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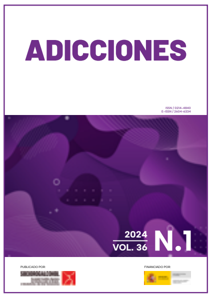

ORIGINAL

Spanish validation of the Gamblers' Belief Questionnaire (GBQ)

Validación española de la escala "Gamblers Belief Questionnaire (GBQ)"

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Abstract

The objective of this study is to validate The Gambler's Beliefs Questionnaire, a measure of gamblers' cognitive distortions. The psychometric properties of the scale were analyzed with a Spanish sample of 515 participants aged from 16 and 24 years. Three scales related to pathological gambling (SOGS-RA and MAGS) and to social desirability were administered. A cross-sectional validation was performed, obtaining a scale with 21 items distributed in two independent factors (Luck/perseverance and Illusion of control). The internal consistency ($\alpha = .93$) and test-retest reliability ($r = .69$) are adequate. GBQ scale scores correlate significantly with other measures of pathological gambling (SOGS: $r = .35$; MAGS: $r = .40$, both $p \leq .001$). Higher levels of cognitive distortions are associated with a higher likelihood of being classified as a problem or at-risk gambler. GBQ scores are influenced by social desirability, although the effect sizes are small (r below .20). The GBQ is a useful instrument in the diagnosis and evaluation of the treatment of Spanish youths and adolescents with gambling problems.
Keywords: gambling, questionnaire validation, Gamblers' Beliefs Questionnaire, cognitive distortions, teenagers, youth

Resumen

El objetivo de este estudio es la validación española del "Gamblers Belief Questionnaire (GBQ)" que mide distorsiones cognitivas relacionadas con los problemas de juego. Se analizan las propiedades psicométricas de la escala en 515 jóvenes españoles, de 16 a 24 años. Se administraron tres escalas sobre juego patológico (GBQ, SOGS-RA y MAGS) y deseabilidad social. Se realizó una validación cruzada, obteniéndose una escala de 21 ítems con una estructura bifactorial (Suerte/Perseverancia e Ilusión de Control). La consistencia interna (α = ,93) y estabilidad temporal (r = ,69) de la escala son adecuadas. Las puntuaciones de la escala GBQ correlacionan de forma significativa con otras medidas de juego patológico (SOGS: r = ,35; MAGS: r = ,40, ambas $p \leq$,001). Un mayor nivel de distorsiones cognitivas se asocia a mayor probabilidad de ser clasificado como jugador con problemas o de riesgo. Las puntuaciones del GBQ están influenciadas por la deseabilidad social, aunque los tamaños del efecto son pequeños (r menores a ,20). El GBQ es un instrumento útil en el diagnóstico y evaluación de tratamientos de jóvenes y adolescentes españoles con problemas de juego.
Palabras clave: juego, validación de cuestionario, Gamblers Belief Questionnaire, distorsiones cognitivas, adolescentes, jóvenes

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Gambling addiction or gambling disorder is a non-substance psychological addiction involving loss of control and dependence on gambling (American Psychiatric Association, APA, 2013). It has negative outcomes on the finances, social relationships and health of those affected (World Health Organization, 2017). Gambling disorder has been linked to substance abuse, depression, anxiety, and emotional regulation difficulties (Jauregui, Estévez & Urbiola, 2016). Among the factors contributing to the incidence and maintenance of the disorder are cognitive distortions related to gambling (Chan, Ruiz-Pérez, Morales-Quintero & Echeburúa, 2019; Buen & Flack, 2021), such as the illusion of control, luck, superstitions, predictions and self-correcting chance (Cosenza & Nigro, 2015). A lower level of cognitive bias is associated with a better understanding of chance, the impossibility of predicting results and a higher rate of quitting gambling (Labrador, Mañoso & Alba, 2008; Labrador, Labrador, Crespo, Echeburúa & Becoña, 2020). Indeed, one approach to clinically treating this disorder and problem gambling is to correct the distortions related to gambling (Gooding & Tarrier, 2009).

In young Europeans, pathological gambling rates range from 0.2% to 12.3% (Calado, Alexandre & Griffiths, 2017) and in Spain from 0.72% from 5.6% (Becoña, Míguez & Vázquez, 2001; Chóliz, Marcos & Lázaro-Mateo, 2019). In general, the age of onset is decreasing (13 or 14 years), although there are not many studies on problem gambling

Table 1
Validation and psychometric properties of the GBQ scale in different countries

