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Confirmatory factor analysis of the Spanish version of the Gamblers' Beliefs Questionnaire in a sample of Argentinean gamblers☆

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ABSTRACT

Introduction: Cognitive distortions are related to gambling frequency and gambling severity. Having a culturally sensitive measure to assess cognitive distortions will facilitate the early detection of people who might be at risk of developing problematic gambling behaviors. The Gamblers' Beliefs Questionnaire was translated into Spanish (GBQ-S) but no previous study explored the structure of the GBQ-S in a non-US sample with different levels of gambling involvement. Aim: The present study examined the factor structure of the GBQ-S in a community sample of gamblers from Argentina. It also analyzed the association between cognitive distortions and type of gambling activity and frequency of gambling behaviors and the predictive utility of the GBQ-S on gambling severity. Participants: 508 youth and adults completed the GBQ-S. Results: The CFA showed an overall acceptable fit to the data confirming the proposed two-factor model. Scores of the two GBQ sub-scales were positively and significantly correlated with scores on gambling severity. Cognitive distortions have a significant effect on gambling severity after controlling for frequency of engagement in gambling activities. Luck and perseverance, but not illusion of control, was positively related to gambling severity. Discussion: scores measured by the GBQ-S exhibit adequate psychometric properties for the accurate assessment of cognitive distortions across adults and youth from the general community of Argentina.

1. Introduction

Gambling is a prevalent recreational activity in many countries and across diverse cultures (Clark, 2010; Frascella et al., 2010; Ledgerwood et al., 2009). The large majority of people who gamble do not experience adverse consequences, however, a subset of players experience gambling-related problems and develop severe forms of gambling disorder (French et al., 2008; Korman et al., 2006). Gambling opportunities are rapidly expanding in Argentina. For instance, in the state of Cordoba, where the present study was conducted, there are 19 casinos and 3600 slots (National Lottery of Cordoba, 2016). Unfortunately, there is a scarcity of studies assessing prevalence of recreational, problem or disordered gambling in this country. Some evidence, however, suggest that 60% of Argentinean college students gambled at least once in their lifetime while between 6 and 12% meet the cut score criteria for problem gambling based on SOGS' scores (Tuzinkievich, del Vera, Caneto, Garimaldi, & Pilatti, 2013a,b). These rates of gambling engagement are similar to those found in United States (Huang, Jacobs, Derevensky, Gupta, & Paskus, 2007) and Canada (Huang & Boyer, 2007; Ladouceur, Dubé, & Bujold, 1994) employing the DSM IV and SOGS criteria, respectively. The aims of the current study were to examine the behavior of Argentinian gamblers and enrich the psychometric validity of the Spanish Version of the Gamblers' Beliefs Questionnaire (GBQ-S).

Cognitive perspectives on gambling emphasize the presence of a number of cognitive distortions, including overestimation of personal ability to influence a win, superstitious beliefs and lucky rituals assumed to increase the chance of winning, and a misunderstanding of random sequences and the independence of turns (Fortune & Goodie, 2012). Cognitive distortions are prevalent among gamblers across the severity spectrum, from social gamblers to disordered gamblers, and even non-gamblers (e.g., Ladouceur, 2004; Winfree, Meyers, & Whelan, 2013). Strong confidence in these beliefs is presumed to maintain problematic gambling behavior despite repeated negative outcomes.

Two prevalent cognitive distortions reported in the literature are illusion of control and illusory correlation (Fortune & Goodie, 2012). Illusion of control underlies the belief that gambling is a game of skill, instead of a game of chance, leading the gamblers to believe their skills are determinant to win the game. In other words, illusion of control refers to "an expectancy of a personal success probability

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that is higher than the objective probability should warrant" (Fortune & Goodie, 2012, pp. 301). Illusory correlation is the process of relating two events, based on experience or perceptions, even when there is no association between them (Fortune & Goodie, 2012). This cognitive distortion underlies the belief that luck plays an important role in gambling outcomes and different superstitions in relation to gambling (Fortune & Goodie, 2012). Illusory correlation is the core element of the association between particular habits, thoughts and superstitions with winning (Fortune & Goddie, 2012).

