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The Gambling Urge Scale: Reliability and validity in a clinical population

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The aim of this study was to establish reliability and validity of the Gambling Urge Scale (GUS) in a clinical population of problem gamblers. This cohort study was conducted in South Australia between March 2008 and March 2009. Participants were problem gamblers aged $\geq$18 years ($n = 158$) who were seeking treatment from a range of gambling help services. Measures included gambling urge, problem gambling screening, gambling behaviour and problems caused by gambling, such as personal health and relationships. The psychometric properties investigated were internal reliability, criterion-related validity, concurrent validity and construct validity. Results showed high internal consistency for GUS ($\alpha = 0.93$) and significant item-rest correlations ranging from 0.72 to 0.86. For criterion-related validity, a GUS cut score of three correctly classified 81.13% of participants as problem gambling with sensitivity 84.75% and specificity 76.6%. Concurrent validity was significant with a number of gambling-related symptoms and problems including psychological disturbance, work and social functioning and gambling-related cognitions ($p < 0.001$). An insignificant correlation was found between gambling urge and sensation seeking traits ($p = 0.663$). When controlling for gender and age the instrument was shown to have significant predictive properties for different levels of gambling severity ($p < 0.001$). A principal component analysis for the one component showed an overall explained variance of 75.54%. These findings indicate that GUS is a valid and reliable instrument for problem gambling screening, to measure treatment outcomes and may predict relapse in problem gambling.

Keywords: *Problem gambling, Gambling Urge Scale, reliability, validity, clinical population*

INTRODUCTION

Pathological gambling (PG) is defined by the American Psychiatric Association (2000) DSM-IV-TR as '. . . persistent and recurrent maladaptive gambling behaviour that disrupts personal, family and vocational pursuits'. The term 'problem gambling' typically defines a wider spectrum of gambling disorders and has been used to develop diagnostic instruments, such as the Canadian Problem Gambling Index (CPGI; Ferris & Wynne, 2001) and the Victorian Gambling Screen (VGS; Ben-Tovim, Esterman, Tolchard, & Battersby, 2001). Estimates of the prevalence of individuals with gambling disorders in the Australian adult population average around 2% (Delfabbro, 2008). Prevalence rates in other countries have ranged from approximately 0.5–2% or more (Becona, 1996; Bondolfi, Osiek, & Ferrero, 2000; Shaffer & Hall, 2001; Wardle et al., 2007; Wong & Ernest, 2003).

There are numerous dominant models to explain gambling disorders including cognitive and psychobiological approaches (Clark, 2010). The cognitive approach is based on erroneous beliefs (e.g. 'luck helps me win') and inaccurate perceptions (e.g. 'gambling makes things better for me'), the gambler holds about notions of randomness (Ladoucer et al., 2001; Raylu & Oei, 2004a) which are rewarded, learned and become habitual. Evidence for this approach has come predominantly from 'think aloud' techniques where gamblers have verbalised their perceptions and beliefs during gambling activities (Gadboury & Ladouceur, 1989). The psychobiological approach is focused on brain function using comparative studies between cases (problem gamblers) and controls (non-problem gamblers). Neurochemical studies have shown that there are links between neurotransmitters (e.g. dopamine) and psychophysiological arousal in problem gamblers when they are exposed to gambling cues and that these

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effects are mediated within the brain 'reward system' in neuropsychological and neuroimaging studies (Clark, 2010).

Previous research has established commonalities between gambling disorders and substance use disorders (SUD) in neurocognitive and physiological pathways (Paris, Franco, Sodano, Frye, & Wulfert, 2009; Tamminga & Nestler, 2006) resulting in the proposed reclassification of PG from 'Impulse-Control Disorders Not Elsewhere Classified' to 'Addiction and Related Disorders' in the forthcoming DSM-5 (American Psychiatric Association, 2010). Central to the maintenance of SUD and relapse after a period of abstinence are urge or craving states experienced by individual users (Bohn, Krahn, & Staehler, 1995; Tiffany, 1992). Whilst not a diagnostic criterion for substance dependence in DSM-IV-TR, craving is stated to be experienced by 'most (if not all)' individuals with the disorder (American Psychiatric Association, 2000).