Country	Author and year	*N*	Sample	Reverse translation	Nº items	EF	Reliability	Validity
USA	Steenbergh et al., 2002	403	Community and university	Original versios	21	EFA: 2 factors	*α* = .92 F1 *α* = .90 F2 *α* = .84 *r* = .77	GBQ with duration of gambling sessions: *r* = .43. *p* = .001 Problematic scores higher than non-problematic GBQ with social desirability: *r* = -.03. *p* > .050
Hispanic USA	Winfree, Meyers & Whelan, 2013	219	Community	Yes	20	EFA: 2 factors	*α* = .95 F1 *α* = .96 F2 *α* = .86	GBQ-S with SOGS: *r* = .33. *p* < .001 GBQ-S with DSM-IV: *r* = .35. *p* < .001 Differences in GBQ-S between non-gamblers and non-pathological gamblers and problem gamblers classified by SOGS and DSM-IV
China	Wong & Tsang, 2012	258	Youth services centres	Yes	14	EFA: 2 factors	*α* = .91 F1 *α* = .87 F2 *α* = .82	GBQ-C with GUS-C: *r* = .52. *p* < .01 GBQ-C with GRCS-C dimensions: *r* entre .48 y .75. *p* < .01 GBQ-C accounted for 22% of SOGS-RA variance controlling for sex and age
Italy	Marchetti et al., 2016	749	Community	Yes	21	EFA: unidimensional	*α* = .93 *r* = .83	GBQ-I with SOGS: *r* = .42; with GABS: *r* = .63; with gambling frequency: *r* = .26; with BDI-II: *r* = .19. *p* < .01; with STAI-Y state and trait: *r* = .18. *p* < .01 and *r* = .16. *p* < .01 Differences in GBQ-I means between non-gamblers, social gamblers and problem gamblers GBQ-I accounted for 22.1% of SOGS variance controlling for sex and age
Argentina	Pilatti, Cupani, Tuzinkievich, Winfree, 2016	508		Winfree et al., 2013	20	EFA: 2 factors	F1: *ρ* = 0.94 F2: *ρ* = 0.85	Illusion of control (*r* = 0.40. *p* ≤ 0.001) and Luck/Perseverance (*r* = 0.45. *p* ≤ 0.001) with gambling severity (S-PGSI) Factors F1 and F2 increased the variance explained by gambling severity by 12% (men) and 31% (women)

Note. GBQ: Gamblers' Beliefs Questionnaire; F1: Luck/Perseverance and F2: Illusion of control; GBQ-S: Spanish version Gamblers' Beliefs Questionnaire; SOGS: South Oaks Gambling Screen; DSM-IV: Diagnostic Criteria; GBQ-C: Chinese version Gamblers' Beliefs Questionnaire; GUS-C Gambling Urge Scale-Chinese; GRCS-C Gambling Related Cognition Scale-Chinese; SOGS-RA: South Oaks Gambling Screen revised for adolescents; GBQ-I: Italian version Gamblers' Beliefs Questionnaire; GABS: Gambling Attitudes and Beliefs Survey; BDI-II: Beck Depression Inventory II; STAI-Y: State-Trait Anxiety Inventory Y; S-PGSI: Spanish-Problem Gambling Severity Index.

and gambling disorders at these ages (Ciccareli, Nigro, D'Olimpio, Griffiths & Cosenza, 2021; Estévez, Herrero & Sarabia, 2014; Labrador et al., 2021; Muñoz-Molina, 2008).

The measurement of factors associated with gambling disorder, such as cognitive distortion, can contribute to understanding this type of addiction. Cognitive biases are created by reducing large amounts of available information to facilitate cognitive processing tasks, which can lead to drawing distorted conclusions from reality. In gambling, cognitive biases (for example, the illusion of control, evaluation biases about outcomes, or the gambler's fallacy) can lead to irrational conclusions about the probability of predicting or controlling the outcomes of an event occurring by chance, that is, one that is unpredictable and uncontrollable (Labrador et al., 2021). Several studies have shown that, while cognitive distortions are found in non-gamblers, such biases grow as the participation in gambling and its problems increase (Goodie & Fortune 2013; Labrador et al., 2021). Moreover, cognitive distortions in students have been shown to be an important risk factor for the development of gambling problems (MacKay & Hodgins, 2012).

Nevertheless, most research involving young people with gambling problems has been carried out in Anglo-Saxon countries and cannot be extrapolated to Spain. An initial review found five specific instruments in Spanish for young people. The SOGS-RA (Winters, Stinchfield, Fulkerson, 1993, translated by Secades & Villa, 1998), MAGS (Shaffer, LaBrie, Scanlan, & Cummings, 1994, translated by Secades & Villa, 1998), and DSM-IV-J (Fisher, 1993, translated by Becoña & Gestal, 1996), which are used to discriminate between gamblers with and without pathologies, have been validated in adolescents but not in the Spanish version. The Gambling Motives Questionnaire (GMQ; Stewart & Zack, 2008) has been validated in young Spanish people (Cerdà, Nebot, Campos & Quero, 2016), but does not measure cognitive distortions. Only the Inventory of Thoughts on Gambling (Echeburúa & Báez, 1994) evaluates cognitive distortions, focusing on users of slot machines. All the Anglo-Saxon instruments reviewed are also limited to classifying gamblers with or without problems; the only one to measure cognitive distortions about gambling is the Gamblers' Beliefs Questionnaire (GBQ) (Steenbergh, Meyers, May & Whelan, 2002).

The GBQ scale has been validated in different countries and languages (see Table 1), allowing for cross-cultural comparisons. It has high internal consistency and test-retest reliability, and high convergent validity with the SOGS and the DSM-IV. In addition, the GBQ scale is related to constructs associated with the development and maintenance of pathological gambling, and correlates with the Eysenck impulsivity questionnaire (Mackillop, Anderson, Castelda, Mattson & Donovick, 2006), the Canadian Problem Gambling Index (CPGI) (Ferris & Wynne, 2001), and the Toronto Alexithymia and Motivation Scale (Mitrovic & Brown, 2009). Given the scarcity of instruments validated in Spanish and the fact that the scales do not include measurements of cognitive distortions, the objective of this study was to validate the "Gamblers' Beliefs Questionnaire" (Steenbergh et al., 2002) in Spanish adolescents and with young people.

