# Spanish validation of the pathological buying screener in patients with eating disorder and gambling disorder

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*Background and aims:* Pathological buying (PB) is a behavioral addiction that presents comorbidity with several psychiatric disorders. Despite the increase in the prevalence estimates of PB, relatively few PB instruments have been developed. Our aim was to assess the psychometric properties of the Spanish version of the pathological buying screener (PBS) and to explore the associations between PB, psychopathology, and personality traits. *Methods:* A total of 511 participants, including gambling disorder (GD) and eating disorder (ED) patients diagnosed according to DSM-5 criteria, as well as healthy controls (HCs), took part in the study. *Results:* Higher PB prevalence was obtained in ED patients than in the other two study groups (ED 12.5% vs. 1.3% HC and 2.7% GD). Confirmatory factor analysis (CFA) verified the 13-item structure of the PBS, and indexes of convergent and discriminant capacity were estimated. CFA confirmed the structure in two factors (excessive buying behavior and loss of control) with excellent internal consistency ($\alpha = .92$ and $.86$, respectively). Good convergent capacity was obtained with external psychopathology and personality measures (positive correlations with novelty seeking and negative associations with self-directedness and harm avoidance were found). Good discriminative capacity to differentiate between the study groups was obtained. *Discussion and conclusions:* This study provides support for the reliability and validity of the Spanish adaptation of the PBS. Female sex, higher impulsivity, and higher psychopathology were associated with PB.

*Keywords:* pathological buying, gambling disorder, eating disorder, pathological buying screener, validation, psychometric properties

## INTRODUCTION

Pathological buying (PB) is characterized by impulsive drives and compulsive behaviors that lead to excessive shopping. As a consequence of this excessive behavior, individuals with PB suffer significant psychological distress and legal/financial problems (Müller, Mitchell, & de Zwaan, 2013). No consensus has been reached regarding the classification of PB (Zadka & Olajossy, 2016) and the current version of the fifth edition of *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5; American Psychiatric Association [APA], 2013)

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did not categorize PB as a mental disorder (Piquet-Pessôa, Ferreira, Melca, & Fontenelle, 2014; Potenza, 2014). However, PB is often clinically classified as a behavioral addiction, due to its shared phenotype with other recognized behavioral addictions, such as gambling disorder (GD; Granero, Fernández-Aranda, Steward, et al., 2016; Grant, Potenza, Weinstein, & Gorelick, 2010; Kellett & Bolton, 2009; Müller et al., 2019). They are characterized by an early onset of problematic behavior, significant comorbidity with other psychiatric disorders, emotional dysregulation, high levels of novelty seeking, loss of control, and compulsivity (Black, Shaw, McCormick, Bayless, & Allen, 2012; Granero, Fernández-Aranda, Mestre-Bach, et al., 2016; Granero, Fernández-Aranda, Steward, et al., 2016). In addition, a dimensional categorization of these disorders, based on the impulsive–compulsive spectrum, has received significant empirical support in recent years (Dell'Osso, Allen, Altamura, Buoli, & Hollander, 2008; Di Nicola et al., 2014; Petruccelli et al., 2014). Behavioral addictions like GD, as well as other pathologies, such as eating disorders (EDs), are included within this framework (Chamberlain, Stochl, Redden, & Grant, 2018; Hollander et al., 1996).Taking personality patterns into account, all these disorders show common vulnerability factors, including temperamental traits and high levels of impulsivity (Claes et al., 2012; Jiménez-Murcia et al., 2015; Kim, Ranson, Hodgins, McGrath, & Tavares, 2018), although there are some differences between groups in personality dimensions, especially novelty seeking and harm avoidance (del Pino-Gutiérrez et al., 2017; Jiménez-Murcia et al., 2015).

Focusing specifically on PB, epidemiological studies indicate that its prevalence has risen in the past three decades although PB prevalence estimates can be rather imprecise, with values ranging from 1% to 20% (Aboujaoude, 2014; Maraz, Griffiths, & Demetrovics, 2016), with a pooled prevalence of 5% being the best estimate provided to date (Maraz et al., 2016; Müller et al., 2019). The diverse origin of the samples, the variability in the definitions of PB, and a lack of valid assessment tools are likely to be the main reasons why such unreliable estimates have been reported (Duroy, Gorse, & Lejoyeux, 2014; Maraz, Eisinger, et al., 2015; Maraz, van den Brink, & Demetrovics, 2015; Sussman, Lisha, & Griffiths, 2011). When considering face-to-face interviews and strict diagnostic criteria, recent literature has highlighted the appearance of PB as a comorbid feature in other disorders (such as ED or other behavioral addictions), (Fernández-Aranda et al., 2008; Granero, Fernández-Aranda, Steward, et al., 2016; Mestre-Bach, Steward, Jiménez-Murcia, & Fernández-Aranda, 2017). This association suggests the existence of shared vulnerabilities between these disorders, especially in female clinical populations (Granero, Fernández-Aranda, Steward, et al., 2016). In general terms, those cases with both conditions generally have higher psychopathology and more dysfunctional personality traits (del Pino-Gutiérrez et al., 2017; Granero, Fernández-Aranda, Mestre-Bach, et al., 2016; Jiménez-Murcia et al., 2015).