Similarly, urge states play an important role in gambling pathology (Raylu & Oei, 2004b) and have been proposed by DSM to increase during periods of psychological disturbances, such as depression and stress (American Psychiatric Association, 2000). The physiological state of gambling urge can arise from internal triggers (e.g. depression) and external triggers (e.g. gambling cues) that activate arousal and gambling-related cognitions (Sharpe, 2002). Imaging studies have established links between intensities of self-reported gambling urges and changes in brain activity including retrieval and processing of emotion and impulse regulation (Balodis, Lacadie, & Potenza, 2011; Potenza et al., 2003) and involve the same neural substrates as urge or craving in SUD.

A number of psychometric instruments for measuring self-reported urges and craving have been developed that are specific to gambling disorders, although with limited external validity (Ashrafioun & Rosenberg, 2011). The Gambling Symptom Assessment Scale comprises 12 items which measure average symptom levels in the domains of urge, thoughts associated with gambling and gambling behaviours. Participants met DSM-IV criteria for PG and were recruited through newspaper advertisements and referrals for pharmacologic intervention in a drug treatment study (Kim, Grant, Potenza, Blanco, & Hollander, 2009). Another measure, the gambling craving scale (GACS) was developed using first-year university students and found three factors from nine items comprising anticipation, desire and relief (Young & Wohl, 2009). Further validation of GACS psychometric properties was conducted with a community sample of gamblers.

The Gambling Urge Scale (GUS) is a six-item scale based on the Alcohol Urge Questionnaire (AUQ). The AUQ eight-item scale was developed from pre-testing a 49-item questionnaire measuring several urge-related domains in 351 abstinent, treatment-seeking alcoholics. Results indicated that alcohol urges were best described by a single factor (Bohn et al., 1995). The GUS was developed and validated using a community sample of 968 volunteers recruited by advertising and undergraduate university students (Raylu & Oei, 2004b). Of these, approximately 48 (5.0%) study participants were classified as 'problem gamblers' based on the validated South Oaks Gambling Screen (SOGS) for lifetime problem gambling (Lesieur & Blume, 1987; Stinchfield, 2002). The GUS was shown to have sound psychometric properties and measure urge on a single factor. Following the creation of GUS in 2004, further validation of the instrument's psychometric properties has been conducted in a Chinese community sample (GUS-C) comprising Australian and Taiwanese residents (Oei, Lin, & Raylu, 2007).

Studies utilising GUS as an outcome measure have included the psychophysiology of gambling in which electrodermal and cardiac activities were monitored (Wilkes, Gonsalvez, & Blaszczynski, 2010) and the effects of cue exposure on craving to gamble (Ashrafioun, McCarthy, & Rosenberg, 2011) in university students. The GUS has also been used in a randomised control trial to investigate gambling treatments with volunteer participants (Oei, Raylu, & Casey, 2010) and in another study investigating the association of psychosocial factors with abstinence and relapse in members of Gamblers Anonymous (Oei & Gordon, 2008). The instrument has also been used as a treatment outcome measure for problem gamblers engaged in cognitive behaviour therapy (Smith et al., 2010).

At the Statewide Gambling Therapy Service and Flinders Gambling Research Centre in South Australia, urge exposure and response prevention are used in both research studies and the clinical management of problem gamblers. The GUS was selected in preference to other measures as it is not only brief, but also broad enough in scope for problem gamblers to identify various components of urge (Bohn et al., 1995).

In the original GUS paper a call was made for further investigations of the instruments psychometric properties in clinical samples (Raylu & Oei, 2004b), however to the best of our knowledge no such studies have been conducted to date. The establishment of reliability and validity in self-reported gambling urge is required in a range of settings in order to feel confident in the use of such tools. Treatment-seeking problem gamblers are one subgroup of the clinical population and often present to help services in response to gambling-related harms including psychological distress and higher levels of suicidal ideation and behaviour (Battersby, Tolchard, Scurrah, & Thomas, 2006; Suurvali, Hodgins, & Cunningham, 2010). Therefore, this study was designed to assess the reliability and validity of GUS in treatment-seeking problem gamblers.