Method

Sampling

The type of sampling applied was incidental. The sample was obtained in October and November 2020 and was composed of N = 515 Spanish students of secondary and university education in the city of Burgos. Women represented 53.2% (n = 274) of the sample and men 46.8% (n = 241). Ages ranged from 16 to 24 years (M = 20.04; SD = 2.53), with 38.8% (n = 200) aged between 16 and 18 years, 26.6% between 19 and 21 years (n = 137) and 34.6% (n = 178) between 22 and 24 years. High school students comprised 37.9% (n = 195), and 62.1% (n = 320) were at university.

Instruments

Gamblers' Beliefs Questionnaire (Steenbergh et al., 2002). This consists of 21 items with response scales from 1 = strongly agree to 7 = strongly disagree. Items were recoded so that higher scores indicate greater cognitive distortion. The total score range is 21 to 147. The internal consistency of the original version of the scale is .92 and test-retest reliability is .77. It has two related factors: Luck/Perseverance (α = .90) and Illusion of control (α = .84).

Massachusetts Gambling Screen (Shaffer et al., 1994, translated by Secades & Villa, 1998). This has 26 items and two subscales with yes/no answers. The first assesses the DSM-IV criteria, with a score greater than 5 on all 12 items indicating gambling problems. The second MAG subscale measures the participants' assessment of their gambling behaviour; a score of 2 or more points on its seven items represents gambling problems, 0 to < 2 points means in transition, and a negative score shows no gambling problems. The original scale has a Cronbach's alpha coefficient of .87, with .87 (DSM) and .83 (MAG) for the subscales. In our study, the internal consistencies were: α = .88 (Total scale); α = .83 (DSM) and α = .68 (MAG).

South Oaks Gambling Screen Revised for Adolescents (SOGS-RA) (Winters et al., 1993, translated by Secades & Villa, 1998). This consists of 16 items, twelve of which are dichotomous (Yes/No). The positive answers are added: 0-1 = player without problems, 2-3 = player at risk and 4 or more = player with problems. This scale makes it possible to differentiate between game types: games of chance (heads or tails, bingo, dice, slot machines, scratch cards and lottery) and games of strategy (playing card games, betting on games of skill, such as pool, golf or bowling, team sports, and horse racing). A Cronbach's alpha of .80 was obtained in the Anglo-Saxon and Spanish versions; in our study it was .88. The non-scored items provide information on the game type and amounts at stake, and the origin of the money. To measure severity, the study also analyzed the items referring to the frequency with which the subject has played ten different types of games during the last year (0 = never, 1 = less than once a month, 2 = monthly, 3 = weekly and 4 = daily). Cronbach's alpha for this subscale was .75.

Social Desirability Scale (Crowne & Marlowe, 1960, adapted by Ferrando & Chico, 2000). This comprises 33 dichotomous items (True/False), with higher scores indicating greater social desirability. The original version had a Cronbach's alpha of .73, with .78 for the Spanish version, while internal consistency in our study was .65.

Procedure

The reverse translation method was used (Hambleton & Patsula, 1999) in translating the GBQ scale (Steenbergh et al., 2002) into Spanish. Two researchers independently translated the original version into Spanish and agreed on the translations. The items were then translated into English by two other people, replicating the process. The resulting Spanish translation was reviewed by a bilingual expert psychologist who changed item 11 to improve clarity (Definitive item: *"Even when I may be losing with my strategy or playing technique, I must keep it because I know I will win again"*). Two researchers applied the scales in three secondary schools and at the University of Burgos during school hours (duration 15 minutes). Two weeks later, the GBQ scale was administered again to a subsample of adolescents and young people. The study complied with the Ethical Principles of the American Psychological Association for research (APA, 2017). Permissions were obtained from parents' associations and school directors, as was parental consent. All participants were informed in advance of the study and of their right to withdraw their participation at any time without consequences. Those who agreed to participate by signing an informed consent completed the anonymous questionnaires voluntarily and did not receive any compensation for taking part in the study.

Statistical and psychometric data analysis

Of the original N = 528 participants, 13 had more than 20% missing data and were eliminated (Downey & King, 1998). To obtain evidence of internal structure validity, cross-validation was applied by randomly dividing the sample into two. Exploratory factor analysis (EFA) was performed with the first half of the sample and confirmatory factor analysis (CFA) with the second, using a maximum likelihood estimation method for robust data with bootstrap (10,000) to analyze the correlation matrix. Various authors recommend this procedure as a way of replicating the factorial model found in the EFA (Thompson, 2004). In the CFA, the fit indices and factorial weights were used to determine the model that best fit the data. The following indices were calculated: Chi square ($\chi 2$), Akaike Information Criterion (AIC), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI) and Root Mean Square Error of Approximation (RMSEA). The lower the values of $\chi 2$, AIC, RMSEA (< .08), and the higher the CFI and TLI (< .90), the better the model. The goodness of fit of the theoretical models was measured using absolute and relative indices (Hu & Bentler, 1999).