A greater level of these cognitive distortions is related to greater severity of gambling, not only among clinical disordered gamblers (Michalczuk et al., 2011; Winfree et al., 2015), but also among non-clinical adolescents (Donati et al., 2015; Taylor et al., 2014) and college students (Mackillop et al., 2006; Winfree et al., 2013). The illusion of control has become an important phenomenon in experimental studies (Stefan & David, 2013, meta-analysis), however, its relevance to explain gambling behavior and disordered gambling is limited by the fact that some forms of gambling involve a genuine component of skill (e.g. poker: Meyer et al. 2013). Traditionally, two different categories have been used to classify the broad range of gambling activities: chance based games versus skill based games (Myrseth et al., 2010) or strategic versus non-strategic games (Grant et al., 2012). Skill or strategic games include gambling activities where some level of knowledge or skills in the game (e.g. poker, sports betting) can influence the outcome, at least potentially. In games of chance or non-strategic games, the gambler has no control or influence on the gambling outcomes (e.g. slots machines, lottery, and bingo). There is evidence that cognitive distortions are differentially related to different game preferences and, for example, skill gamblers, compared to chance gamblers, showed higher scores on the illusion of control scale of the Gamblers' Beliefs Questionnaire (Myrseth et al., 2010).

The valid assessment of gambling-related cognitive distortions can support evidence-based treatments targeting these distorted cognitions. The Gamblers' Beliefs Questionnaire (GBQ; Steenbergh et al., 2002) was developed to assist in case conceptualization, treatment planning, cognitive restructuring, relapse prevention, and monitoring behavior change (Whelan, Steenbergh, & Meyers, 2007). Factor analytic data from a community sample supported a two-factor structure: Illusion of Control and Luck/Perseverance (Steenbergh et al., 2002). The Illusion of Control factor was comprised of items that shared a theme of overestimating the influence of one's skill orientation on the outcome of chance-determined games. The Luck/Perseverance factor was comprised of items that share a common theme of an overestimation of chances of winning, including beliefs that one is prone to good fortune (i.e., illusory correlation).

The GBQ showed adequate psychometric properties regarding internal structure, confiability and concurrent validity (Steenbergh et al., 2002). Recently, the GBQ was examined in a treatment-seeking sample of disordered gamblers (Winfree et al., 2015). As expected, GBQ scores significantly decreased following a brief cognitive-behavioral intervention for disordered gambling. Results indicated that the original two-factor model provided a better fit than a single-factor model. However, the original two-factor model did not provide an overall adequate fit to the data. This finding is likely a result of the treatment-seeking sample endorsing more overall distortions and endorsing them more strongly (Winfree et al., 2015).

A Spanish version of the GBQ has also shown promise. Winfree, Meyers, & Whelan (2013) evaluated a Spanish adaptation of the measure (GBQ-S) in a U.S. based adult Latino sample and found adequate psychometric evidence and replicated the factor structure of the original English version. These results, however, do not guarantee the adequacy and appropriateness of this version to assess cognitive distortions in other Spanish speaking samples. The International Test Commission (ITC) asks for a comprehensive examination of the potential linguistic and cultural differences among the population for whom the versions of an instrument are intended (ITC, 2010). To date, the measure has not been evaluated in a Spanish-speaking sample outside US and, therefore, further validation of this measure in other Spanish-speaking samples from other parts of the world is an important next step.

Most psychological constructs are highly dependent on the cultural aspects where the tests are used, therefore, bias in test construction and test adaptation have a profound and deleterious impact on decisions regarding treatment and intervention (ITC, 2010). Argentina is a South American country with a large prevalence of European descent, and this European immigration has influenced Argentinean culture. The socio-cultural background is, therefore, quite dissimilar to that found among Hispanic population in U.S., mostly characterized by Mexican ascendant (US Department of Commerce Economics and Statistics Administration, 2012). It is reasonable; therefore, not to assume in advance that psychometric tests will behave similarly across diverse cultural groups, despite they speak the same language. Additionally, there is a need to study psychological variables in more diverse cultural groups (Henrich et al., 2010).