A number of psychometric indicators were determined important for evaluating GUS in treatment seekers. These were internal reliability, criterion-related

validity, construct validity and concurrent validity of GUS due to expected variation between community samples and a clinical sample in severity of symptoms and related problems. The variables that have been linked with problem gambling include gambling-related cognitions (Raylu & Oei, 2004a), sensation seeking traits (Ashrafioun et al., 2011), comorbid conditions such as depression, anxiety and alcohol use (Lorains, Cowlishaw, & Thomas, 2011) and social factors (Afifi, Cox, Martens, Sareen, & Enns, 2010). These validation strategies provide a comprehensive coverage for assessing potential utility of GUS in treatment and research settings.

METHODS

Participants

The participants in this study were adults ($n = 158$) who were seeking assistance from a range of community-based outpatient gambling help services in metropolitan South Australia. All of the services contacted agreed to participate. This study was part of a prospective cohort study examining relapse in problem gambling (Battersby et al., 2010).

Measures

Baseline demographic variables: gender, age, relationship and employment status as well as data for self-reported duration of gambling problem (<2 years, 2–5 years, 5+ years) and primary form of gambling (electronic gaming machines (EGMs), TAB/racing, casino games, raffles/bingo/bingo tickets, scratch tickets/X-lotto/Powerball, Keno, private gambling, e.g. card games, sports betting and other) were collected.

The following measures of problem gambling symptoms and behaviours were collected at baseline and at three or six months if data were missing at three months.

Urge

The GUS is a questionnaire measuring the extent of gambling urge based on the participant's self-reported thoughts and feelings at the time of completing the questionnaire. The scale consists of six items rated on a Likert (0–7) scale (total scores ranging from 0 to 42) including statements such as 'I crave a gamble right now' and 'All I want to do is gamble'. A final score is generated as a total of the response to each item and higher scores indicate greater urges to gamble. Research into concurrent, predictive and criterion-related validity of GUS suggest the measure is a valid and reliable instrument for assessing gambling urges among non-clinical gamblers (Raylu & Oei, 2004b).

Problem gambling screen

The VGS is a self-reported questionnaire measuring the extent to which a gambler's behaviour has caused harm to themselves, their family or the community in the previous four weeks. The harm to self-subscale has been validated for use in Australia in both community and clinical populations (Tolchard & Battersby, 2010) where a cut score of 21 or higher is indicative of problem gambling. Concurrent validity indicates the scale correlates very highly with the SOGS ($r = 0.97$), but extends the score range. The VGS has also shown similar properties in construct validity as the CPGI on a number of problem gambling correlates (e.g. 'self-rating of problem'; 'wanted help' and 'suicidal tendencies'; McMillen & Wenzel, 2006).

Cognitions

The Gambling Related Cognition Scale (GRCS) is a 23-item self-report questionnaire that records common thoughts associated with problem gambling at the time of completing the questionnaire. The scale comprises five subscales: gambling expectancy, GE; inability to stop gambling, IS; predictive control, PC; interpretive bias, IB and illusion of control, IC (Raylu & Oei, 2004a).

Gambling behaviours

At each assessment, participants self-reported their gambling behaviours from the previous four weeks and were then classified as either problem gambling or non-problem gambling according to their aims of abstinence or controlled gambling. Three questions pertaining to outcome status were asked:

(i) Are you currently aiming to be abstinent from gambling? (Yes/No).

When answering 'No' the person was asked.

(ii) To what level are you aiming to limit your gambling? (Once a week/Twice a week/Three or more times a week/daily).

(iii) How often did you gamble during the last four weeks? (Never/Once/Twice/Once a week/Twice a week/Three or more times a week).

Participants who answered 'Yes' to question (i) and reported any gambling activity in that time period were categorised as problem gambling. Participants answering 'No' to question (i) and reporting gambling activity in question (iii) that exceeded their aims in question (ii) were also categorised as problem gambling. Otherwise participants were categorised as non-problem gambling.

The following measures of personality traits and problems associated with gambling were collected at baseline.

Depression and anxiety

The Depression Anxiety and Stress Scale (DASS-21) is a 21-item self-report questionnaire which measures depression, anxiety (state) and stress (Lovibond & Lovibond, 1995). Participants were asked to indicate

how much each statement applied to them over the previous week.

