Lopez-Gonzalez, H., Estévez, A. & Griffiths, M.D. (2018). Spanish validation of the Problem Gambling Severity Index (PGSI): A confirmatory factor analysis with sports bettors. *Journal of Behavioral Addiction,* in press.

ABSTRACT

Background and aim: The Problem Gambling Severity Index (PGSI) is one of the most widely used screening tools for problem gambling. However, no empirically validated adaptation of the instrument to Spanish-speaking countries exists to date. *Methods:* A sample of 659 sports bettors (M_{age}: 35.1 years, SD=10.12; 74.2% males) was recruited via an online research panel. A Confirmatory Factor Analysis (CFA) was run to confirm its construct validity. The participants were administered the Spanish version of the PGSI, along with the adaptation to Spanish of the DSM-IV problem gambling instrument for convergent validity. *Results:* The CFA of the Spanish PGSI showed satisfactory construct validity. The internal consistency ($\alpha_{ordinal}$=.97), as well as its convergent validity with the DSM-IV scores (r=.77, p<.001) was good. *Conclusion:* The Spanish adaptation of the PGSI offers satisfactory validity and reliability properties, and is a good psychometric instrument for exploring the social consequences of problem gambling in Spanish-speaking contexts.

KEYWORDS

Gambling; problem gambling; PGSI; sports betting; gambling disorder

INTRODUCTION

Problem gambling (PG) is the only non-substance-related addiction officially recognized in the latest (fifth) edition of the *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association [APA], 2013). Those in the general population that have gambling disorder (past twelve months) has been estimated to be 0.2%-0.3%, whereas lifetime prevalence rates range from 0.4%-1% (APA, 2013). Recent systematic reviews note prevalence estimates vary between territories, time-frames, and assessment instruments used (Calado & Griffiths, 2016; Williams, Volberg, & Stevens, 2012).

In many English-speaking countries, the Problem Gambling Severity Index (PGSI; Ferris & Wynne, 2001) has progressively replaced previous instruments assessing problem gambling

prevalence, and is arguably the most widely used PG screening tool currently (Calado & Griffiths, 2016). The PGSI was conceived to reflect more socially-oriented (rather than clinical) PG aspects (Petry, 2016). Therefore, it complements development of DSM gambling disorder criteria without being outdated. The PGSI has adapted well to internet-based gambling activities, as well as newer gambling forms like fantasy gaming (Nower, Caler, Pickering, & Blaszczynski, 2018), and online sports betting (Lopez-Gonzalez, Estévez, & Griffiths, 2018).

Some scholars have criticised the PGSI classification structure (Petry, 2016), while others argue it underestimates the PG prevalence among women (Orford, Wardle, Griffiths, Sproston, & Erens, 2010). The same authors also note that the PGSI assesses gambling problems as a continuum instead of dichotomous (yes/no) alternatives (e.g., DSM criteria). Subsequent assessments and reassessments of PGSI validity and reliability have confirmed its efficacy (Currie, Casey, & Hodgins, 2010; Miller, Currie, Hodgins, & Casey, 2013). Some studies have used the PGSI without previously validating the instrument in their own language, or administered it in English form to non-native English speakers (Bonnaire et al., 2017; Hanss et al., 2015).

The present study was conducted in Spain, and the PG prevalence is in line with most Western countries. Using the Spanish NODS (NORC [National Opinion Research Center] Diagnostic Screen, 1999), the latest prevalence study showed a PG incidence of 0.3% (past-year), and 0.9% (lifetime)(Dirección General de Ordenación del Juego [DGOJ], 2016). Pilatti and Tuzinkievich (2015) reported the use of a Spanish PGSI version in the development of their Gambling Motives Questionnaire (Argentinian sample), but was not psychometrically validated. Given Spanish is spoken by an estimated 470 million people worldwide (i.e., in the top three most spoken languages globally), and that 21 countries' official language is Spanish (World Atlas, 2018), a Spanish PGSI is warranted. Consequently, a Spanish PGSI is likely promote research on problem gambling in Spanish-speaking countries and facilitate cross-cultural studies using related screening instruments.