Evaluating the GBQ-S in an Argentinian sample would provide valuable information regarding gambling behavior and cognitive distortion endorsement among the Argentinian community. Having a culturally sensitive measure to assess cognitive distortions will facilitate the early detection of people who might be at risk of developing problematic gambling behaviors. The present study examined the factor structure of the GBQ-S in a sample of gamblers from Argentina with different levels of gambling involvement. Additionally, we analyzed the association between cognitive distortions and type of gambling activity and frequency of gambling behaviors. Finally, we examined the predictive validity of the GBQ-S by assessing its association with level of gambling severity.

2. Methods

2.1. Sample

The study's sample comprised 616 (209 men, 407 women) participants. A majority of the participants ($n = 339$, 54.9%) completed a paper-and-pencil survey while 277 (45.1%) participants completed an online survey. Participants who completed the paper-and-pencil survey were recruited from psychology (40.4%), engineering (24.9%) and biology (7.1%) courses at the National University of Cordoba (Argentina). We approached all department chairs via email or phone; yet only those from these three departments accepted being part of the study, and, as such, only students enrolled in these classes were included in the study. Twenty-seven cases were eliminated due to missing >20% of data. Participants who completed the online survey were recruited through advertisements on social network sites (i.e. Facebook and Twitter), and e-mailing lists. This advertisement asked for young adults and adults (ages between 18 and 60 years) from the general community who gambled within the previous twelve months. Participants did not receive any monetary compensation for their participation. Only participants who reported lifetime gambling were retained for the study. Eighty-one cases from the paper-and-pencil survey reported no lifetime prevalence of gambling and were not included in the study. The final sample was composed of 508 participants (65.6% females). The mean age of 25.50 years ($SD = 9.46$ years) was statistically similar across males and females. Of the total sample, 82.5% were between 18 and 30 years old and 17.5% between 31 and 60. The majority of the sample (70.9%) reported living in the state of Cordoba, however; only 46.5% indicated they were born in that state. The remaining participants were from (53.5%) and lived in (29.1%) other states of Argentina. None of the participants indicated a different nationality. Table 1 shows sex, age and lifetime gambling engagement as a function of method of data collection.

Table 1
Demographic characteristics and occurrence of gambling for each sub-sample (online and paper-and-pencil surveys).

	Paper-and-pencil	Online
Sex (%)		
Men	40.1	29.6
Women	59.5	70.4
Age (M/SD)	20.9/4.5	29.4/10.7
College student	100	52.7
Worker[a]	21.1	44.4
Lifetime gambling (%)		
Casino	45.7	84.1
Lottery	58.6	88.4
Online gambling	2.6	67.9
Gambling with others	75.4	89.5
S-PGSI (%)[b]		
NPG (0)	–	47.8
LLP (1–2)	–	34.8
MLP (3–7)	–	13.0
PG (≥8)	–	4.4

Data are presented as percentage of subjects that fell into each category. For continuous variables data are presented as means and standard deviation in each category.
[a] Percentages do not sum to 100% because being a student or a worker are not mutually exclusive.
[b] NPG: non-problem gambling; LLP: low level of problems with few or no identified negative consequences; MLP: moderate level of problems leading to some negative consequences; PG: problem gambling with negative consequences and a possible loss of control.

3. Measures

3.1. Spanish version of the Gamblers' Beliefs Questionnaire (GBQ-S, Winfree et al., 2013)

This is a 20-item self-report instrument designed to assess gambling related cognitive distortions (Steenbergh et al., 2002). Each item of the GBQ consists of a statement that represents a cognitive distortion commonly held by gamblers. Respondents rate their level of agreement with each statement on a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree). GBQ has two sub-scales: Luck/Perseverance (12 items) and Illusion of Control (8 items). Higher scores are indicative of higher levels of cognitive distortion. The Spanish-GBQ has demonstrated adequate internal consistency (from $\alpha = 0.87$ to $\alpha = 0.97$; Winfree et al., 2013). Both surveys (internet and paper-and-pencil) included the Spanish-Gamblers' Beliefs Questionnaire (see the instruments section).