Trait anxiety

The Trait Anxiety Inventory form Y-20 is a 20-item self-report measure designed to record levels of trait anxiety where participants indicated how they generally felt in response to each statement (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983).

Alcohol use

The Alcohol Use Disorders Identification Test (AUDIT): Self Report Version is a non-diagnostic 10-item questionnaire indicating hazardous alcohol use. The items cover both past and present use of alcohol in three domains: alcohol intake, alcohol dependence and adverse consequences of drinking (Reinert & Allen, 2002).

Sensation seeking traits

The Arnett Inventory of Sensation Seeking is a 20-item self-report questionnaire that measures sensation seeking personality traits by asking participants to indicate their response to statements that best applies to them at the time of completing the questionnaire (Arnett, 1994).

Social support

The Multidimensional Scale of Perceived Social Support is a 12-item self-report questionnaire containing three subscales (significant other, family and friends). Participants indicate how they feel in response to statements at the time of completing the questionnaire (Zimet, Dahlem, Zimet, & Farley, 1988).

Functional ability

The Work and Social Adjustment Scale is a self-report questionnaire used to measure an individual's perspective of their functional ability or impairment in the following areas: work, home management, social leisure, private leisure and family and relationships (Mundt, Marks, Shear, & Greist, 2002). Participants were asked to respond to each item in context of their current problem gambling.

Statistical analysis

Internal reliability of GUS was assessed using Cronbach's alpha and item-rest correlations where each item was correlated with the remaining items total score. For criterion-related validity we used follow-up data for GUS, VGS and gambling behaviours at three or six months if data were missing at three months and conducted nonparametric receiver operator characteristic (ROC) analyses. To enhance validity of findings two independent reference variables were used to identify participants as either problem gambling or non-problem gambling: (i) cut score of 21 on the VGS as previously validated, and (ii) participants aim of abstinence or controlled gambling and their self-reported gambling behaviours. The classification accuracy of GUS was further compared with measures of gambling-related cognitions using the 23-item GRCS. To protect against an increased probability of Type I error due to multiple comparisons, Bonferroni adjusted *p*-values were calculated.

The construct validity of GUS was determined by regressing GUS scores onto an ordinal measure of problem gambling severity by stratifying VGS scores at the 25th and 75th percentiles. Probabilities for each level of severity over a range of gambling urge scores were then calculated when controlling for gender and age. A principal component analysis was also used to assess overall explained variance from a single factor and results were compared with those from the original validation of GUS in a community sample. To determine the extent of association between gambling urge and gambling-related problems or characteristics, correlation coefficients were calculated.

RESULTS

Participant enrolment and flow

Eligible participants for this study were adults ($n = 277$) who were seeking assistance from gambling help services in the time period March to September 2008. Reasons for non-participation were 94 (34%) not interested/refused and 25 (9%) attributed to inconsistent application of research protocol/unknown reason. The final study cohort comprised of 158 (57%) individuals consenting to participate. Baseline measures were collected following consent to participate and follow-up measures were taken at three and six months. There were 109 (70%) completed assessments at approximately three or six months if data were available and missing at three months. A significant difference in age was found between follow-up completers (mean = 45.8 years, standard deviation (SD) = 12.9) and non-completers (mean = 40 years, SD = 12.1; $p = 0.008$). A significant difference was also found in gender distribution for non-completion with 36 (42.35%) males compared to 13 (17.81%) females ($\chi^2 = 11.06$, df = 1, $p = 0.001$). There was no significant difference in baseline VGS harm to self-subscale scores between completers and non-completers ($p = 0.83$).

Baseline data

The sample comprised of 54% (85) male participants, mean age 44 years (SD = 12.92), relationship status for 56% (88) was single or separated, and 55% (86) were in full-time or part-time employment. The distribution for duration of gambling problem was 20% (31) self-reporting less than two years, 23% (36) between two and five years, and 57% (87) greater than five years. The main form of gambling for 87% (138) of participants was EGMs.

