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BRIEF REPORT

Probing Gambling Urge as a State Construct: Evidence From a Sample of Community Gamblers

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Little effort has been made to systematically test the psychometric properties of the Gambling Craving Scale (GACS; Young & Wohl, 2009). The GACS is adapted from the Questionnaire on Smoking Urges (Tiffany & Drobes, 1991) and thus measures gambling-related urge. Crucially, the validation of scales assessing gambling urge is complex because this construct is better conceptualized as a state (a transient and context-determined phenomenon). In the present study, we tested the psychometric properties of the French version of the GACS with 2 independent samples of community gamblers following an induction procedure delivered through an audio-guided imagery sequence aimed at promoting gambling urge. This procedure was specifically used to ensure the assessment of gambling urge as a state variable. Participants also completed measures of gambling severity, gambling cognitions and motives, impulsivity, and affect. Confirmatory factor analysis showed that the original 3-factor solution (anticipation, desire, relief) did not fit the data well. Additional exploratory factor analysis suggested instead a 2-factor solution: an intention and desire to gamble dimension and a relief dimension. The factorial structure resulting from the exploratory factor analysis was tested with confirmatory factor analysis in a second independent sample, resulting in an acceptable fit. The 2 dimensions presented good internal reliability and correlated differentially with the other study's variables. The current study showed that, similar to what has been reported for substance-related urges, gambling urges are adequately probed with a bidimensional model. The findings suggest that the French GACS has good psychometric properties, legitimizing its use in research and clinical practice.

Keywords: gambling, craving, urge, assessment, GACS

Influential models posit craving as a central construct to explain the maintenance and exacerbation of gambling disorder (Blaszczynski & Nower, 2002; Brevers & Noël, 2013; Sharpe, 2002). Craving also has a pivotal role in gambling disorder relapse (Oei & Gordon, 2008) and treatment attrition (Smith et al., 2010). Recent evidence supports the natural course of gambling craving (before treatment, during treatment, after treatment) as a relevant clinical outcome in assessing treatment effectiveness (Caler, Garcia, & Nower, 2016; Pickering, Keen, Entwistle, & Blaszczynski, 2018). Although research findings converge to highlight that craving is not unique to drugs and plays a pivotal role in gambling disorder (e.g., Grant & Kim, 2003; Ladouceur, Sévigny, Blaszczynski, O'Connor, & Lavoie, 2003; Wood & Griffiths, 2007), research conducted in the gambling field has often used terms such

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as craving, urge, or desire interchangeably (e.g., Ashrafioun & Rosenberg, 2012; Young, Wohl, Matheson, Baumann, & Anisman, 2008). Such conceptual confusion was in particular favored by the fact that influential models, such as that by Tiffany and Conklin (2000), define craving as the desire or urge for positive reinforcement (e.g., feeling high) and/or for negative reinforcement (e.g., feeling relieved), thereby equating constructs such as craving, desire, and urge. Crucially, recent cognitive approaches of craving provided a theoretical background that allows for distinguishing these constructs and for assuming their specificity (the elaborated intrusion theory of desire; see Kavanagh, Andrade, & May, 2005; May, Andrade, Panabokke, & Kavanagh, 2004). According to these models, craving constitutes an elaborate and obsessive cognitive experience that encompasses other complex and multisensorial mental imagery processes, whereas urge can be considered the immediate perspective of positive and/or negative reinforcement (Cornil et al., 2018; Kavanagh et al., 2005). From such a perspective, urge plays an important role in the broader craving experience but does not at all constitute the craving experience *per se*.