Once the final model was obtained, in addition to Cronbach's alpha, reliability in the form of internal consistency was also measured with the Omega indices (ω) and the mean variance extracted (MVE). In the case of the ω index, values above .70 are considered adequate, and for MVE, values above .45 (Hayes & Coutts, 2020; Garson, 2016). The test-retest reliability of the scale was also calculated. Evidence of the validity of the relationship with external variables was obtained through Pearson correlations with the SOGS-RA and MAGS scales and with gambling frequency (severity) and three logistic regressions. The Odds Ratio (OR) or probability ratio for the values established by the DSM (binary logistic regression), SOGS-RA and MAGS (multinomial) were estimated on the basis of GBQ scores. It was thus verified whether the presence of cognitive distortions explained the classification in gambling problem categories as defined by the DSM, SOGS-RA and MAGS. To obtain evidence of discriminant validity, the SOGS-RA and MAGS classification was used to describe the differences in the mean GBQ scores and dimensions obtained by the classification of participant groups as people with or without gambling problems. Effect sizes were estimated using Cohen's d (low effect size: d = 0.2, medium: d = 0.5, high: d = 0.8) (Cohen, 2013). Finally, the influence of social desirability on the responses of the participants was examined using Pearson correlations. SPSS Windows 24 and M-Plus 8.5 were used, and a significance level of ≤ .05.

Results

Prevalence of gamblers with problems and/or at risk/transition

The DSM screening test (MAGS subscale) detected n = 33 (6.4%) young people with gambling problems, with n = 482 (93.6%) not having gambling problems. The MAG (MAGS subscale) detected n = 29 (5.6%) youths with gambling problems, n = 65 (12.6%) in transition and n = 421 (81.7%) without gambling problems. The SOGS-RA test found n = 42 (8.2%) youths with gambling problems, n = 56 (10.9%) at risk, and n = 417 (81%) without gambling problems. Both games of chance and strategy were played by 75.8%

(DSM: n = 25), 69.1% (MAG: n = 65), and 75.5% (SOGS-RA: n = 74) of gamblers with gambling problems or at risk/in transition.

The percentage of men classified as pathological or at risk/in transition is greater than that that of women (DSM: χ^2 = 20.506, p = .0001; MAG: χ^2 = 39.017, p = .0001; SOGS-RA: χ^2 = 30.490, p = .0001). There are no differences by age in DSM ($t_{(513)}$ = -.901, p = .368) or in MAG ($F_{(2.512)}$ = 1.313, p = .270), but age differences were found in SOGS-RA ($F_{(2.512)}$ = 4.782, p = .009). Pathological gamblers (M = 20.81; SD = 2.14) have a higher mean age than those at risk/in transition (M = 19.25; SD = 2.59).

Games of chance were reported by 6.1% (DSM: n = 2), 12.8% (MAG: n = 12) and 12.2% (SOGS-RA: n = 12), and games of strategy by 3% (DSM: n = 1), 8.5% (MAG: n = 8) and 7.1% (SOGS-RA: n = 7). Between 15.1% (DSM: n = 5) and 5.1% (SOGS-RA: n = 5) did not select any of the listed games.

Descriptive analysis of the scale items

The descriptive analysis of the GBQ scale (Steenbergh et al., 2002) showed that no item mean was above the theoretical scale mean (4) (see Table 2). The mean score for the entire sample of participants was 57.93 (SD = 24.72), with scores ranging from 21 to 138. The items with the highest scores were 5 and 7 of the "illusion of control" dimension, and the lowest scores were for items 10 and 15 of the "luck/perseverance" dimension. Skewness and kurtosis indices were calculated to examine the item distributions. Only the kurtosis coefficient of item 15 showed a value greater than ± 2.0, considered unacceptable (George & Mallery, 2011).

Internal structure validity evidence

The sample was randomly divided into two halves. The EFA was performed with one half (n = 258) and the factorial structure was validated by CFA in the other (n = 257). The sample adequacy indices obtained (KMO= .94; Bartlett,

Table 2
Descriptive Analysis of the items in the Spanish version of the Gamblers' Beliefs Questionnaire