When compared to previous normal population scores baseline DASS-21 means were higher for the

Table I. Sensitivity and specificity for GUS cut scores.[a]

GUS cut point	VGS ($n = 104$)			Gambling behaviours ($n = 105$)		
	Sensitivity (%)	Specificity (%)	Correctly classified (%)	Sensitivity (%)	Specificity (%)	Correctly classified (%)
0	100.00	0.00	55.66	100.00	0.00	53.27
1	89.83	63.83	78.30	78.95	48.00	64.49
2	86.44	72.34	80.19	73.68	54.00	64.49
3	84.75	76.60	81.13	71.93	58.00	65.42
4	74.58	82.98	78.30	63.16	64.00	63.55
5	69.49	82.98	75.47	59.65	66.00	62.62

Note: [a]Referent variables VGS and gambling behaviours in dichotomous form (0 = non-problem gambler, 1 = problem gambler).

depression (10.76 ± 6.35), anxiety (6.63 ± 5.65) and stress (10.60 ± 6.01) scales, and in the moderate severity range (Lovibond & Lovibond, 1995). Mean scores on the TAI (53.86 ± 11.01) were higher than previous normative data in working adults, college and high school students by at least one SD (Spielberger et al., 1983). The distribution of baseline scores across severity categories of the AUDIT were 24.1% ($n = 38$) for abstainers, 46.8% ($n = 74$) low risk alcohol use, 14.6% ($n = 23$) risky or harmful alcohol use and 14.6% ($n = 23$) alcohol dependence likely (Reinert & Allen, 2002). Baseline mean scores for VGS (40.09 ± 11.46) were in the more severe range for problem gambling and stratification at cut score 21 found 94.9% ($n = 150$) participants were classified as problem gambling at baseline (Tolchard & Battersby, 2010). Baseline characteristics also included mean scores for GUS (14.16 ± 11.52), WSAS (16.03 ± 9.73), MSPSS (48.88 ± 22.08), AISS (46.72 ± 7.65) and GRCS (65.50 ± 25.03).

Internal reliability

Cronbach's alpha (α) coefficient for GUS completed by participants was 0.93 indicating a high level of internal consistency based on the recommendation that measurements on individuals should achieve a minimum reliability of 0.90 and a desirable standard of 0.95 (Terwee et al., 2007). A Cronbach's alpha of 0.81 was found in the original community sample (Raylu & Oei, 2004b). Item-rest correlations for the six GUS questions were 0.72, 0.81, 0.78, 0.86, 0.85 and 0.80, respectively, indicating that each item was measuring a specific construct related to the total score of remaining items.

Criterion-related validity

We used ROC analysis to assess the extent to which GUS scores at three or six months accurately classified individuals with a gambling disorder at three or six months follow-up from treatment engagement at baseline. The referent variables were comprised of two separate measures; VGS scores and self-reported gambling behaviours, with both in dichotomous form (0 = non-problem gambler, 1 = problem gambler). For VGS, the validated cut score of 21 was used (Tolchard & Battersby, 2010) in which 47 participants were identified as non-problem gamblers (scores 0–21, mean = 11.19, SD = 6.84) and 59 as problem gamblers (scores 22+, mean = 36.76, SD = 8.91). For gambling behaviours, participants were classified according to each individual's defined abstinence or controlled gambling status and gambling activities in the previous four weeks. Table I presents sensitivity and specificity values for the first six GUS scores. The most accurate classification is given with a GUS score ≥ 3 with 2 or less classified as non-problem gambling and those of 3 or more classified as problem gambling. The resulting sensitivity and specificity with VGS as referent variable was 84.75% and 76.60%, respectively, and 83 (80.19%) of the 104 individuals were correctly classified. At the same GUS score and gambling behaviours as referent, sensitivity and specificity was 71.93% and 58%, respectively, and 69 (65.42%) of 105 individuals were correctly classified. The original validation of GUS involving a community sample found 87% were correctly classified according to SOGS cut scores where 620 participants met criteria for non-problem gambling (SOGS score of 0) and 71 participants as 'probable problem gambling' (SOGS score ≥ 4) (Raylu & Oei, 2004b).