Regarding the problem of assessment measures, few self-rating scales have been developed to specifically measure PB, and most of the existing tools have been developed by consumer researchers instead of psychopathology researchers (Black, 2011). Some self-report scales, such as

Compulsive Buying Scale (Faber, O'Guinn, & Guinn, 1992), the 13-item questionnaire developed by Edwards' group (Edwards, 1993); the Richmond Compulsive Buying Scale (RCBS; Ridgway, Kukar-Kinney, & Monroe, 2008), the 13-item Canadian Compulsive Buying Measurement Scale (Valence, d'Astous, & Fortier, 1988); the 14-item German Addictive Buying Scale (GABS; Scherhorn, Reisch, & Raab, 1990); and the 12-item Compulsive Acquisition Scale (Frost, Steketee, & Williams, 2002), while having their respective strengths, suffer from distinct shortcomings. For example, the RCBS is based on explanatory models of compulsive buying behavior by linking PB to obsessive–compulsive spectrum disorders. Similarly, some studies have also criticized that the assessment of the PB construct (which includes components like impulse control, distress caused by others knowing a person's purchasing habits, tension when not shopping, spending to improve mood, or irrational spending habits) could be exclusively based on a single-dimension factor, and that it can be next interpreted in a binary classification system (present vs. absent) based on a cut-off point [although empirically chosen based on a statistical criterion, 2 standard deviations ($SD$s) above the mean value found in a general population; Faber et al., 1992].

In order to overcome such limitations, Müller, Trotzke, Mitchell, De Zwaan, and Brand (2015) recently developed a new self-report scale to identify patients who present PB, the pathological buying screener (PBS). One initial 20-item version was created to cover multiple compulsive buying-related areas during the past 6 months: preoccupations/craving, lack of control, resistance against excessive spending, hiding purchases, emotional dysregulation, lies about spending, degree of suffering, interference with daily functioning, and financial consequences. The validation analysis of this tool in a large German community sample ($n = 2,539$) through exploratory and confirmatory factorial analyses revealed a satisfactory final version based on the selection of 13 items, structured into two factors (Müller et al., 2015): *loss of control/consequences* (10 items) and *excessive buying behavior* (3 items). The authors provide psychometric evidence regarding the adequate reliability and validity of the 13-item PBS, and suggest two thresholds to be the best cut-off points for the PBS total score (29 and 39, which represent 2 $SD$s above the mean and the average scoring for all scale items).

In comparison with the GABS (which is centered on the concept of PB as a behavioral addiction, with the consequence of underestimating the loss-of-control aspects of buying episodes), the PBS has the advantage of considering both impulse control and addictive features of excessive buying behavior. Moreover, the PBS includes items to measure craving and loss of control. Finally, a global advantage of the PBS in contrast with all the other available measures for PB symptoms is the inclusion of a time period (behavior during the past 6 months).

Given the advantages of the PBS, the aim of this study was to evaluate the psychometric properties of the Spanish adaptation of this screening tool in a large clinical sample including patients who met diagnostic criteria for GD, or ED, when compared to healthy controls (HCs). The choice of these disorders was based on the impulsive–compulsive

spectrum framework, since both disorders would be part of the spectrum. Furthermore, previous work by our group has found compulsive buying behavior to be prevalent in patients with EDs (Fernández-Aranda et al., 2006, 2008; Jiménez-Murcia et al., 2015). In this vein, several studies on the etiology of behavioral addictions observed the existence of common risk and protective factors associated with these disorders, such as personality traits, high levels of sensitivity to punishment and reward, materialism, etc. (Guerrero-Vaca et al., 2018). In previous studies on PB, carried out by our group, we observed that in patients with GD, the prevalence of PB was low (less than 1%). However, when we considered the PB subsample, the rate of the co-occurrence of PB + GD increased to almost 19%. In addition, when sex was taken into account, the comorbidity between BD and GD rose to 37.5% (Granero, Fernández-Aranda, Steward, et al., 2016).