3.2. Gambling involvement

Gambling was defined as the act of placing an amount of money on the uncertain prospect of a larger monetary outcome. One question assessed lifetime occurrence of different gambling activities (roulette, sports, blackjack, poker, bingo, lottery, scratch cards, dice, and slot machines) in different gambling settings (casino, internet, in groups with other people). Additionally, we developed an ad hoc questionnaire to assess frequency of gambling behaviors. Participants reported last year frequency (i.e. almost daily, 1–3 times a week, 1–3 times a month, 10–11 times per year, 4–8 times per year, 2–3 times per year, once a year, never in the previous year) of gambling in each of the mentioned gambling activities. This set of questions was similar to those used in previous studies (Dechant, 2013; Ginley et al., 2014; MacLaren, Harrigan, & Dixon, 2012). Only participants who completed the online survey answered questions regarding frequency of gambling involvement. For the regression analyses, gambling activities were grouped based on their gambling setting (i.e. casino, internet) and their category (i.e. chance and skill). Therefore, the following categories of gambling activities were developed: chance based games at a casino, skill based games at a casino, chance based games on internet, skill based games on internet, chance based games with other people, skill based games with other groups, and lottery games [bingo, scratch].

3.3. Spanish-Problem Gambling Severity Index (S-PGSI)

In a previous study (Pilatti & Tuzinkievich, 2015) we translated the nine items of the PGSI from English into Spanish. Participants indicated how often they had experienced each of the nine items within the previous year. Response choices range from 0 (never) to 3 (almost always) and, therefore, total scores range from 0 to 27. Only participants who completed the online survey answered this measure. Scores on S-PGSI are interpreted as followed: 0 = non-problem gambling; 1–2 = low level of problems with few or no identified negative consequences; 3–7 = moderate level of problems leading to some negative consequences; 8 or more = problem gambling with negative consequences and a possible loss of control (Hodgins, Stea, & Grant, 2011). The S-PGSI showed adequate internal consistency in a previous study ($\alpha = 0.88$) and predictive validity in terms of gambling motives (Pilatti & Tuzinkievich, 2015). The present study yielded a Cronbach's alpha of 0.87 for S-PGSI scores.

4. Procedure

4.1. Paper and pencil survey

The principal researcher and three advanced students in Psychology administered the survey collectively in a classroom. They explained how to answer the questions of the anonymous survey. They remained throughout the session until all participants had completed the survey. Researchers encouraged the participants to complete the whole questionnaire. They emphasized the voluntary nature of participation and guaranteed confidentiality of the participants. Participants provided verbal informed consent before scale administration. The administration of the survey took approximately 30 min. The collection of data took four months within the first half of 2013.

4.2. Online survey

We created a computerized questionnaire, developed with the LimeSurvey software (license of the National University of Cordoba), to collect data. Participants responded to advertisements posted in social network sites (i.e., Facebook and Twitter) and sent by e-mail. The advertisement contained a link to the survey that included an online consent form. This online procedure minimizes the likelihood of missing data by prompting messages for any missed items. Questions did not ask for personally identifying information. The collection of data took five months within the end of 2013 and the beginning of 2014.

Both surveys (internet and paper-and-pencil) included the Spanish-Gamblers' Beliefs Questionnaire (see the instruments section). The online survey included the Spanish-PGSI and questions regarding frequency of gambling behaviors. The University Internal Review Board approved all study procedures and the National Agency for Promotion of Science and Technology (FONCyT) reviewed the protocol.

4.2.1. Data analysis

4.2.1.1. Descriptive analyses. We employed descriptive analysis to depict the occurrence of gambling behaviors and severity of gambling involvement. We conducted Cramer's V and Student's *t*- to explore differences between men and women in the frequency and severity of gambling, respectively.

4.2.1.2. Confirmatory and reliability analyses. First, we screened for outliers and missing data (Tabachnick & Fidell, 2011). Normality of the distribution of each item was assessed through inspection of asymmetry and kurtosis scores. Values between ±2 in asymmetry and kurtosis, which are considered appropriate in the literature (George & Mallery, 2003). Univariate atypical cases were identified by calculating the standard z-score for each variable (z-scores > 3.29 were considered atypical)