To compare classification properties of self-reported gambling urge with self-reported gambling cognitions a further ROC analysis was conducted using GRCS subscale and total scores (Table II). The probability of a problem gambler selected at random having a higher GUS score than a non-problem gambler when selected at random was 87% when using VGS as referent variable. For GRCS total score the probability was 79%, which was not significantly different to GUS ROC area ($p = 0.467$). The GUS classification accuracy was significantly higher than GRCS subscales Predictive Control (87% *vs.* 65%, $p < 0.001$) and Illusion of Control (87% *vs.* 64%, $p < 0.001$). For gambling behaviours there was a non-significant difference between GUS and GRCS total score (71% *vs.* 66%, $p = 1.00$) and a significant difference between GUS and Illusion of Control (71% *vs.* 52%, $p = 0.002$).

Table II. ROC analysis for multiple comparisons.

	VGS ($n = 104$)			Gambling behaviours ($n = 105$)		
Measure	ROC area	SE	Adjusted[a] p	ROC area	SE	Adjusted[a] p
GUS (standard)	0.87	0.03		0.71	0.05	
GRCS-						
GE	0.74	0.05	0.084	0.66	0.05	1.00
IS	0.80	0.04	0.673	0.67	0.05	1.00
PC	0.65	0.05	<0.001	0.60	0.04	0.264
IB	0.76	0.04	0.121	0.66	0.05	0.999
IC	0.64	0.05	<0.001	0.52	0.05	0.002
Total	0.79	0.04	0.467	0.66	0.05	1.00

Note: [a]Bonferroni adjusted.

Concurrent validity

The measures relating to gambling pathology and related problems were assessed for any association with gambling urge. It was shown that higher levels of GUS scores were significantly associated with greater severity in dysfunction with work and social activities ($r = 0.49$, $p < 0.001$). Of similar magnitude and direction was the relationship between urge and psychological disturbance involving stress ($r = 0.44$, $p < 0.001$), state anxiety ($r = 0.41$, $p < 0.001$) and depression ($r = 0.40$, $p < 0.001$) as with trait anxiety ($r = 0.42$, $p < 0.001$). There was a low negative correlation between GUS and MSPSS scores where higher levels of urge were associated with decreased social support ($r = -0.28$, $p < 0.001$). There was a significant relationship between gambling urge and harm to self-subscale of the VGS ($r = 0.55$, $p < 0.001$). Overall correlation between gambling-related cognitions was moderate ($r = 0.49$, $p < 0.001$) although the subscales Illusion of Control ($r = 0.29$, $p < 0.001$) and Predictive Control ($r = 0.27$, $p < 0.001$) were more in the low range. For sensation seeking traits there was no significant association with self-reported gambling urge ($r = -0.03$, $p = 0.663$) as with alcohol use ($r = 0.12$, $p = 0.127$).

Construct validity

To assess the degree to which the GUS could predict different levels of gambling severity as measured on the VGS when controlling for gender and age we conducted an ordinal logistic regression at baseline. Scores on the VGS were stratified based on the 25th and 75th percentiles to generate three categories of severity as the dependent variable: (i) scores less than 33 ($n = 41$, mean = 25, SD = 9.52); (ii) scores 34 to 48 ($n = 82$, mean = 42.04, SD = 3.54) and (iii) scores greater than 48 ($n = 35$, mean = 53.2, SD = 3.14). The model as a whole was statistically significant when compared to a model with no predictors ($\chi^2(3) = 53.94$, $p < 0.001$). For a one unit increase in GUS, we could expect a 1.11 increase in the log odds of being in a higher level of gambling severity, when gender and age are held constant (95% CI: 1.08–1.15, $p < 0.001$). Figure 1 plots the predicted probabilities for each gambling severity level against GUS scores. The probability of gambling severity in the lower range of VGS scores decreases rapidly with increasing GUS scores, whereas the probability of extreme severity increases.

A principal component analysis for the one component found an overall explained variance of 75.54% and an item average of 24.46% of unexplained variance (Table III). All loadings were positive and of approximately equal size suggesting the component did not conflict with the data ($\chi^2(5) = 3.42$, $p = 0.636$).