We hypothesize that the Spanish version of the PBS would be structured into two factors as found in the original version of the questionnaire, measuring loss of control/consequences and excessive buying behavior. In addition, based on the shared vulnerabilities and comorbidity between behavioral addictions (including PB) with many psychopathological conditions and personality traits documented in scientific research, we hypothesize the existence of a positive association between higher PBS factor scores with worse psychopathological state [higher Symptom Checklist-90 Items – Revised (SCL-90-R) scales] and more dysfunctional personality traits (particularly, higher novelty seeking scores and lower self-directedness and cooperativeness scores), and that these associations will emerge in three groups. Finally, we hypothesize that a higher prevalence of PB will be present in the clinical groups compared with the HC group.

## METHODS

### Participants and procedure

The study was conducted between March 2016 and 2017. The total sample included $n = 511$ participants [two clinical groups ($n = 176$ ED and $n = 184$ GD) and a HC group ($n = 151$)]. Patients were referred to our Department of Psychiatry through general practitioners or via another healthcare professional and both clinical groups were consecutively admitted to an outpatient psychiatric treatment. The hospital is a public university hospital certified as a tertiary care center for the treatment of GD and it oversees the treatment of highly complex cases through the state public healthcare system. Patients were diagnosed according to DSM-5 criteria (APA, 2013) by licensed clinical psychologists and psychiatrists. The HC groups ($n = 151$) were volunteers recruited from the same catchment area who were screened for the presence of ED, GD, or any psychiatric disorder.

For the clinical groups, the assessment was conducted prospectively in a single session. In addition to the assessment battery, patients underwent a semi-structured face-to-face interview regarding their psychopathological symptoms (Fernández-Aranda & Turon, 1998; Jiménez-Murcia, Aymamí-Sanromà, Gómez-Peña, Álvarez-Moya, & Vallejo,

2006). This interview also gathered sociodemographic data (e.g., education and marital status) and additional relevant clinical information. If patients were unable to complete the evaluation on their own (e.g., due to being illiterate), these instruments were administered verbally by research staff.

### Measures

The assessment included the Spanish PBS as well as measures of global psychopathology and personality traits. Supplementary Table S1 includes the Cronbach's α coefficients estimated in study sample.

*Pathological buying screener (PBS; Müller et al., 2015).* The 13-item PBS was translated from English into Spanish in accordance with the International Test Commission Guidelines for Translating and Adapting Tests (ITC, 2010). Experienced bilingual clinical psychologists with extensive experience in behavioral addictions translated the items from the original PBS into Spanish. The translated items were then back-translated by an independent native English speaker (TS), and the observed differences between the both versions were discussed and resolved by common consensus. The Spanish version of the PBS was finally reviewed by two other independent Spanish-speaking clinical psychologists, who had not been involved in the previous back-translation process.

*Symptom Checklist-90 Items – Revised (SCL-90-R; Derogatis, 1990).* This questionnaire evaluates a broad range of psychological problems and psychopathological symptoms. This questionnaire contains 90 items and measures nine primary symptom dimensions: somatization, obsession–compulsion, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism. It also includes three global indices: (a) a global severity index, designed to measure overall psychological distress; (b) a positive symptom distress index, to measure the intensity of the symptoms; and (c) a positive symptom total (PST), which reflects self-reported symptoms. A validated Spanish version was used (González de Rivera, De las Cuevas, Rodríguez, & Rodríguez, 2002). The Spanish validation scale obtained good psychometrical indexes, with a mean internal consistency of .75 (Cronbach's α). In the study sample, the consistency was between good ($\alpha = .782$ for the paranoia subscale) and excellent ($\alpha = .981$ for the composite scales).

*Temperament and Character Inventory – Revised (TCI-R; Cloninger, 1999).* This is a reliable and valid 240-item questionnaire that measures seven personality dimensions: four temperament (novelty seeking, harm avoidance, reward dependence, and persistence) and three character dimensions (self-directedness, cooperativeness, and self-transcendence). All items are measured on a 5-point Likert-type scale. A validated Spanish version was used (Gutiérrez-Zotes et al., 2004). The scales in the Spanish revised version showed adequate internal consistency (Cronbach's α mean value of .87). In the study, consistency indices ranged from *good* ($\alpha = .70$ for novelty seeking subscale) to *very good* ($\alpha = .859$ for persistence subscale).

*Other sociodemographic and clinical variables.* Additional data (clinical and social/family variables related to gambling) were measured using a semi-structured face-to-face clinical interview described elsewhere

(Fernández-Aranda & Turon, 1998; Jiménez-Murcia et al., 2006). Some of the disorder-related variables covered included the age of onset and the duration of the disorder.