The inconsistency in the labels used to describe the craving experience has also impacted its assessment, resulting in a situation in which scales that use various labels (e.g., urge, craving, desire, obsession) are generally postulated as measuring a similar underlying construct (i.e., gambling craving). Several scales have thus been developed to assess constructs such as gambling urge and craving, most inspired by or transposed from instruments developed in the substance use disorder field (for recent reviews, see Ashrafioun & Rosenberg, 2012; Caler et al., 2016). Early instruments consisted of single-item rating scales assessing the intensity of an urge or desire to gamble, but successive refinement of these instruments revealed the importance of assessing a variety of specific emotional, cognitive, and physiological experiences that characterize gambling urge and/or craving. The need for valid multidimensional assessment measures led to the development of the Gambling Craving Scale (GACS; Young et al., 2009). The GACS is a nine-item self-report measure of gambling craving adapted from the Questionnaire on Smoking Urges (QSU; Tiffany et al., 1991), which is largely used to measure two dimensions of cigarette craving, namely intention and desire to smoke (expectation of positive reinforcement) and relief from negative affect (expectation of negative reinforcement; e.g., Cox, Tiffany, & Christen, 2001; Dethier, Heeren, Galanti, Philippot, & Billieux, 2014). The GACS is to date considered the main and most used measure of gambling craving (Ashrafioun & Rosenberg, 2012; Caler et al., 2016), especially when it comes to experimental studies aiming to induce or mitigate gambling craving (e.g., cue reactivity or intervention studies). Notably, despite being generally thought to measure craving and being named after this construct, the GACS was developed by adapting the QSU and in fact measures gambling urge.

The GACS was validated by Young et al. (2009) through a classic two-step strategy in which they used exploratory factor analyses (EFAs) and confirmatory factor analyses (CFAs) in two independent samples of gamblers. EFAs with a Promax oblique rotation suggested a three-factor solution (anticipation, desire, relief; Study 1 with undergraduate gambler students), which was further supported by a CFA (Study 2 with community gamblers). Thus, as measured by the GACS, gambling urge encompasses both (a) the anticipation of the consequences of gambling (i.e., expectations of fun and enjoyment and/or relief from negative subjective experiences) and (b) the desire to gamble to obtain these consequences (i.e., reinforcements).

An important limitation of these previous psychometric studies is that they failed to ensure that participants completing the scale actually experienced a gambling urge, and at the same time, the scale included only state-based items (e.g., Item 1: "Gambling would be fun right now"). A potential consequence of such an approach is that it is likely that most undergraduate students included in the original validation (Young et al., 2009; Study 1) did not experience a gambling urge when they were asked to respond to the items, which could have affected their answers and thus the proposed factor structure of the GACS. Indeed, craving and/or urge consists of transient and context-dependent subjective states (Drummond, 2001; Sayette et al., 2000); it is thus questionable whether asking undergraduate students to respond to items that measure current urge without having elicited it is likely to result in a reliable factor model. This issue is particularly critical because the GACS is often used as a state measure in experimental cue reactivity or intervention studies inducing or targeting craving and/or urge episodes (e.g., Bouchard et al., 2017; Brevers et al., 2017; Ciccarelli, Nigro, Griffiths, Cosenza, & D'Olimpio, 2016). To capitalize on a multidimensional measurement of gambling urge (such as that proposed for the GACS), researchers should therefore validate such a model in participants who have undergone an urge induction procedure. Moreover, although some studies used translated versions of the GACS (e.g., French version: Bouchard et al., 2017; Brevers et al., 2017), the only available psychometric study on the scale is the initial paper by Young et al. (2009). Accordingly, further psychometric studies are required to establish the psychometric properties of the GACS, which is the most commonly used scale to measure gambling urge.

The present study was designed to address these limitations by testing the psychometric properties of the GACS following an induction procedure to confirm or reject the proposed three-factor model of gambling urge obtained in a sample of undergraduate students (Young et al., 2009). More precisely, the present study tested the psychometric properties of the French version of the GACS in two independent samples of community gamblers following an induction procedure delivered through an audio-guided imagery sequence. This procedure was specifically used to ensure that the measure of gambling urge is conceptualized as a state variable. Construct validity of the French version of the GACS was also tested by considering its relation with gambling-related constructs (gambling cognitions and gambling motives) and constructs known to have an influence on gambling urge and related craving experiences (impulsivity traits and affect).

