because less education is required to complete it and equally good psychometrics are required relative to the GMS. We also suggested a new and simpler scoring of the MGMS, which, in contrast with the previous formula, allows researchers to assess a score for each motivation as well as a meaningful total motivation score. Specifically, the advantages of the new scoring system are that (a) higher scores now indicate higher motivation, (b) a score of 0 is meaningful, (c) amotivation is no longer grouped with non-self-determined motivations, and (d) the formula is simpler and more intuitive.

Limitations and Future Directions

College samples tend to consist of individuals with less problem gambling than do clinical samples. Ours was a college sample in which 40% of participants scored 4 or more on the DIGS and 17% scored at least 5 on the SOGS (i.e., who were at risk of becoming probable pathological gamblers). This proportion of probable pathological gamblers was higher than that in an average college sample of 8% probable pathological gamblers (Blinn-Pike, Worthy, & Jonkman, 2007). This may be attributable to the fact that we recruited only people who gambled in the past 12 months and that the SOGS often produces high false positive rates (Goodie et al., 2013).

It is also possible that social desirability played a role in our results, as none of the instruments contained items to detect social desirability. Finally, motivations other than excitement and socialization may predict problem gambling in populations that include more severe gamblers, as other studies have suggested (Chantal et al., 1995; Lee et al., 2007; Stewart & Zack, 2008).

We recognize the generalizability of a non-clinical sample to a clinical sample. Because of the small sample sizes of problem and non-problem gamblers, we could not perform measurement invariance across groups of differing degrees of problem gambling and confidently interpret the results. Replicating these results in a clinical sample prior to relying on it for clinical purposes may be necessary in future studies. Such studies could compare a college population with a problem gambler population to examine whether the MGMS measures gambling motivation similarly or differently across the two populations by using measurement invariance. This measurement invariance across samples would allow researchers to be more confident in generalizing the results to a more clinical population. To better understand the relationship between gambling motivations and gambling problems, future studies could also re-test the model in which gambling motivations predict gambling problems in community samples in order to expand the participants' range in age and gambling severity.

Despite these limitations, this paper aimed to improve the assessment of gambling motivation for a better understanding of problem gambling. To accomplish this, we evaluated the existing motivation scales in the gambling literature, modified the GMS that aligned closely with SDT, and included a more refined spectrum of gambling motivation discussed in the literature. Compared with the GMS, the MGMS could be a useful tool for measuring gambling motivations with more meaningful motivation scores and more stable psychometric properties.

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Appendix A

Gambling Motivation Scale

Does not correspond at all		Corresponds a little		Corresponds moderately		Corresponds a lot		Corresponds exactly
1		2	3	4		5	6	7

Why do you play for money (bet) at your favorite game?

1. Because it is exciting to play for money.
2. Because it makes me feel like somebody important.
3. For the feeling of efficacy that I get when I play my favorite game.
4. Because, for me, it is the best way to relax completely.
5. I play for money, but sometimes I ask myself if I should continue to play my favorite game.
6. Because playing for money allows me to test my capacity to control myself.
7. I play for money, but sometimes I ask myself what I get out of it.
8. To get rich.
9. To show others that I am a dynamic person.
10. For the pleasure I get at improving my knowledge of the game.
11. To buy something that I dream of.
12. Because it allows me to enjoy myself enormously.
13. Because it is the best way I know of to eliminate tension.
14. For the strong sensations I feel when I play my favorite game.
15. For the satisfaction of learning new ways of playing my favorite game.
16. To be envied by others.
17. Because it is the hobby I have chosen to clear my mind.
18. For the pleasure of knowing my abilities at this game.
19. For the satisfaction I feel when I can control the game.
20. For the curiosity of knowing what can happen in the game.
21. I play for money but sometimes I feel I am not getting a lot out of it.
22. To make money quickly and easily.
23. Because it's the best way I know of to meet my friends.
24. For the feeling of control it gives me.
25. I play for money but I sometimes ask myself if it is good for me.
26. Because when I win, I feel like someone important.
27. To make a lot of money.
28. For the thrill or the strong sensations it gives me.

Items for each subscale:	Knowledge	10, 15, 18, 20
	Accomplishment	3, 6, 19, 24
	Excitement	1, 12, 14, 28
	Socialization	4, 13, 17, 23
	Monetary gain	8, 11, 22, 27
	Social recognition	2, 9, 16, 26
	Amotivation	5, 7, 21, 25

Appendix B

Modified Gambling Motivation Scale

Strongly disagree	Disagree	Slightly disagree	Neutral	Slightly agree	Agree	Strongly agree
1	2	3	4	5	6	7

Why do you gamble at your favorite game?