(Kline, 2011). These analyses were performed separately for the total sample and then for the sub-samples who completed the online and the paper-and-pencil forms. Subsequently, we conducted a confirmatory factor analysis (CFA) with Mplus to examine the underlying factor structure of the GBQ-S. The model proposed two inter-correlated factors in which items load on their individual subscale factor. We employed *robust weighted least squares* (robust WLS) to estimate the model. This method better suites factor analyses with ordinal indicators (Flora & Curran, 2004). We employed multiple indices of goodness of fit to evaluate the fit of the model: the Tucker–Lewis index (TLI), the Comparative Fit Index (CFI), and the root mean square error of approximation (RMSEA) and Weighted Root Mean Square Residual (WRMR). CFI and TLI values equal or >0.90, RMSEA values between 0.05 and 0.08, and WRMR values below 1.00 (Yu & Muthén, 2002) indicate an excellent or acceptable model fit. To study internal consistency, the *composite reliability* (i.e., the total amount of true score variance in relation to the total scale score variance) was estimated for each subscale of the instrument. Values equal or greater than 0.70 were considered as acceptable (Nunnally, 1978). Scores of each of the subscales were calculated by the sum of the items that are defined a priori by the instruments (GBQ-S and S-PGSI). To determine if data from both methods of data collection (online and paper-and-pencil) show similar structures to the proposed model, we ran CFA separately for each sub-sample of participants.

4.2.1.3. Evidence of validity. We conducted a set of analysis to provide evidence for the validity of the measure. First, we explored the correlation between scores of each of the GBQ subscales and the level of severity. Next, we screened the variables (total scores on each sub-scale) to detect multivariate outliers (Mahalanobis distance measure; $p < 0.001$) (Kline, 2011). We also examined the distribution of the variables through inspection of asymmetry and kurtosis scores. Finally, we conducted a hierarchical regression analysis (enter method) to determine the capacity of each scale of gambling distortions (Luck and Perseverance and Illusion of Control) to predict level of gambling severity (criterion variable). We controlled the effect of gambling frequency. These analyses were performed separately for the samples of men and women.

5. Results

5.1. Descriptive results

Table 2 shows frequency of gambling engagement in a broad range of gambling activities and its association with sex. It also displays mean scores on the S-PGSI as a function of sex.

5.2. Confirmatory factor analysis and composite reliability

Because <5% of the data were missing, missing values were imputed by mode substitution (Schafer, 1999). This imputation method imputes values within the seven response options (discrete values such as 1, 2, etc.) of the self-response scale, whereas other methods (e.g. estimation by maximization) tend to introduce continuous variables (e.g., 2.4, 3.8),

Table 2
Frequency of gambling engagement and its association with sex.

	Never in the last year	Once a year	2–3 times per year	4–8 times per year	10–12 times per year	1–3 times per month	1–3 times per week	Almost every day	Cramer's V/t
Casino									
Cards	77.6	10.8	5.1	1.4	2.2	0.4	1.1	1.4	0.35***
Roulette	66.4	17.3	10.1	2.2	1.1	1.8	0.4	0.7	0.20
Bingo	71.5	14.8	9.4	2.2	0.4	1.1	0.0	0.7	0.25**
Slots	45.8	27.1	15.2	5.1	1.8	2.9	0.7	1.4	0.28***
Dice	94.2	2.9	1.4	0.7	0.0	0.7	0.0	0.0	0.19*
Sports	96.4	2.5	0.7	0.0	0.0	0.0	0.0	0.4	0.19*
Lottery									
Lottery tickets	50.2	28.2	11.6	4.3	2.2	2.9	0.4	0.4	0.21
Quiniela	39.0	24.9	17.7	5.4	3.2	4.0	2.5	3.2	0.23*
Scrapies	55.6	20.9	13.4	4.7	1.4	2.5	0.7	0.7	0.13
Quini 6	44.4	18.1	11.9	7.9	5.8	5.8	5.8	0.4	0.19
Bingo	62.1	19.5	7.6	6.1	1.4	2.2	0.4	0.7	0.23*
Internet									
Pocker	72.6	4.3	5.8	2.9	4.0	5.1	1.1	4.3	0.36***
Slots	88.8	4.3	1.8	2.2	0.7	0.4	0.4	1.4	0.13
Table games	69.7	9.0	7.2	3.2	4.3	3.2	0.7	2.5	0.08
Roulette	96.0	1.8	0.7	0.4	0.4	0.4	0.0	0.4	0.20
Cards	90.6	3.6	1.4	2.2	0.7	1.1	0.0	0.4	0.17
Sports	94.9	1.1	2.2	0.0	0.7	0.4	0.0	0.7	0.13
Dice	93.9	2.2	1.8	0.7	0.4	0.7	0.0	0.4	0.23*
Bingo	98.6	0.4	0.4	0.0	0.4	0.0	0.0	0.4	0.14
In groups with others									
Pocker	61.7	11.9	8.7	4.7	4.0	5.4	1.4	2.2	0.33***
Sports	77.3	9.7	7.6	2.2	2.2	0.7	0.0	0.4	0.20
Table games	55.6	15.2	15.9	6.1	2.2	4.0	0.4	0.7	0.16
Video games	74.7	8.7	7.2	2.9	2.2	2.9	0.4	1.1	0.22
Roulette	89.9	6.9	1.8	0.0	0.7	0.4	0.0	0.4	0.20*
Pool	70.8	14.4	11.2	1.8	1.1	0.4	0.0	0.4	0.14
Cards	49.5	14.1	18.4	7.6	4.0	4.7	0.7	1.1	0.20
Dice	66.1	14.1	9.7	4.3	1.4	3.6	0.0	0.7	0.18
S-PGSI (mean/SD)									
Male	2.7(4.5)								4.1***
Female	1.1(1.9)								