Method

Participants

This study was conducted by using a cross-sectional online survey. Two independent samples of community gamblers were recruited through online advertisements on research-related websites and Facebook groups. Inclusion criteria were being at least 18 years old, being a fluent French speaker, and having gambled at least once in the past year. The independence of the two samples was guaranteed by using the personal data collected (i.e., Internet protocol address and e-mail address) to remove participants from Sample 2 who had

already completed the online survey (in Sample 1). These data were dissociated from the data set before the analyses to ensure confidentiality. All participants provided online consent prior to starting the survey. The Ethical Committee of the Psychological Sciences Research Institute at the Université catholique de Louvain (Belgium) approved the study protocol.

Procedure

The online survey consisted of three sections. The first concerned the central variables of the study (e.g., the French GACS, gambling-related information, affective states). The second comprised additional trait measures (e.g., impulsivity traits, gambling cognitions) used to support the validity of the GACS. The last section of the survey (optional in Sample 1 and mandatory in Sample 2)[1] consisted of an induction procedure (aimed at promoting gambling urge) followed by the completion of the GACS. The first section of the online survey contained demographic items, the Positive and Negative Affect Schedule (Watson, Clark, & Tellegen, 1988; French version: Gaudreau, Sanchez, & Blondin, 2006), items assessing gambling preferences, the French GACS (Young et al., 2009),[2] and the Problem Gambling Severity Index (PGSI; French items; Ferris & Wynne, 2001). The second section of the online survey consisted of additional questionnaires presented in random order: the short UPPS-P Impulsive Behavior Scale (Billieux et al., 2012), the Gambling Motives Questionnaire–Financial (Schellenberg, McGrath, & Dechant, 2016; French version: Devos et al., 2017), and the Gambling-Related Cognitions Scale (Raylu & Oei, 2004a; French version: Grall-Bronnec et al., 2012). Participants were next asked whether they agreed to participate in the third section of the survey. On agreement, the induction procedure was delivered through an audio-guided imagery sequence based on the imagery script described by Ashrafioun, McCarthy, and Rosenberg (2012). The induction lasted 156 s, and the script was read with an enthusiastic tone. Relaxation was first induced, after which participants were instructed to picture themselves, as vividly as possible, discussing gambling wins with friends. Several gambling types were mentioned, including bets, lottery tickets, casino games, slot machines, dice, poker, and blackjack. Participants were asked to think about their favorite ways to gamble and to mentally picture themselves gambling for 15 s. Finally, they were instructed to open their eyes. Participants then completed the GACS a final time (Young et al., 2009). In Sample 2, the GACS was administered only after the induction procedure. A short recorded audio-guided mindfulness session was proposed to avoid carryover effects related to the experiment. The GACS (Young et al., 2009) was translated from English into French and then backtranslated to English to establish consistency with the original English version. The total score ($\alpha = .87$ before induction; $\alpha = .89$ after induction) was used to confirm the effect of the induction procedure. Details about the scales used are presented in Table 1.

Two independent samples were used in the current study. Three respondents (one in Sample 1; two in Sample 2) were excluded based on outliers or extreme responses (age $>$ 90 years). In Sample 1, 187 participants started and completed the online survey, but 22 did not agree to take part in the third section of the online survey. Therefore, 165 participants between ages 18 and 68 years were used for data analysis. Sample 2 comprised 256 participants between ages 18 and 74 years (see Table 2 for the demographic details of both samples), who all underwent the induction procedure. Participants had the opportunity to receive compensation (5 Euros) by providing their e-mail at the end of the survey (45.5% of Sample 1 and 53.5% of Sample 2 required compensation). For both samples, there were no differences between participants requiring compensation or not in terms of demographics (age and gender) or problem-gambling symptoms (Problem Gambling Severity Index score). The first sample was used in the initial analyses to test the structural validity of the French GACS based on the model validated by the authors of the GACS (Young et al., 2009), whereas the second sample was used for cross-validation.