METHODS

Participants and procedure

The target population was Spanish adult gamblers and a Barcelona market research company collected the data. They offered their online research panel (containing approximately 1,200 adults) who had claimed in past studies to have bet on sports. In March 2017, 848 participants from the research panel accessed a *Qualtrics* online survey, and accepted the study's terms and conditions. To participate, the survey asked a filter question: *"Have you placed at least one bet on sports in the past 12 months?"* Only those who answered 'yes' continued (n=709). Some participants did not complete the questionnaire leaving 659 fully-completed questionnaires for analysis. All participants received points that could be redeemed for gifts in the market research company's online store. Participants' mean age was 35.1 years (SD=10.12) ranging from 18-66 years with significantly more males (74.2%; n=489).

Measures

Socio-demographic variables. These variables included age, gender, living situation (i.e., who they lived with), occupation, and education.

Problem Gambling Severity Index (PGSI; Ferris & Wynne, 2001). The English PGSI comprises nine items to assess gambling severity, with five items assessing adverse consequences of gambling and four items assessing problematic behaviours of gamblers (Holtgraves, 2009). The PGSI can also be used to assess gambling problems among online participants (Gainsbury et al., 2016). Each item is rated by respondents on a 4-point scale (i.e., 0=Never, 1=Sometimes, 2=Most of the time, 3=Almost always). Final scores range from 0 to 27 and allow for the categorization of respondents into four exclusive groups: 0=non-problem gamblers; 1–2=low-risk gamblers; 3–7=moderate-risk gamblers; and >8=problem gamblers. The original scale validation showed a very good reliability of .84 (Ferris & Wynne, 2001).

Standardised procedures were followed (Brislin, 1970) to adapt the PGSI to Spanish language. The original English version was independently translated into Spanish by two of the present authors fluent in both languages. These two versions were compared and every discrepancy was discussed until reaching an agreement. The consensual Spanish version was sent to an

external examiner (English native speaker and linguist), with previous experience in psychometric validations. This person back-translated into English and compared both versions looking for incongruences. These were dealt with by introducing changes to the scale until a final Spanish version was agreed with the back-translator. This final version was further assessed by a Spanish expert in gambling who had first-authored the Spanish DSM-IV gambling disorder criteria. The translation from English into Spanish presented no real obstacles in terms of cultural or linguistic differences, and was performed in compliance with the International Test Commission Guidelines for Translating and Adapting Tests (International Test Commission, 2010).

Stinchfield's measure of DSM-IV diagnostic criteria for problem gambling (Stinchfield, 2003). This instrument is a 19-item self-administered questionnaire reflecting the ten diagnostic problem gambling criteria of the *Diagnostic and Statistical Manual of Mental Disorders–Text Revised* [DSM-IV-TR] (American Psychiatric Association, 2000) in a dichotomous format (i.e., yes/no). Each criterion has two items (except Criterion 4). Endorsing at least one of the two items is sufficient to endorse the whole criterion. Respondents can score from 0-10, with scores of 5+ indicating problem gambling (Stinchfield, 2003). The present study used the validated Spanish version (Jimenez-Murcia et al., 2009). This showed high internal consistency (Cronbach's alpha=.95), with low false positives and moderate false negatives, and high sensitivity and specificity when applying the cut-off point of five. This instrument assessed the convergent validity of the Spanish PGSI. Scores on DSM-based instruments such as the NODS have been found to correlate highly with PGSI scores (r=.83) (Currie et al., 2010).

Analytical approach

To explore the fit of the Spanish PGSI and confirm its unidimensional structure, a confirmatory factor analysis (CFA) was carried using structural equation modelling MPLUS 6.12 software. The remaining descriptive and inferential statistical analyses were conducted using IBM SPSS 21. Finally, the ordinal alpha coefficient was calculated to assess the reliability of the instrument using a macro for IBM Microsoft Excel designed by Dominguez-Lara (2012). The intrinsic characteristics of the PGSI scoring system, which consists in less than five categories per item

(i.e., four responses per item), makes the data more unlikely to follow a normal distribution and informed the decision to treat responses as ordinal. Therefore, use of conventional CFA approaches such as the maximum likelihood technique was not advisable. A Weighted Least Squares Mean and Variance Adjusted (WLSMV) estimation was favoured because it provides good estimations for non-normal distributions, and is especially robust in datasets larger than 200 cases (Li, 2016).