1. It is exciting to gamble.
2. It makes me feel important.
3. I feel competent when I gamble.
4. It is the best way to relax.
5. I play for money, but I sometimes worry if I should continue playing.
6. Gambling allows me to test my control.
7. I play for money, but I sometimes wonder what I get out of gambling.
8. I play for money.
9. To show others that I am a dynamic person.
10. I enjoy improving my knowledge of the game.
11. I play for money to buy what I desire.
12. It allows me to enjoy myself enormously.
13. It is the best way I know to eliminate tension.
14. I experience strong sensations when I gamble.
15. I enjoy learning new strategies.
16. I want to be envied by others.
17. It is my hobby to clear my mind.
18. I enjoy knowing my ability in this game.
19. I like it when I can control the game.
20. I am curious to know what will happen in the game.
21. I play for money, but I sometimes feel I do not get a lot out of it.
22. It is quick and easy money.
23. It is the best way to spend time with friends.
24. It gives me a feeling of control.
25. I play for money, but I sometimes wonder if it is good for me.
26. I feel important when I win.
27. It makes me a lot of money.
28. It gives me a thrill or strong sensation.

Items for each subscale:	Intellectual challenge	10, 15, 18, 20, 3, 6, 19, 24
	Excitement	1, 12, 14, 28
	Socialization	4, 13, 17, 23
	Monetary gain	8, 11, 22, 27
	Social recognition	2, 9, 16, 26
	Amotivation	5, 7, 21, 25

Appendix C

Discussion of Fit Statistics and Results of Measurement Invariance

The chi-square goodness-of-fit test tends to become significant as sample sizes increase even if there is a small difference between the observed and the predicted variance-covariance matrices in large samples, such as in our sample (N = 402). However, large sample sizes are needed for the chi-square to have asymptotic distribution and multivariate normality (Brown, 2006; Kline, 2016; Marsh, Balla, & McDonald, 1988). Therefore, poor models can have a non-significant chi-square if their sample sizes are small enough, but good models can have a significant chi-square if their sample sizes are large enough. This suggests that the chi-square difference test has higher Type I error rates in large sample sizes.

Regardless of the sensitivity to sample sizes of the chi-square, many researchers still use chi-square tests to judge the goodness of fit because there are no other statistical tests that use the known distribution, the chi-square distribution (Vandenberg & Lance, 2000). Thus, other fit indices (e.g., TLI, CFI, RMSEA, SRMR, AIC, and BIC) should be considered when judging model fit because fit indices compare the observed models with the alternative models from the data. If a set of fit indices indicates good fit, researchers can be more confident about their results. In measurement invariance, the change of CFI can adequately judge whether the measurement invariance holds across groups. If the change of CFI is smaller than or equal to .01, it is reasonable to conclude that the groups have the same level of measurement invariance (Cheung & Rensvold, 2002; Meade, Johnson, & Braddy, 2008). According to Tables C1 and C2, our results suggest that the measurement invariance holds between groups across levels of measurement invariance.

Table C1

Fit Indices for Measurement Invariance of Both Gambling Motivation Scales on the Six-Factor Model

Model	χ^2	*df*	$\Delta\chi^2$	Δdf	RMSEA	TLI	CFI	SRMR	AIC	BIC
					Est (LL, UL)					
1. Configural invariance	2133.80***	670	–	–	0.074 (0.070, 0.077)	.95	.96	0.066	35719	36385
2. Metric invariance	2166.38***	692	32.55	22	0.073 (0.069, 0.076)	.95	.96	0.063	35819	36645
3. Uniqueness invariance	2271.81***	720	105.36***	28	0.073 (0.070, 0.077)	.95	.96	0.066	35757	36189
4. Scalar invariance	2771.81***	742	0.00	22	0.072 (0.068, 0.075)	.96	.96	0.066	35825	36416
5. Factor covariance	2326.26***	769	54.46***	27	0.071 (0.068, 0.074)	.96	.96	0.095	35826	36290

Note. RMSEA = root mean square error of approximation; Est = estimates; LL = lower limit; UL = upper limit; TLI = Tucker-Lewis index; CFI = comparative fit index; SRMR = root mean square residual; AIC = Akaike information criterion; BIC = Bayesian information criterion.
***$p < .001$.

Table C2

Factor Covariances of the Six Motivations of the GMS and MGMS

	1		2		3		4		5		6	
	GMS	MGMS	GMS	MGMS	GMS	MGMS	GMS	MGMS	GMS	MGMS	GMS	MGMS
1. Intellectual challenge	–	–										
2. Excitement	1.00***	.58***	–	–								
3. Socialization	.65***	.39***	.72***	.52***	–	–						
4. Social recognition	.76***	.61***	.72***	.54***	.78***	.61***	–	–				
5. Monetary gain	.42***	.23***	.52***	.30***	.42***	.25***	.58***	.34***	–	–		
6. Amotivation	.44***	.25***	.50***	.29***	.55***	.42***	.55***	.43***	.57***	.31***	–	–

Note. Factor covariances were standardized. These factor covariances were estimated without any invariant restrictions. GMS = Gambling Motivation Scale; MGMS = Modified Gambling Motivation Scale.
***$p < .001$.