Results

Descriptive statistics for gambling behaviors (frequency and severity) are outlined in Table 2. The results of the repeated-measures analysis of variance conducted on the GACS (total score precraving and postcraving induction) showed a significant main effect of time, $F(1, 164) = 42.92$, $p < .001$, $\eta^2 = .21$. Post hoc tests showed that the two time points differed significantly (T0 [preinduction] $<$ T1 [postinduction], $p < .001$) in the expected direction (higher global urge following the induction procedure): T0: $M = 27.08$, $SD = 10.22$; T1: $M = 31.04$, $SD = 11.62$; mean change from T0 = 3.96 (7.76). Such analysis ensured the efficacy of the induction procedure and supported the relevance of subsequent analyses to establish the structural validity of the GACS as a scale measuring a state construct. We also tested whether different levels of problem gambling based on the PGSI scores (nonproblem gamblers, low-risk gamblers, moderate-risk gamblers, problem gamblers) impacted the efficacy of the induction procedure, which was not the case ($p = .80$).

The first step of our psychometric investigation, conducted in Sample 1, consisted of testing the expected three-factor structure of the GACS (Young et al., 2009) with a CFA. Because the induction procedure proved efficient, data on the GACS completed postinduction were used for these analyses. As suggested by Rhemtulla, Brosseau-Liard, and Savalei (2012), given that the data were ordinal (e.g., Likert scale), the weighted least squares mean and variance robust estimator was used in all CFAs. Four widely accepted fit indices with established cutoffs were used to determine the acceptability of model fit (Kline, 2010): (a) χ^2 test, (b) Bentler's comparative fit index (CFI; values above .90 suggest acceptable fit); (c) root mean square error of approximation (RMSEA; values less than .07 indicate acceptable fit); and (d) standardized root-mean-square residual (SRMR; values less than .08 suggest acceptable fit). The CFA of the three-factor GACS presented a poor fit of the data ($\chi^2 = 151.41$, $df = 24$, $p < .001$; RMSEA = 0.18 [0.15–0.21], CFI = .99, SRMR = 0.11).

In accordance with this initial result and considering that the structural validity of the GACS was tested only in a unique study

[1] After the large majority of participants agreed to undergo the craving induction in Sample 1 and to limit the number of nonusable data (only participants having completed the three sections were retained for analyses), we decided to make the craving induction procedure mandatory for Sample 2.

[2] The craving induction procedure was efficient in Sample 1 (see *Results* section), so we decided not to administer the GACS two times in Sample 2 for time-saving purposes.

Table 1
Characteristics and Reliability for the Scales

Author (year)	Questionnaire	Number and type of items	Response format	Reliability (Sample 2)[a]
Young and Wohl (2009)	Gambling Craving Scale (GACS)	9 items distributed on 3 subscales (anticipation, desire, and relief)	7-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*)	Subscale αs ranging from .78 to .87[b]
Ferris and Wynne (2001)	Problem Gambling Severity Index (PGSI)	9 items	4-point Likert scale: 0 (*never*), 1 (*sometimes*), 2 (*most of the time*), 3 (*almost always*)	Total score $\alpha = .84$
Billieux et al. (2012)	Short UPPS-P Impulsive Behavior Scale (S-UPPS-P)	20 items distributed on 5 subscales (negative urgency, positive urgency, lack of premeditation, lack of perseverance, and sensation seeking)	4-point Likert scale: 1 (*I agree strongly*), 2 (*I agree somewhat*), 3 (*I disagree somewhat*), 4 (*I disagree strongly*)	Subscale αs ranging from .77 to .84
Grall-Bronnec et al. (2012)	Gambling-Related Cognitions Scale (GRCS)	23 items distributed on 5 subscales (interpretative bias, illusion of control, predictive control, gambling expectancies, and perceived inability to stop gambling)	7-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*)	Subscale αs ranging from .75 to .90
Devos et al. (2017)	Gambling Motives Questionnaire-Financial (GMQ-F)	15 items distributed on 4 subscales (coping, enhancement, social, and financial)	4-point Likert scale: 1 (*never or almost never*), 2 (*sometimes*), 3 (*often*), 4 (*almost always or always*)	Subscale αs ranging from .74 to .84
Gaudreau, Sanchez, and Blondin (2006)	Positive and Negative Affect Schedule (PANAS)	20 items distributed on 2 subscales (positive affect and negative affect)	5-point Likert scale: 1 (*not at all or very slightly*), 2 (*a little*), 3 (*moderately*), 4 (*quite a bit*), 5 (*extremely*)	Subscale αs .81 and .90, respectively