DISCUSSION

This study is the first evaluation of GUS psychometric properties in a clinical population. The major limitation is that the GUS is a self-report measure and theoretically less reliable than a clinician administered measure. Also, the sample was predominantly problem EGM users, and therefore any conclusions drawn are limited to this form of gambling. However, EGMs are associated with high prevalence rates of gambling disorders (Wilkes et al., 2010) and the reliability and validity of gambling urge measures need to be established in this subgroup and other types of gambling (Ashrafioun & Rosenberg, 2011). This makes good sense as problem gamblers may, at least partly, be differentiated between those who seek to reduce (e.g. EGMs) or augment (e.g. horse racing) urge states based on gambling modality (Blaszczynski & Nower, 2002). A further limitation is that missing data at follow-up limits the external validity of findings for GUS utility in discriminating between problem and non-problem gamblers especially as non-completers were, on average, younger and a greater proportion were males.

The findings from this study demonstrated that in a clinical sample of problem gamblers as defined by a score in excess of 21 on the VGS, the GUS is a suitable scale to measure urge to gamble. The findings have

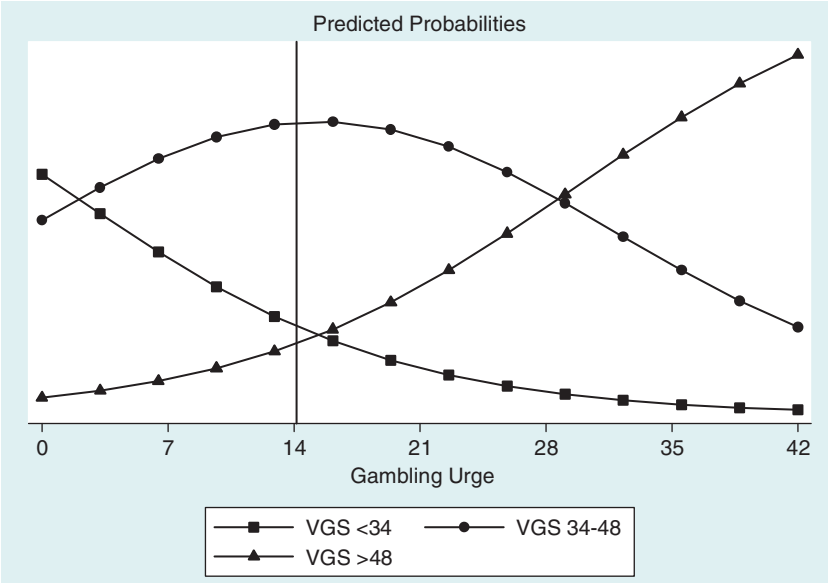

Figure 1. Predicted probabilities of gambling severity using GUS.[a]
Note: [a]Vertical line is mean GUS score.

Table III. Principal component analysis of GUS ($n = 154$).

Item number and content	Factor loading	Unexplained variance
1. All I want to do now is to gamble	0.38	0.36
2. It would be difficult to turn down a gamble this minute	0.41	0.23
3. Having a gamble now would make things seem just perfect	0.40	0.27
4. I want to gamble so bad that I can almost feel it	0.43	0.18
5. Nothing would be better than having a gamble right now	0.42	0.18
6. I crave a gamble right now	0.41	0.24

demonstrated the internal reliability of the instrument (Chronbach $\alpha = 0.93$) in a clinical population, which was better than that in the community sample of 0.81 (Raylu & Oei, 2004b). This is not surprising as the questionnaire was derived from its use in clinical populations of alcohol dependent participants (Bohn et al., 1995).

Criterion-related validity was very acceptable with 81.13% being correctly classified compared to 87% by Raylu and Oei (Raylu & Oei, 2004b) and may be due to the use of differing screening instruments and the larger sample size used in the community sample. A surprising finding was that a score of only three out of a possible 42 categorised over 80% of participants correctly. The right skewed distribution of GUS total scores at three or six month follow-up were most likely due to a significant proportion of participants achieving a clinically significant improvement in problem gambling symptoms. A nonparametric ROC analysis was conducted for the follow-up data to account for non-normality and may have resulted in a conservative estimate for the area under the curve. The relatively low score of three suggests that the presence of even a few symptoms of urge indicates a significant likelihood of problem gambling. Similarly the GUS was better able to identify problem gamblers than the GRCS (87% *vs.* 79% being correctly classified), especially when the subscales of the GRCS were examined.