In order to validate model fit, the following indices were calculated: Root Mean Square of Approximation (RMSA), Comparative Fit Index (CFI), Tucker-Lewis Fit Index (TLI), and Weighted Root Mean Square Residual (WRMR). The thresholds for a good fit were considered following conventional values as recommended in the literature (Hu & Bentler, 1999; Jackson, Gillaspy, & Purc-Stephenson, 2009): RMSA<.08; CFI>.95; TLI≥.95; and WRMR<.90. Also, a chi-square test was run expecting a statistically non-significant result (i.e., *p*-value greater than .05).

Ethics

The study obtained approval from the first author's university research ethics committee, and conducted in accordance with the principles of the Declaration of Helsinki. All respondents had to click an 'accept' hyperlink to participate in the survey, and were informed about the (i) topic of the study, (ii) right to stop participating at any time, and (iii) anonymity and confidentiality of data provided. Additionally, they were reassured of their right to withdraw data from the study at any point prior to publication, and were given the contact details of the principal investigator. The market research company who collected the sample only invited adults to participate (18+ years).

RESULTS

Descriptive statistics

In terms of living situation, 292 participants (44.3%) lived only with their partner; 259 with family members other than partner (39.3%); 76 on their own (11.5%); 24 with friends (3.6%); and eight in other kinds of living arrangement (1.2%). Most participants (n=401) had university education

(60.8%); 139 professional or vocational training (21.1%); 114 secondary education (17.3%); and five lower than secondary education (0.8%). As to occupation, most were working (n=517; 78.5%), whereas others were studying (n=84; 12.7%), unemployed (n=42; 6.4%), retired (n=6; 0.9%), or in an unspecified occupational situation (n=10; 1.5%).

Construct validity

The one-factor model of the Spanish PGSI was tested by means of a CFA. In the analysed sample (N=659), the tests showed the following results: $\chi^2(27)=96.57$ $p<.05$, CFI=.997, TLI=.996, RMSEA=.063 [90% CI: .049−.076], WRMR=0.772. The *p*-value for the chi-square test (i.e., $p<.05$) was expected to be non-significant. Nevertheless, chi-square results are sensitive to large sample sizes (n>200), sometimes producing false positives, in which case it is recommended to weigh the indicators of the rest of the fit exams before discarding the proposed model (Hair, Anderson, Tatham, & Black, 2010). All fit indicators unambiguously demonstrated a very good overall fit between the model and the data. Therefore, the model was deemed appropriate.

Item analysis and reliability

All items of the Spanish PGSI showed a great factor loading regarding the only dimension they assessed (i.e., problem gambling), ranging from $r_s=.77$ to .96. Similarly, item-total correlation, calculated using Spearman's *rho* due to the ordinal nature of the data, also showed high coefficients (.70-.80). These results combined with the those provided by the polychoric correlations (items correlating between .64-.91) provided evidence of the adequacy of including all nine items of the Spanish PGSI. The overall scale reliability was excellent (.97).

Regarding internal consistency, and given the characteristics of the 4-point response scale in the original PGSI, data were analysed as an ordinal variable. Consequently, internal consistency was estimated using an *ordinal alpha coefficient*, following expert guidelines (Elosua & Zumbo, 2008; Zumbo, Gadermann, & Zeisser, 2007). This resulted in an $\alpha_{ordinal}$ of .97. This estimate was well above the conventional threshold of good reliability. Both item analysis

and reliability tests demonstrated the relevancy of the included items, with none of the items showing inconsistent psychometric properties.