[a] Reliability values (Cronbach's alpha) were presented for Sample 2, given that all the measures were used for the convergent validity analysis (assessed by using Sample 2). [b] These values concern the original three-factor solution (anticipation, desire, relief).

(Young et al., 2009) that presented several limitations (e.g., absence of an induction procedure), we decided to conduct an additional EFA to identify a potential alternative model to be compared with the original three-factor model. An EFA with principal axis factoring was thus performed to explore the structure of the scale. Oblique rotation (Promax) was used to allow factors to correlate and to increase their interpretability, which is similar to the strategy generally used for multidimensional craving and/or urge scales (e.g., Chauchard, Goutaudier, Heishman, Gorelick, & Chabrol, 2015; Young et al., 2009). Two widely used criteria were applied to determine the number of nontrivial factors to be retained: (a) eigenvalues greater than 1.00 and (b) the scree test (Cattell, 1966). The Kaiser-Meyer-Olkin measure of sampling adequacy (.86) and Bartlett's test of sphericity ($\chi^2 = 1286.91$, $df = 36$, $p < .001$) indicated that the correlation matrix was appropriate for conducting the analysis. Both the eigenvalue criterion and the scree test suggested the presence of two nontrivial factors. More specifically, EFA produced two factors with eigenvalues greater than 1.00 (5.01, 1.96) that explained 77.43% of the variance, exceeding the 50% recommended for a meaningful factor solution (Floyd & Widaman, 1995). Two items (4 and 6) loading similarly and heavily (>.49) on both factors were removed, and the EFA was performed again. The subsequent EFA produced two factors with eigenvalues greater than 1.00 (3.66, 1.72) that explained 76.87% of the variance. All items exceeded factor loadings of .40 (see Table 3). The items loading on the first factor reflected an intention to gamble characterized by planning and expectation of positive effects (fun, excitement, enjoyable); therefore, the first extracted factor was labeled Intention and desire to gamble. Items loading on the second factor reflected relief from negative affect expected from gambling; consequently, the second extracted factor was labeled Relief from negative affect. The two factors were moderately intercorrelated ($r = .29$; $p < .001$), suggesting that the GACS comprised two relied but specific factors related to gambling urge. The factors were renamed according to the QSU labels because the GACS was developed after this scale.

A new series of CFAs were conducted in an independent sample (Sample 2) to test the derived two-factor structure of the French GACS from the results in Sample 1. Several models were tested and compared: the initial three-factor model (Model A) by Young et al. (2009), the two-factor model resulting from the EFA conducted in Sample 1 (Model B), and a one-factor model (Model C), because most recent published studies with the GACS rely only on the global score (see, e.g., Caselli & Spada, 2015; Fernie et al., 2014; Harrison, Jessen, Lau, & Ross, 2018; Takeuchi et al., 2016). Among the three models (see Table 4 for the fit indices), the CFA showed that the two-factor model produced an acceptable fit, $\chi^2(13) = 25.02$, $p = .023$; RMSEA = 0.06 [0.02–0.09], CFI = .99, SRMR = 0.05. As expected, the indicators all showed significant positive factor loadings, with standardized coefficients ranging from .47 to .94 (see Table 3). Finally, the model that allows covariances between the two latent craving factors fits the data significantly better than does the model that treats the latent factors as independent, $\chi^2(1) = 198.93$, $p < .001$.