ITEMS	*M*	*SD*	*Skew*	*Kurtosis*
1.- I think of the game as a challenge.	3.34	1.80	.24	-.85
2.- My knowledge and skill in gambling contribute to the likelihood that I will make money.	3.36	1.95	.29	-1.05
3.- My choices or actions affect the game on which I am betting.	3.65	2.06	.10	-1.25
4.- If I am playing and losing, I should continue because I do not want to miss a win.	2.70	1.94	.87	-.43
5.- I should keep track of previous winning bets so that I can figure out how I should bet in the future.	3.77	2.02	.02	-1.19
6.- When I am gambling, "near misses" or times when I almost win remind me that if I keep playing, I will win.	2.93	1.82	.59	-.67
7.- Gambling is more than just luck.	3.76	2.08	.03	-1.31
8.- My gambling wins are evidence that I have skill and knowledge related to gambling.	2.99	1.84	.49	-.87
9.- I have a "lucky" technique that I use when I gamble.	2.49	1.76	.84	-.47
10.- In the long run, I will win more money than I will lose gambling.	2.09	1.66	1.52	1.45
11.- Even though I may be losing with my gambling strategy or plan, I must maintain that strategy or plan because I know it will eventually come through for me.	2.90	1.73	.56	-.57
12.- There are certain things I do when I am betting (for example, tapping a certain number of times, holding a lucky coin in my hand, crossing my fingers, etc.) which increase the chances that I will win.	2.46	1.91	1.07	-.10
13.- If I lose money gambling, I should try to win it back.	2.79	1.94	.76	-.61
14.- Those who don't gamble much don't understand that gambling success requires dedication and a willingness to invest some money.	2.78	1.84	.64	-.70
15.- Where I get money to gamble doesn't matter because I will win and pay it back.	1.87	1.59	1.97	3.03
16.- I am pretty accurate at predicting when a "win" will occur.	2.71	1.76	.75	-.41
17.- Gambling is the best way for me to experience excitement.	2.15	1.68	1.37	.84
18.- If I continue to gamble, it will eventually pay off and I will make money.	2.18	1.58	1.36	1.21
19.- I have more skills and knowledge related to gambling than most people who gamble.	2.22	1.69	1.27	.68
20.- When I lose at gambling, my losses are not as bad if I don't tell my loved ones.	2.19	1.73	1.41	1.01
21.- I should keep the same bet even when it hasn't come up lately because it is bound to win.	2.59	1.70	.80	-.25
Total scale	57.93	24.72	.73	.42

$\chi 2 = 2987.64$, $p \leq .001$) indicate that the application of the EFA was plausible and feasible. A factorial analysis of principal components with varimax rotation was performed. The factorial solution yielded three factors with 58.47% of the explained variance. Since it did not fit the original structure, a forced EFA was applied to two factors, which explained 53.55% of the variance. The first dimension explained 45.78%, with 14 items corresponding to the "luck/perseverance" factor. The second dimension (7.77% of the variance) composed of seven items, corresponded to the "illusion of control" factor. Unlike the original version, in the EFA item 9 and 19 loaded on the first factor. In addition, items 6, 8, 11 and 14 carried a weight close to or greater than .40 in both factors. Items 6 and 8 had higher factorial weight in dimension 2 and items 11 and 14 in dimension 1 (see Table 3).

A CFA was carried out to confirm the two-dimensional model obtained in the forced EFA. Three models were proposed (see Table 4): original model 1, model 2 based on the EFA result, and model 3 showing the best fit with the data. Models 1 and 2 did not have acceptable fit indices. The CFA results for model 2 indicated that item 19 had more weight in the luck/perseverance factor 1 than in its original illusion of control dimension. The MIs of model 2 also suggested significant changes, with item 9 (MI: 16.81) (illusion of control Factor 2) and item 6 (MI: 16.82) (luck/perseverance factor 1) finally remaining in their original dimension. Although the EFA indicated that items 8, 11

Table 3
Exploratory Factor Analysis of the Gambler's Beliefs Questionnaire Scale: original model and Spanish version model

	Original version		Spanish version: forced EFA	
Ítems	**I**	**II**	**I**	**II**
1	.11	**.56**	.30	**.65**
2	.14	**.61**	.22	**.71**
3	-.03	**.61**	.07	**.74**
4	**.48**	.07	**.58**	.34
5	.15	**.51**	.14	**.63**
6	**.52**	.12	.46	**.53**
7	-.10	**.57**	.17	**.49**
8	.12	**.67**	.41	**.58**
9	.33	**.40**	**.65**	.30
10	**.46**	.21	**.79**	.25
11	**.51**	.31	**.62**	.42
12	**.56**	.11	**.60**	.33
13	**.65**	.13	**.60**	.38
14	**.43**	.19	**.51**	.49
15	**.74**	-.12	**.81**	.15
16	**.43**	.30	**.68**	.32
17	**.61**	-.02	**.75**	.20
18	**.73**	.05	**.83**	.28
19	.34	**.41**	**.75**	.20
20	**.84**	-.21	**.79**	.05
21	**.70**	.02	**.57**	.33

Figure 1
Confirmatory Factor Analysis of the Spanish version of the Gambler's Beliefs Questionnaire (GBQ-E): Model 3

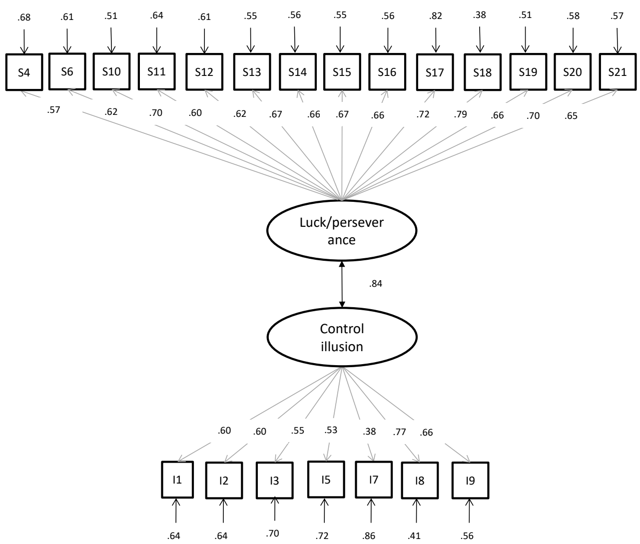

Table 4
Confirmatory Factor Analysis of the Gambler's Beliefs Questionnaire Scale