Note: Quiniela and Quini 6 are two common gambling activities in Argentina.
* $p \leq 0.05$.
** $p \leq 0.01$.
*** $p \leq 0.001$.

changing the original distribution (Dominguez Lara, 2014). We then calculated asymmetry and kurtosis indices to examine the univariate distribution of the items assessing frequency of gambling, severity of gambling and cognitive distortions (Tabachnick & Fidell, 2011). Seventeen variables showed values greater than ±2.0 which are considered unacceptable (George & Mallery, 2011). Non-normal distribution may affect the association between the predictor and the criterion variables. Therefore, we transformed these variables. Specifically, we first applied a rank transformation and then we obtained z scores (McDonald, 1999). These transformed values were used in the rest of the analysis.

CFA results confirmed the two-factor model. Specifically, CFA results showed an overall acceptable fit to the data for the total sample (CFI 0.93; TLI 0.92, RMSEA 0.085, WRMR 1.387) and for both, the online (CFI 0.92; TLI 0.90, RMSEA 0.090, WRMR 1.241) and the paper-and-pencil (CFI 0.96; TLI 0.95, RMSEA 0.081, WRMR 1.011) sub-samples. The factor loadings weight ($p \leq 0.05$) for the Illusion of Control factor varied between 0.45 and 0.85, 0.52 and 0.90, 0.35 and 0.79 for the total, online and paper-and-pencil samples, respectively. The standardized regression weights for Luck/Perseverance varied between 0.67 and 0.83, 0.76 and 0.82, 0.59 and 0.79 for the total, online and paper-and-pencil samples. Composite reliability for Illusion of Control was $\rho = 0.85$, $\rho = 0.80$ and $\rho = 0.89$ for the total, online and paper-and-pencil samples, respectively. For Luck/Perseverance, the observed composite reliability was $\rho = 0.94$, $\rho = 0.92$, and $\rho = 0.96$ for each sample. Table 3 shows standardized factorial weights for each item on its corresponding factor, the composite reliability for each subscale and indices of goodness of fit for the total sample and separately as a function of method of data collection.

5.3. Criterion-related validity

Scores of each GBQ-S sub-scales were positively and significantly correlated with scores on the S-PGSI. Specifically, a higher level of cognitive distortion measured by the Illusion of Control ($r = 0.40$, $p \leq 0.001$) and the Luck/Perseverance ($r = 0.45$, $p \leq 0.001$) scales was related to a greater level of gambling severity as measured by the S-PGSI. Next, we conducted the regression analysis. Based on the observed differences in gambling involvement and level of severity, we decided to conduct the regression analysis separately for the subsample of men and the subsample of women. We checked for multivariate assumptions of independence between residues, homoscedasticity, linearity, normality, and multicollinearity (Tabachnick & Fidell, 2011). Table 4 shows the main results of this analysis. In the first step of the regression, we included frequency of gambling on each gambling activity (chance and skill games at a casino, chance and skill games on internet, chance and skill games with other people and lottery games). In the second step, we entered the two scales of cognitive distortions (Luck and Perseverance and Illusion of Control). We conducted this analysis for women and men in two separate analyses.