Internal consistency was examined by computing Cronbach's alpha and composite reliability (Raykov, 1997) on the basis of the identified factors. Composite reliability was computed with an online calculator (Colwell, 2016). Both values were good to ex-

Table 2
Sample Characteristics

Characteristic	Sample 1 (N = 165)	Sample 2 (N = 256)	Statistical test
Mean age (*SD*)	29.94 (11.85)	27.67 (10.34)	p = .04
Sex (%)			*ns*
Male	41.2	44.5	
Female	58.8	55.5	
Nationality (%)			p = .001
Canadian[a]	.6	0	
Belgian[b]	16.4	29.7	
French[b]	78.8	66.4	
Swiss[a]	2.4	0	
Other[a]	1.8	3.9	
Mother tongue (%)			*ns*
French	98.2	95.3	
Other	1.8	4.7	
Education (%)			*ns*
None	.6	0	
Primary	0	.8	
Secondary	11.5	20.7	
Diploma of collegial studies (Canada)	0	.8	
Bachelor	48.5	48.0	
Master	32.1	25.4	
PhD	2.4	2.3	
Other	4.8	2.0	
Gambling frequency (%)			*ns*
At least a few times a year	38.2	44.1	
At least once a month	18.2	19.9	
A few times a month	15.2	14.8	
Once a week	13.9	8.6	
A few times a week	13.3	11.7	
Every day	1.2	.8	
Mean PGSI (*SD*)	3.41 (4.23)	2.81 (3.20)	*ns*
PGSI score (%)			*ns*
Non–problem gamblers [PGSI = 0]	30.9	28.8	
Low-risk gamblers [PGSI = 1–2]	25.5	30.5	
Moderate-risk gamblers [PGSI = 3–7]	29.1	30.5	
Problem gamblers [PGSI ≥8]	14.5	10.2	

Note. PGSI = Problem Gambling Severity Index; *ns* = not significant. Sample characteristics were compared with analysis of variance for continuous variables and χ^2 tests for categorical variables.
[a] groups do not differ significantly. [b] groups differ significantly.

cellent for the two subscales: Intention and desire to gamble (α = .78; composite reliability = .81) and Relief from negative affect (α = .86; composite reliability = .92). There was also a significant positive correlation between the two factors, r = .40, $p < .001$.

In the last step of our data analyses, convergent validity was assessed by examining the correlations between GACS scores and measures of gambling participation (gambling frequency and problem gambling symptoms), other gambling-related variables (gambling cognitions and gambling motives), and addiction and urge-related constructs (impulsivity and affect). A series of correlation comparisons were conducted by using Eid, Gollwitzer, and Schmitt's (2011) calculations via the Psychometrica online calculator (Lenhard & Lenhard, 2014). Pearson correlation analyses revealed significant relationships between the Relief from negative affect factor and gambling frequency and problem gambling symptoms (see Table 5). In contrast, the Intention and desire to gamble factor presented a lower correlation with problem gambling symptoms (comparison of correlations test, $p < .001$). To determine how the two GACS subscales were associated with gambling motives, problematic gambling-related cognitions, impulsivity traits, and affect, we examined the simple correlations between each GACS subscale (see Table 5). The correlations between Relief from negative affect (GMQ social/GMQ coping) and the five GRCS subscales (r = .36–.60) were statistically significantly higher than those between Intention and desire to gamble (GMQ social/GMQ coping) and the five GRCS subscales (r = .14–.41; all comparisons of correlations test, $p < .001$).