Convergent validity

Participants' responses to the Spanish PGSI were then compared to the responses of the most recently validated Spanish problem gambling screening instrument (i.e., Spanish DSM-IV). This comparison was used to determine the convergent validity of the new instrument. PGSI and DSM-IV scores were highly and positively correlated (Spearman's *rho*=.745, *p*<.001). Convergence was further assessed by analysing the discrepancies and agreements between the participants that each instrument identified as problem or non-problem gamblers. After applying the recommended cut-off points in the score system for problem gambling detection (i.e., five for DSM-IV; 8 for PGSI), a contingency table showed that both scales had a considerable degree of mutual agreement (Cohen's Kappa coefficient >.61). Additionally, and despite the PGSI not being a diagnostic tool, the scale showed great accuracy and power in predicting problem gambling in the DSM-IV scale (sensitivity=.93; and specificity=.79).

Within sample incidence of problem gambling

Participants' PGSI scores were categorized into four groups according to gambling severity. Results showed the following distribution: (i) the non-problem gambling group (i.e., scores of 0) comprised 256 participants (38.8% of the sample); (ii) the low-risk gambling group (i.e., scores 1–2) comprised 175 participants (26.6%); the moderate-risk gambling group (i.e., scores 3–7) comprised 102 participants (15.5%); and (iv) the problem gambling group (score ≥ 8) comprised 126 participants (19.1%).

The items most frequently endorsed by problem gamblers (i.e., responding anything other than "Never") were: first, feeling guilty about the way they gambled; second, having been criticised about their gambling; and third, trying to win back the money they lost (i.e., 'chasing losses') (see Table 1). However, among moderate-risk gamblers, the most frequently endorsed item was chasing losses, followed by feeling guilty, and being criticized about their gambling. Two-thirds

of the participants (64.5%) categorized by the PGSI as low-risk gamblers reported chasing their losses, while 17.7% felt guilty about their gambling, and 13.1% felt criticised for gambling.

INSERT TABLE 1 AROUND HERE

No significant associations were found between problem gambling severity and gender, age, level of education, or occupation. A small but significant difference was found concerning cohabitation. After applying Bonferroni correction to adjust the *p*-values to control for familywise errors, a significant association emerged between cohabitation and problem gambling severity ($\chi^2(12)=27.210$, $p<.007$). Residuals with a z-score higher than 2 showed that problem gamblers were much more likely to live only with their partner (Z=3.6), whereas those living with their families were less likely to be problem gamblers (Z=−3.4).

DISCUSSION

The purpose of the present study was to adapt the Problem Gambling Severity Index (PGSI; Ferris & Wynne, 2001) for Spanish-speaking countries. A convenience sample of 659 Spanish sports bettors were recruited to explore the internal consistency and validity of the new instrument. In general, the Spanish PGSI showed great convergent validity with the Spanish DSM-IV. Furthermore, the CFA carried out confirmed the PGSI's unidimensional solution. As has typically been the case in other countries (Barbaranelli, Vecchione, Fida, & Podio-Guidugli, 2013), the convergent validation of the PGSI performed well and was predictive of the scores in other DSM-based tools. Its reliability was similarly high ($\alpha_{ordinal}=.97$), even higher than in previous PGSI adaptations including China ($\alpha=0.77$; Loo, Oei, & Raylu, 2011), New Zealand ($\alpha=0.86$; Devlin & Walton, 2012), and Sweden ($\alpha=0.82$; Svensson & Romild, 2014), although the ordinal nature of the reliability measure utilized here does not exactly equate the measures reported in these aforementioned studies.

The present study demonstrated the convenience of the existing cut-off point of 8 to discriminate between those already suffering problem gambling and other at-risk gamblers, with accurate diagnosis of problematic participants both by the Spanish PGSI and the DSM-IV. This

threshold has caused controversy in the past, especially in studies where moderate-risk and problem gamblers were merged to allow for greater statistical power (Currie et al., 2013). In these cases, both false positives and false negatives were more common. In the present study, the size of the surveyed sample allowed for statistical significance without the need for category mergers. Other authors have argued the PGSI is relatively weak in evaluating the low to moderate-risk spectrum of gambling problems (Jackson, Wynne, Dowling, Tomnay, & Thomas, 2010; Miller et al., 2013), although such debates are usually consubstantial to cut-off score decisions, and vary between countries. For instance, in territories with higher problem gambling prevalence rates (e.g., South Africa), lower cut-off points have been proposed for efficient problem gambling detection (Dellis et al., 2014).