5.4. Subsample of men

In the first step, gambling frequency explained 43% of the variance of the severity of gambling $F(7, 61) = 7.60$. Casino chance games ($\beta = 0.41$, $t = 3.74$, $p < 0.001$) and casino skill games ($\beta = 0.30$, $t = 2.52$, $p < 0.05$) were positively associated to severity of gambling. In the second step, the percentage of explained variance increased 12% [$F(2, 69) = 9.36$, $p < 0.001$] after entering Luck and Perseverance and Illusion of Control scales. The scale measuring Luck and Perseverance ($\beta = 0.30$, $t = 2.80$, $p < 0.01$) was positively associated to severity of gambling. Additionally, the effect of frequency of casino skill gambling was no longer significant, indicating this effect was completely mediated by cognitive distortions.

5.5. Subsample of women

Gambling frequency for each gambling activity explained 18% of the variability of the severity of gambling $F(7, 183) = 5.87$. Casino chance games ($\beta = 0.20$, $t = 2.77$, $p < 0.01$), casino skill games ($\beta = 0.15$, $t = 2.10$, $p < 0.05$) and group skill games ($\beta = 0.33$, $t = 3.78$, $p < 0.001$) had positive effects on scores of indicating severity of gambling. In the second step, the percentage of explained variance increased to 31% [$F(2, 181) = 16.11$, $p < 0.001$] after entering the two scales of cognitive distortions (Luck and Perseverance and Illusion of Control). The scale Luck and Perseverance ($\beta = 0.39$, $t = 4.38$, $p < 0.001$) was

Table 3
Standardized regressions weights and composite reliability for each GBQ item. Results are presented for the total sample and for each sub-sample (online and paper-and-pencil surveys).

	Total	Paper-and-pencil	Online
	Factor loadings weight		
IC1	0.49	0.54	0.43
IC2	0.45	0.52	0.35
IC3	0.71	0.70	0.71
IC4	0.64	0.76	0.50
IC6	0.74	0.81	0.66
IC8	0.49	0.55	0.44
IC9	0.85	0.89	0.79
IC10	0.79	0.90	0.66
CR	0.85	0.89	0.80
LyP5	0.73	0.77	0.68
LyP7	0.75	0.83	0.65
LyP11	0.75	0.83	0.68
LyP12	0.67	0.76	0.59
LyP13	0.83	0.85	0.83
LyP14	0.76	0.76	0.78
LyP15	0.76	0.81	0.73
LyP16	0.79	0.84	0.73
LyP17	0.70	0.78	0.63
LyP18	0.83	0.87	0.79
LyP19	0.80	0.83	0.78
LyP20	0.71	0.82	0.60
CR	0.94	0.96	0.92
CFI	0.93	0.96	0.92
TLI	0.92	0.95	0.90
RMSEA	0.09	0.08	0.09
WRMR	1.39	1.01	1.24

CFI: Comparative Fit Index; TLI: Tucker–Lewis index; RMSEA: root mean square error of approximation; WRMR: Weighted Root Mean Square Residual. CR: composite reliability.

Table 4
Predictive utility of gambling involvement and cognitive distortions on gambling severity. Results are presented separately for the sub-sample of women and the sub-sample of men.

	Men		Women	
	Step 1	Step 2	Step 1	Step 2
	β	β	β	β
Casino chance games	0.41***	0.38***	0.20**	0.21**
Casino skill games	0.30*	0.13	0.15**	0.12
Lottery tickets	0.03	0.01	−0.02	−0.09
On-line skill games	0.10	−0.01	0.04	−0.01
On-line chance games	0.11	0.13	−0.14	−0.11
Group skill games	−0.11	−0.09	−0.02	0.03**
Group chance games	−0.09	−0.09	0.33***	0.20
Luck and perseverance		0.30**		0.39***
Control illusion		0.16		−0.01
ΔR^2		0.12***		0.12***
R^2	0.43***	0.55***	0.18***	0.31***
R^2 adjusted	0.37***	0.49***	0.15***	0.27***

β = standardized regression coefficient; ΔR^2 = R Square change; R^2 = R Square; Adjusted R Square.
*** $p < 0.001$.
** $p < 0.01$.
* $p < 0.05$.

positively associated to the criterion variable. Also, we observed that the effects of frequency of casino skill games and group skill games were completely and partially mediated, respectively, by these cognitions. Specifically, in the second step the effect of frequency of casino skill gambling was no longer significant while the effect of frequency of gambling in groups descended to 0.20.