	Nº of ítems	*S-B χ*	*df*	*CFI*	*TLI*	*RMSA*	*90% CI of RMSA*	*AIC*	*Δχ² (Δdf)¹*
Model 1	21	399.85	188	.88	.87	.066	.057; .075	19642.18	
Model 2	21	382.82	188	.89	.88	.063	.054; .073	19619.37	17.03. p = .0001
Model 3	21	342.73	188	.91	.90	.057	.048; .067	19571.12	40.09. p = .0001

Note. N = 257; [1] $\Delta\chi^2$ = Change in chi-square between the proposed models (model 2 and 3) and original (model 1). $^{***}p \leq .001$.

and 14 also loaded on both factors, the fit of the data worsened when the dimension was changed with respect to the original model. The final model, model 3, included 14 items in dimension 1 luck perseverance and 7 in dimension 2 illusion of control (Spanish version of *Gamblers' Beliefs Questionnaire*, GBQ-E).

Internal consistency reliability

To measure the reliability of the GBQ-E scale as internal consistency, the Cronbach alpha coefficient was used. The indices obtained were: .93 for the general scale, .93 for F1 "luck/perseverance" and .79 for F2 "control illusion". All items contributed similarly to the internal consistency of the global scale and the factors. The item-total correlations ranged from .34 to .77 (global scale), from .60 to .79 (F1) and from .38 to .63 (F2). In addition, the data showed an omega index of .80 at T1 and .93 at T2 for the luck/perseverance dimension (*MVE* T1 = 45.36 and *MVE* T2 = 51.65) and between .85 and .93 for the illusion of control dimension (*MVE* T1 = 51.46 and *MVE* T2 = 45.97).

Test-retest reliability

To verify the temporal stability of the study, the GBQ-E scale was applied again after two weeks to 130 adolescents and young people. A moderate correlation was obtained for the scores obtained at both times on the general scale (r = .69) and on the first (r = .66) and second factor (r = .69) ($p \leq .0001$).

Validity evidence of relationship with external variables

To obtain evidence of convergent validity, we calculated the Pearson correlations of the GBQ-E scale and its factors with the SOGS and MAGS and their dimensions, as well as with the frequency of gambling.

The GBQ-E scale and its factors correlated positively and significantly with the SOGS-RA and MAGS scales and their dimensions (see Table 5), that is, the higher the score on the GBQ-E scale and its dimensions, the higher the score on the problem gambling screening scales. Moreover, the total GBQ-E score is positively associated with the severity of gambling ($r = .36$, $p \leq .0001$).

To test whether cognitive distortions predicted problem gambling or being at risk/in transition, several logistic regression models were applied. The hierarchical binomial logistic regression model of the DSM variable was statistically significant (χ^2 = 53.045, p = .0001). Sex was entered in the first block as a control variable because significant differences were found in the DSM, and the GBQ-E total score was entered in the second block. Nagelkerke's R^2 coefficient showed that 11.1% of the DSM variation was explained by sex. Once the total GBQ-E score was entered, the model explained 25.8%. Sex (B = 1.889, ET = .516, p = .0001) and cognitive distortions about gambling (B = .040, ET = .008, p = .0001) significantly explained classification as a person with gambling problems. Thus, being male (OR = 6.615, 95% CI: 2.405, 18.197) and having distorted beliefs (OR = 1.041, 95% CI: 1.026, 1.057) increased the risk of being a problem gambler.

The multinomial logistic regression model of the MAG variable was also statistically significant (χ^2 = 81.460, p = .0001). Nagelkerke's R^2 coefficient indicated that 10.9% of the variation of the MAG variable was explained by sex. This percentage of explained variance rose to 21.2% on entering the total GBQ-E score. Sex and cognitive distortions about gambling significantly explained classification as a person with gambling problems (Sex: B = -1.911, ET = .521, p = .0001; GBQ-E: B = .041, ES = .008, p = .0001) or being at risk/in transition (Sex: B = -1.263, ET = .300, p = .0001; GBQ-E: B = .024, ES = .006, p = .0001). Thus, being male and having distorted beliefs increased the risk of being a problem gambler (Sex: OR = 0.148, 95% CI: 0.053, 0.411; GBQ-E: OR = 1.042, 95% CI: 1.026, 1.058) or at risk/in transition (Sex: OR = 0.283, 95% CI: 0.157, 0.510; GBQ-E: OR = 1.024, 95% CI: 1.013, 1.036).