The results obtained here showed that both at-risk gamblers and problem gamblers identified chasing losses, feeling guilty, and being criticised, as the top-three items of the scale they related most to. Low and moderate-risk gamblers had chasing losses as the most endorsed item on the scale. This has also been reported in a Finnish PGSI study, where chasing losses was the most endorsed item (Raisamo, Mäkelä, Salonen, & Lintonen, 2015). In the present study, chasing losses was endorsed by almost 65% of low-risk gamblers, which considering the 2-point maximum score necessary to be categorized in that group, means that many individuals are considered to be low-risk gamblers because of this particular behaviour. However, as the disorder develops, feeling guilty about one's gambling behaviour, and being criticised for gambling, take priority and become more prevalent.

There are some limitations associated with the present study. First, the validation was carried out with general population data, rather than a clinical group previously diagnosed with gambling disorder. Second, the self-report nature of the data collected makes this study vulnerable to several respondents' biases including social desirability and memory recall (Pontes & Griffiths, 2016). Third, the sample used for the Spanish PGSI was not intended to be representative of the Spanish population, or any particular age group within it. Therefore, the recruitment method utilized might have introduced a number of biases in the sample. The use of an online research panel could have overestimated the proportion of internet bettors while

underestimating those bettors who primarily bet offline. Fourth, the study's results cannot be considered as indicative of the prevalence rate of problem gambling in Spain, since, among other things, the filter question (i.e., having placed a bet in the past twelve months) only selected those individuals who actively engaged in sports betting, ignoring all other types of gamblers and non-gamblers. Fifth, the self-selection method of the online panel could have prompted that participants with a greater interest in sports betting might have been more likely to opt in. Similarly, those already experiencing gambling-related harm might have found an incentive in participating in the survey. Finally, all the participants engaged in sports betting and some may argue that this is a limitation given that the PGSI was developed to be used in epidemiological studies of the general population. However, given that all the participants were gamblers and the PGSI assesses the potential for at-risk and problem gambling, such a population is arguably advantageous in this respect. Also, the items are generic and were not developed to differentiate between different types of problem gamblers, therefore the participants all being sports bettors is unlikely to have made any material difference. Additionally, previous research using nationally representative samples has shown that individuals with higher PGSI scores are likely to engage in many different types of gambling (Wardle et al., 2011).

CONCLUSION

Notwithstanding these limitations, the Spanish PGSI adaptation was found to offer good validity and reliability properties. The PGSI stands as a complementary screener to the DSM-based diagnostic tools, which are primarily focused on the clinical aspects of gambling disorder, whereas a new Spanish PGSI is a good psychometric tool for assessing problem gambling from the perspective of its social consequences.

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Table 1. Percentage (%) of item endorsement per problem gambling severity group

Item brief description	Non-problem gambler	Low-risk gambler	Moderate-risk gambler	Problem gambler	χ^2 (df)
1. Betting more than can afford to lose	0[1]	12	46	88.8	420.93 (9)*
2. Betting more for same excitement	0	6.8	46	92.8	492.06 (9)*
3. Chasing losses	0	64.5	78.4	95.2	521.45 (9)*
4. Borrowing money	0	1.7	14.7	91.2	512.25 (9)*
5. Self-perception of gambling problems	0	5.7	41.1	86.5	524.74 (9)*
6. Health problems	0	4.5	32.3	92	517.32 (9)*
7. Criticised over gambling behaviour	0	13.1	47	95.2	499.54 (9)*
8. Financial problems	0	1.1	14.7	91.2	519.17 (9)*
9. Feeling guilty about gambling	0	17.7	61.7	97.6	519.59 (9)*

Note 1: % within each problem gambling severity group that responds “Sometimes” or higher frequency to the item. Note 2: * *p value* < .001