Similarly, construct validity of GUS scores with VGS also showed that the GUS scores relate closely and significantly to gambling severity, suggesting that the intensity of the urge to gamble is a strong indicator of problem gambling severity. Concurrent validity also indicated GUS scores correlated highly with measures of severity in dysfunction with work and social activities, stress, state anxiety and depression, harm to self, gambling-related cognitions and less strongly with decreased social support. These findings indicate that the GUS is a robust measure of gambling disorders and strongly relates to indicators of gambling severity and its associated harms.

As previously shown (Young & Wohl, 2009) we found that higher levels of gambling urge were associated with greater problematic gambling-related cognitions. However, when comparing classification properties of gambling urge to gambling cognitions on two independent outcome measures of problem gambling, there was no statistically significant difference between the 23-item GRCS total score, a composite of several kinds of erroneous beliefs, and the six-item GUS. However, GUS was significantly better in classification on both outcome measures of problem gambling than GRCS subscale 'Illusion of Control'.

This may suggest that psychophysiological states, such as urge, are highly prevalent in individuals with problem gambling as cravings are in SUD (American Psychiatric Association, 2000). A single factor for measuring urge may have greater clinical utility for treatment assessment, planning and evaluation than a multidimensional measure of cognitions. Asking about the presence of an uncontrollable urge to gamble may be the simplest way to determine whether someone is a problem gambler or not. Also it has been proposed that cognitions are a subclass of behaviours and exist within a human behaviour causal stream rather than as an independent entity (Latimer & Sweet, 1984). This is an important issue which requires further study as cognitive and behavioural strategies have both been employed in the successful treatment of problem gambling (Gooding & Tarrier, 2009).

There was no relationship between urge and sensation seeking traits which have been proposed as a related construct to impulsivity with emphasis on novelty and intensity components (Arnett, 1994). In contrast, a significant association between sensation seeking and GUS scores has previously been found in an investigation of the impact of cue exposure on craving to gamble in a non-clinical sample of university students (Ashrafioun et al., 2011). Furthermore, research in SUD has shown that impulsivity and urge are related to a number of drug use variables including years of use and severity of withdrawal (Tziortzis, Mahoney III, Kalechstein, Newton, & La Garza II, 2011). Whilst a subgroup of problem gamblers has a tendency for antisocial, impulsive traits (Blaszczynski & Nower, 2002), results from this study may be explained, at least partly, by the relative homogeneity of the current sample in which 87% self-reported their main form of gambling as electronic gaming and where sensation seeking may not play an important role as in other types of gambling (Sharpe, 2002). These findings suggest that gambling urges are independent of personality traits such as impulsivity and sensation seeking at least in some subgroups of problem gamblers and support the proposed reclassification of gambling disorders as an addiction rather than an impulse control disorder.

Overall these findings raise the question of the importance of urge in the maintenance of the pathological and problem gambling cycle. Urge has recently been shown to have key predictive properties of relapse in a prospective observational study by Battersby et al. (2010) and in the model of relapse proposed by Oakes and colleagues (Oakes et al., 2011). These findings suggest that urge is a central issue that relates in important ways to relapse, harm and problems arising from pathological and problem gambling when robust measures are used. The significant role of urge also has implications for understanding the aetiology of problem gambling using behavioural models of conditioning where the variable interval schedule of reinforcement provided by EGMs and other forms of gambling explain the development and maintenance of urge (Battersby, Oakes, Tolchard, Forbes, & Pols, 2007).

SUMMARY AND CONCLUSIONS

These findings are important as they contribute to the evidence for a validated measure of gambling urge in the GUS. As a number of treatments for gambling disorders focus on gambling urge, this measure could be used to assess whether or not a gambling urge has been extinguished and therefore treatment having been objectively completed. Also, one advantage of the GUS measure or asking about an urge to gamble is to provide a quick means of identifying persons who might benefit from urge focused treatments, such as exposure therapy (Battersby, 2010; Battersby et al., 2007; Oakes, Battersby, Pols, & Cromarty, 2008) and in predicting relapse (Oakes et al., 2011). This measure would be useful in settings where lengthy questionnaires would be impractical for determining appropriate treatments, for example gambling helplines and general counselling services for gambling problems. The GUS would be quick to administer and sensitive to severity of gambling pathology and consequently provide informative data for treatment referral that would result in developing more efficient treatment pathways.

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