6. Discussion

The present study examined the psychometric properties of the Spanish version of the Gamblers' Beliefs Questionnaire in an Argentinean sample of youth and adults. This Spanish version, adapted from the original English version, has shown adequate psychometric properties with Hispanic gamblers living in the US (Winfree et al., 2013). Until now, however, no previous study evaluated the psychometric properties of the GBQ-S in Spanish-speaking sample outside U.S. Gambling is a prevalent activity among Argentinean youth and there is a need to develop culturally appropriate measures for the assessment of gambling behaviors and its risk factors in this population. In the present study, we seek to provide evidence of the validity of this measure for its use among Argentinean youth and adults. We addressed different sources of validity to provide further evidence of the adequacy of this Spanish version.

Consistent with previous studies (Winfree et al., 2013), results supported the Spanish GBQ as a valid tool to assess cognitive distortions in Spanish-speaking youth and adults from Argentina. Specifically, we confirmed and sustained the original two factor model proposed by Winfree et al. (2013). Importantly, and similarly to prior research (Winfree et al., 2013), both sub-scales showed high values of internal consistency. According to our results, cognitive distortions were similarly distributed regardless of the age of the respondents but men were more likely than women to hold more distorted beliefs about gambling (Raylu & Oei, 2004) and to display higher levels of severity (King et al., 2010). These results added more evidence regarding the validity of this measure.

Previous work supported the association between cognitive distortions and gambling frequency (Donati et al., 2015; Raylu & Oei, 2004) and between cognitive distortions and gambling-related problems (Donati et al., 2015; Raylu & Oei, 2004; Steenbergh et al., 2002; Winfree et al., 2013). Considering the strong relationship between gambling frequency and gambling severity (Bertossa et al., 2014; Holtgraves, 2009; Rahman et al., 2012) a particular goal was to examine the impact of specific types of cognitive distortions on gambling severity while controlling the effect of gambling frequency. To our knowledge, this is the first study to analyze this.

Our results indicate that cognitive distortions explained a percentage of the variance of gambling severity over the effect of frequency of engagement in a broad range of gambling activities. Notably, gambling beliefs regarding luck and perseverance, but not those depicting illusion of control, were positively related to gambling severity, suggesting the former beliefs had an independent and unique impact on gambling related problems regardless of the frequency of gambling involvement. Similarly, Donati et al. (2015) did not find a significant association between GRCS's sub-scales assessing illusion of control and gambling severity, emphasizing the role of these specific distorted cognitions. Accordingly, interventions aimed at reducing problematic gambling behaviors would benefit from challenging these particular beliefs. Indeed, one of the central features of Cognitive-Behavioral Therapy (CBT) for problem gambling is challenging erroneous beliefs about gambling (to understand and identify erroneous thinking about his/her chances of winning) (Okuda et al., 2009).

Despite the evidence regarding the sustainability of the Spanish GBQ to assess cognitive distortions in Spanish-speaking youth and adults from Argentina, there are some limitations that need to be considered when interpreting these results. First, we employed two different methods for data collection, web-based survey and paper and pencil questionnaires. Previous work, however, indicates that quality of information is similar across both methods (Hohwü et al., 2013; Touvier et al., 2010). Additionally, our sample had a higher percentage of women than men and most of the participants were 31 years old or younger. Future studies might explore our results in a more diverse sample regarding not only sociodemographic characteristics but also at the level of involvement in gambling activities.

Despite these limitations this is the first study that examines the psychometric properties of the Spanish version of the GBQ in a sample of Spanish-speaking youth and adults outside of the United States. Our results suggest that scores measured by this tool exhibit adequate psychometric properties (based on the CTT) for the accurate assessment of cognitive distortions across youth and adults from the general community.

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