Discussion

This study aimed to test the psychometric properties of the French GACS following an induction procedure in community gamblers. The main results are that, although the original three-factor model of the GACS had a poor fit, a two-factor model derived from the combined use of EFAs and CFAs in two independent samples adjusted well to the data (after two of the original items were removed). Crucially, our study tested the structural validity of the GACS following an induction procedure because the items assessed gambling urge as a state, that is, a fluctuant and transient phenomenon. The first factor, which corresponds to In-

Table 3
Factor Loadings on the Two Factors of the Gambling Craving Scale (GACS)–French Version

Items	EFA (Sample 1; $n = 165$) rotated factor loadings		CFA (Sample 2; $n = 256$) standardized factor loadings	
	Factor 2	Factor 1	Factor 2	Factor 1
Item 1: "Gambling would be fun right now."		.87		.92
Item 2: "If I had an opportunity to gamble right now, I probably would take it."		.92		.85
Item 3[a]: "I would not enjoy gambling right now."		.41		.47
Item 5: "I need to gamble right now."	.75		.87	
Item 7: "If I were gambling now, I could think more clearly."	.92		.94	
Item 8: "I could control things better right now if I could gamble."	.94		.90	
Item 9: "Gambling would make me less depressed."	.83		.70	
Explained variance (R^2)	52.29	24.58		

Note. EFA = exploratory factor analysis; CFA = confirmatory factor analysis. Factor 1: Intention and desire to gamble; Factor 2: Relief from negative affect.
[a] Reverse-coded item.

tention and desire to gamble, consisted of three items (Items 1, 2, and 3), all part of the original GACS factor anticipation of positive affect. The second factor corresponds to Relief from negative affect, consisting of four items. Three (Items 7, 8, and 9) were part of the original GACS factor, relief, and one (Item 5) was part of the original GACS factor, desire (Young et al., 2009). Notably, these two factors, Intention and desire to gamble and Relief from negative affect, are consistent with those previously reported in studies that used the QSU (Tiffany et al., 1991) in samples of cigarette smokers (e.g., Toll, Katulak, & McKee, 2006) and marijuana consumers (Chauchard et al., 2015). This consistency in results between the present study and these studies is important because the GACS items are directly inspired from the QSU items. For example, the two-factor model of the GACS in the present study is aligned with the 10-item QSU-Brief (Cox et al., 2001).

The inconsistency between our results and those of the original study may be due to a crucial difference in methodological approaches because, for theoretical reasons, we decided to test the psychometric structure of the GACS following an induction procedure. Such a procedure in our view better reflects the experiences of gamblers in the real context of gambling in comparison with the previous measurement approach, and it allowed us to model a semiecological situation in which gambling urge is prompted by external gambling-related cues. Beyond this important methodological point, it is worth noting that some differences between our samples and those of Young et al. (2009) could have contributed to the differences in results (e.g., demographic differences, cultural differences, or language differences related to the craving term; see Hormes & Rozin, 2010). To overcome these language differences, further studies must be undertaken to investigate the structure of the English GACS following an induction procedure.

This study also provided additional evidence regarding the convergent validity of the French version of the GACS by highlighting that the Intention and desire to gamble and the Relief from negative affect factors were positively associated with problem gambling symptoms and problematic gambling-related cognitive distortions (e.g., Young

Table 4
Fit Statistics for the CFA Models (Sample 2, n = 256)

Model	χ^2	*df*	*p*	CFI	SRMR	RMSEA (90% CI)
Model A	95.27	24	<.001	.99	.08	.11 (.09–.14)
Model B	25.02	13	.023	.99	.05	.06 (.02–.09)
Model C	192.61	14	<.001	.97	.13	.22 (.20–.25)

Note. CI = confidence interval; CFI = comparative fit index (>.90); SRMR = standardized root mean square residual (<.08); RMSEA = root mean square error of approximation (<.07). Model A = three-factor model proposed by Young and Wohl (2009); Model B = two-factor model resulting from the exploratory factor analysis conducted in Sample 1; Model C = one-factor model.