In the case of the SOGS-RA, sex and age were included in the first model because significant differences were found, and the GBQ-E score was included in the second model. The global multinomial logistic regression model

Table 5
Correlation coefficients of the GBQ-E and its factors (F1: Luck/Perseverance and F2: Illusion of control) with the SOGS-RA, MAG scales and their two subscales (DSM and MAGS)

	SOGS-RA	MAGS	MAG	DSM
GBQ-E	.35***	.40***	.30***	.42***
GBQ-E F1	.37***	.41***	.32***	.42***
GBQ-E F2	.26***	.30***	.21***	.33***

Note. SOGS-RA: South Oaks Gambling Screen revised for adolescents (Winters et al., 1993); MAGS: Massachusetts Gambling Screen (Shaffer et al., 1994). MAG: MAGS subscale; DSM: MAGS subscale, DSM -IV criteria; GBQ-E F1: Luck/Perseverance; GBQ-E F2: Illusion of Control. $p \leq .001$.

of the SOGS-RA variable was statistically significant (χ^2 = 95.734, p = .0001). Nagelkerke's R^2 coefficients indicated that 10.9% of the variance of the SOGS-RA variable was explained by sex and age, rising to 23.9% when the GBQ-E total score is introduced. Sex, age and cognitive distortions about gambling significantly explained being classified as a problem gambler (Sex: B = -1.984, ET = .486, p = .0001; Age: B = .153, ET = .075, p = .040, GBQ-E, MAG: B = .047, ES = .007, p = .0001). Being male, older age, and having distorted beliefs increased the risk of being a person with gambling problems (Sex: OR = 0.137, 95% CI: 0.053, 0.356; Age: OR = 1.165, 95% CI: 1.007, 1.349; GBQ-E: OR = 1.048, 95% CI: 1.033, 1.064). Only GBQ-E total score was a significant predictor of being a player at risk/in transition (GBQ-E: B = .022, ET = .006, p = .0001, OR = 1.022, 95% CI: 1.011, 1.034).

Discriminant validity evidence

To check the discriminatory capacity of the GBQ-E scale, Student's t test was performed for independent samples and ANOVAs. First, the DSM subscale of the MAGS was used to classify participants' gambling behaviour (previous year). As already indicated, 33 potential subjects with gambling problems were identified using the cut-off point of 5 (Shaffer et al., 1994). Significant differences were found in the GBQ-E scores and dimensions obtained by both groups. Players with gambling problems obtained higher scores than players without gambling problems, thus showing more cognitive distortions towards gambling (see Table 6).

The second MAG subscale identified 29 subjects with gambling problems, 65 in transition and 421 without problems. The figures found in the SOGS-RA were 42 with

Table 6
Comparison of mean scores on the GBQ-E scale and its two factors according to the classification based on DSM and MAG and SOGS-RA

		N	*M*	*SD*	*t/F*	*p*	*d*
	Without gambling problems	482	56.12	23.76			
GBQ-E/DSM	With gambling problems	33	84.27	23.87	-6.58	.0001	1.18
	Without gambling problems	482	33.20	16.68			
GBQ-E F1/DSM	With gambling problems	33	54.45	17.85	-7.05	.0001	1.27
	Without gambling problems	482	22.92	8.96			
GBQ-E F2/DSM	With gambling problems	33	29.82	7.61	-4.31	.0001	.78
	Without gambling problems	421	54.38	23.78			
GBQ-E/MAG	With gambling problems	29	82.07[a]	24.72	28.89	.0001	1.08
	In transition	65	70.12[a]	20.84			
	Without gambling problems	421	32.06	16.61			
GBQ-E F1/MAG	With gambling problems	29	53.79[a]	17.35	31.17	.0001	1.18
	In transition	65	42.20[ab]	16.07			
	Without gambling problems	421	22.32	9.04			
GBQ-E F2/MAG	With gambling problems	29	28.28[a]	8.87	16.27	.0001	.78
	In transition	65	27.92[a]	6.77			
	Without gambling problems	417	53.98	23.25			
GBQ-E/SOGS-RA	With gambling problems	42	83.05[a]	22.35	36.57	.0001	.90
	At risk	56	68.50[ab]	23.15			
	Without gambling problems	417	31.67	16.24			
GBQ-E F1/SOGS-RA	With gambling problems	42	53.55[a]	17.10	40.71	.0001	.93
	At risk	56	41.93[ab]	16.35			
	Without gambling problems	417	22.31	8.93			
GBQ-E F2/SOGS-RA	With gambling problems	42	29.50[a]	7.98	17.02	.0001	.63
	At risk	56	26.57[a]	8.02			

Note. GBQ-E F1 = Luck/Perseverance Factor; GBQ-E F2: Illusion of Control. [a] Without gambling problems, [b] Pathological, [c] At risk.

gambling problems, 56 at risk and 417 without problems. The ANOVAS showed significant differences in the means obtained in GBQ and its two dimensions by the groups established with MAG and SOGS-RA. To check which groups showed differences, the Bonferroni post hoc analysis was performed. The results showed the same pattern for the two scales (MAG and SOGS-RA). The group of young people "without gambling problems" maintained significant differences with the groups with "gambling problems" and "at risk/in transition". In addition, gamblers at risk differed from those with gambling problems on the GBQ-E scale and the F1 for the SOGS-RA scale and the F1 according to the MAG (see Table 6).

The results also revealed differences in the GBQ-E depending on the type of game (non-gamblers = 0, chance = 1, strategy = 2, both types of game = 3) ($F_{(3,510)}$ = 12.98, p = . 0001). Participants who played both game types (M = 64.22, SD = 22.74) showed higher GBQ-E scores than non-players (M = 49.08, SD = 24.20) and game-of-chance players (M = 54.08, SD = 25.16). Furthermore, GBQ-E scores were significantly higher in strategy games (M = 62.13, SD = 26.18) than in non-players.