Table 5
Pearson Correlations Between the Two Factors of the GACS and Demographic Characteristics, Gambling Related Variables, Impulsivity Traits, and Affect

Vatiables	Factor 1	Factor 2	*z*
Gender (1 = male; 2 = female)	.11	.04	
Age	−.04	.03	
Gambling frequency	.05	.14*	
PGSI total score	.18**	.45***	−4.24***
GMQ-social	.14*	.44***	−4.67***
GMQ-coping	.22***	.54***	−5.24***
GMQ-enhancement	.35***	.36***	−.16
GMQ-financial	.21**	.16*	.74
GRCS-gambling expectancies	.41***	.56***	−2.63**
GRCS-illusion of control	.26***	.53***	−4.45***
GRCS-predictive control	.34***	.47***	−2.13*
GRCS-inability to stop gambling	.22***	.60***	−6.41***
GRCS-interpretative bias	.36***	.47***	−1.82*
Negative urgency	.17**	.23***	−.89
Positive urgency	.04	.11	
Lack of premeditation	.05	.05	
Lack of perseverance	.05	.07	
Sensation seeking	.04	.19**	
Positive affect	.15*	.12*	.44
Negative affect	−.10	.12*	

Note. GACS = Gambling Craving Scale; PGSI = Problem Gambling Severity Index; GMQ = Gambling Motives Questionnaire; GRCS = Gambling-Related Cognitions Scale. Factor 1: Intention and desire to gamble; Factor 2: Relief from negative affect. The z column refers to the comparisons of correlations.
* $p < .05$. ** $p < .01$. *** $p < .001$.

et al., 2009). An additional point was that these two subtypes of gambling urge were positively associated with gambling motives, affect, and impulsivity traits. More specifically, Relief from negative affect was more strongly associated with cognitive distortions and gambling motives than was Intention and desire to gamble. This result can be linked to emotional vulnerabilities of the gamblers that led to their repeated inability to restrain themselves from urges to gamble. This result can be linked to emotional vulnerabilities of the gamblers that led to their repeated inability to restrain themselves from urges to gamble (see the pathways model of problem and pathological gambling; Blaszczynski et al., 2002). In addition, these results are in line with the studies reviewed by Brevers et al. (2013) showing that comparable sensitization to addiction-related cues happens in pathological gambling, which encompasses the presence of gambling-related urge during gambling cue reactivity and higher activity in the brain reward system in the course of anticipating and expecting gambling outcomes.

Several limitations of the study have to be acknowledged. First, the current study was conducted in nonclinical gamblers; further examination of the GACS in patients with gambling disorder is thus required for this reason as well as because in our study, disordered gambling symptoms (assessed with the PGSI) did not moderate the effect of the induction procedure. Second, the study involved only self-reported measures, which are known to be flawed by social desirability or lack of introspection biases. Third, the study did not include a no-exposure control group. Consequently, it is not possible to ascertain that the increase in urge could result, at least partly, from completing the GACS on two separate occasions within a short period and not necessarily from the induction procedure used. Further studies should also consider concurrent measures of gambling urge (e.g., Gambling Urge Scale; Raylu & Oei, 2004b), craving (e.g., Craving Experience Questionnaire; May et al., 2014), or related constructs such as gambling dark flow (i.e., a pathological absorption or dissociative state that can be assessed with the Game Experiences Questionnaire; Dixon et al., 2018) to establish convergent validity.

Despite these limitations, the present research is the first to examine the factor structure of the GACS by using data obtained after an induction procedure. The results suggest that gambling urge is a construct composed of the expected consequences of gambling (Relief from negative affect–Intention and desire to gamble). The French GACS presents good psychometric properties and can be considered a reliable instrument to measure gambling urge as a state construct in experimental research devoted to the manipulation of such a state as well as in clinical practice. Ultimately, although we decided not to rename the scale investigated in the current study to avoid complicated comparisons with previous research, it is crucial to bear in mind that the GACS, in line with the scales from which it was inspired (i.e., the QSU), is adapted to measure the relatively narrow construct of gambling urge and not the broader and multidetermined construct of gambling craving.

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