Relationship of GBQ-E with the social desirability scale

Following the recommendations of the original authors (Steenbergh et al., 2002), to obtain more evidence on the validity of the scale, we examined the relationship between the GBQ-E scale and the social desirability scale (Crowne & Marlowe, 1960). The correlations indicated a negative and significant association with the total scale (r = -.16, p = .0001), the luck factor (r = -.17, p = .0001) and the illusion of control (r = -.12, p = .007). Participants with higher cognitive distortions had lower social desirability. There were also significant and negative correlations between the social desirability scale and the MAGS global scale (r = -.13, p = .004), its dimensions, MAG (r = -.10, p = .018) and DSM (r = -.13, p = .003), and the SOGS-RA scale (r = -.09, p = .046).

Discussion

The aim of the study was to validate the GBQ (21 items) (Steenbergh et al., 2002), one of the most commonly used measures of cognitive distortions related to problem gambling (Goodie & Fortune, 2013). Different sources of validity were analyzed to provide more evidence of the adequacy of this Spanish version of the GBQ-E. The bifactorial structure (luck/perseverance and illusion of control) of the original scale has been confirmed in different countries (Marchetti et al., 2016; Pilatti, Cupani, Tuzinkievich & Winfree, 2016; Steenbergh et al., 2002; Wong & Tsang, 2012). In this study with a Spanish population of adolescents and young people, the forced EFA confirmed the structure of 21 items and two factors, although three items (9, 19 and 6) did not load in the same dimension as the original version. In our case, the CFAs on the original structure of the scale (model 1) and the forced CFA (model 2) did not show good fit. In the model 3 CFA, item 19, which was initially in the illusion of control dimension, was located in luck/perseverance, increasing the scale's fit indices, as had already been found in a previous study with a Hispanic population (Winfree, Meyers & Whelan, 2013). Items 6 and 9 remained in their original dimensions of luck/perseverance and illusion of control, respectively. These findings suggest that the same general constructs exist across gambling cultures and populations.

This study showed that between 5.6% and 8.2% of the young participants had gambling problems and between 10.9% and 12.6% were gamblers at risk or in transition. These data are similar to those previously found in Spain with the SOGS-RA (6.3%) (Oksanen et al., 2021) and lower than those found with the DSM (17.6%) (Jiménez-Murcia et al., 2021). Most participants classified as problem gamblers or at risk/in transition played both games of chance and strategy. The internal consistency of the general scale and its factors were high and similar to the original version, suggesting that this instrument is suitable for measuring distorted beliefs about gambling in this sample of adolescents and young people.

Evidence on convergent validity was also provided. The positive association between the total scores of the GBQ-E and those obtained in instruments that measure gambling problems and frequency (SOGS-RA, MAG and its DSM and MAGS subscales) (r between .21 and .42) indicated that a greater distortion in the luck/perseverance and illusion of control factors may be associated with a greater drive to participate in games. The results also indicated that the GBQ-E was linked to a higher probability of being classified as having problem gambling according to the DSM, MAGS and SOGS-RA (OR = 1.04) and being at risk according to the MAG and SOGS-RA (OR = 1.02). These data confirm that a high level of cognitive distortion is related to having more gambling problems (Tang & Oei, 2011). Thus, whether the player's drive is motivated by internal states or external triggers, the impulses are often generated when the level of arousal interacts with the erroneous beliefs associated with gambling (Ciccarelli, Griffiths, Nigro & Cosenza, 2017; Ciccareli et al., 2021).

In addition, we found a general pattern confirming the differences between the scores obtained on the GBQ-E scale and its two dimensions by participants without gambling problems, with gambling problems and at risk, according to MAGS and SOGS-RA. The average number of cognitive distortions was higher in people with gambling problems or at risk than in players who did not have problems (Yakovenko et al., 2016). This study, in line with previous research, shows empirical evidence of the association between cognitive distortions and gambling-related problems (Donati, Ancona, Chiesi & Primi, 2015; Pilatti et al., 2016; Steenbergh et al., 2002; Winfree et al., 2013).

The study has some limitations: the cross-sectional design does not allow confirmation of causality between players' beliefs and gambling problems; the incidental sample limits the generalization of the results to other populations and the results have been influenced by the social desirability bias, although the correlations indicate this to be marginal, accounting for only between 2.9% and 1.4% of the variance of the GBQ-E. In addition, because some forms of gambling were not included in the SOGS-RA classification, some participants could play other games that were not registered. Nevertheless, the GBQ-E scale shows good psychometric properties, adequate validity and reliability. For this reason, the GBQ-E is recommended as an appropriate instrument for the evaluation of cognitive distortions associated with games of chance in adolescents and young people. As far as we know, this study fills a gap given the absence of a measure assessing cognitive distortions in Spanish adolescents and young people. This resource will thus help researchers understand the factors involved in initiating and maintaining excessive gambling. Authors such as Canale et al. (2016) point out that education related to the cognitions associated with gambling is an essential resource for the prevention of this problem. For all these reasons, it can be concluded that the scale has wide clinical application in the early detection of cognitive biases, in the formulation of more effective prevention and intervention plans, and in the monitoring of changes in the distortions of patients produced by the treatment.

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Conflict of interests

The authors of the manuscript declare no conflicts of interest.

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