## Statistical analysis

Statistical analysis was carried out using Mplus 8 for Windows (Muthén & Muthén, 1998–2017). A multiple-indicators multiple-causes (MIMIC) CFA tested the bifactor structure of the Spanish version of the PBS. MIMIC is a factorial model used for structural-measurement invariance in multiple groups (i.e., the equivalence of structural and measurement coefficients over groups). In this study, MIMIC CFA included the covariates participants' sex and age, and assessed the measurement of non-invariance by groups defined by group (HC, ED, and GD). In the ED subsample, a MIMIC CFA was also carried out to assess equivalence of the factor structure between the eating diagnostic subtypes [anorexia (AN), bulimia nervosa (BN), binge eating disorder (BED), and other specified feeding or eating disorder (OSFED)]. The CFA modeling was run in two steps: (a) an initial CFA model was obtained without including the measurement of invariance by groups; and (b) a second MIMIC-CFA model was obtained including measurement of invariance by groups. Goodness-of-fit was evaluated using standard statistical measures (Barrett, 2007): the root mean square error of approximation (RMSEA), Bentler's comparative fit index (CFI), the Tucker–Lewis Index (TLI), and the standardized root mean square residual (SRMR). RMSEA < 0.10, TLI > 0.9, CFI > 0.9, and SRMR < 0.1 were considered adequate fit (Kline, 2016). The global predictive capacity of the model was measured by the coefficient of determination (CD), an estimate of the global $R^2$ for the model.

The discriminative capacity of the PBS to differentiate between the study groups was studied via analysis of variance (ANOVA) for the raw factor scores (metric scale) and with logistic regression for the binary screening classification (positive vs. negative, categorical scale, employing the cut-off points of 29 and 39 derived from the original version, as well as the cut-off obtained in this study). Analyses were adjusted for the covariates of sex and age. Effect size was estimated through Cohen's $d$ coefficient ($|d| > 0.50$ was considered moderate effect size and $|d| > 0.80$ good effect size; Kelley & Preacher, 2012).

The convergent discriminative validity of the PBS raw factor scores with the psychopathology (SCL-90-R scales) and personality (TCI-R scales) scales was estimated via partial correlations, adjusted for sex and age. Estimations were obtained for the whole sample, as well as stratified by the study group. The following thresholds for effect size were used: moderate = $|r| > .24$, good = $|r| > .30$, and large = $|r| > .37$ (Rosnow & Rosenthal, 1996).

Increases in type-I error due to multiple statistical comparisons were controlled with Simes' correction method, a familywise error rate stepwise procedure, which offers a more powerful test than Bonferroni correction (Simes, 1986).

## Ethics

The study procedures were carried out in accordance with the Declaration of Helsinki. The University Hospital of Bellvitge's Ethics Committee of Clinical Research approved the study. All subjects were informed about the study and all provided informed consent.

# RESULTS

## Characteristics of the sample

Table 1 includes the frequency distribution of sociodemographic variables and other main clinical variables (age and body mass index), duration of the disorder, and the raw PBS factor scores. Significant differences emerged for all the measures comparing the study groups, except for employment status.

Supplementary Table S1 includes the distribution of the psychometrical measures in the study (psychopathological state measured through the SCL-90-R and the personality traits registered through the TCI-R).

## Factor structure of the PBS

Table 2 contains the results of the CFA in the entire sample and Figure 1 shows the path diagram. The initial CFA two-factor model, adjusted for the participants' sex and age without considering group, obtained adequate goodness-of-fit (RMSEA = 0.087, CFI = 0.901, TLI = 0.902, and SRMR = 0.068), with an excellent Cronbach's α (.92 and .86). The MIMIC CFA (also adjusted by sex and age) including the diagnostic group (GD-ED-HC) also achieved adequate fitting (RMSEA = 0.099, CFI = 0.912, TLI = 0.922, and SRMR = 0.068), and it did not have a better fit to the data compared with the initial CFA model ($\chi^2 = 133.31$, $df = 180$, $p = .996$). Cronbach's α estimates for the MIMIC CFA measuring invariance by GD-ED-HC were also between very good to excellent, being the highest in the ED group (.94 and .87) and the lowest in the HC group (.79 and .82). Finally, the results of the MIMIC CFA obtained in the ED subsample (also adjusted for sex and age) valuing invariance for the ED diagnosis (AN-BN-BED-OSFED) showed equivalent factor structure by groups, with joint test for structural coefficients of $\chi^2 = 7.70$ ($p = .808$) and for measurement coefficients of $\chi^2 = 5.29$ ($p = .508$).

These results as a whole confirm that the structure of the PBS in two dimensions (measuring *loss of control/consequences* and *excessive buying behavior*) is adequate to assess PB in heterogeneous Spanish samples including GD, ED, and HC groups. In fact, to rule out the possible existence of a valid most parsimonious structure for the data, an additional MIMIC CFA was carried out for a one-factor solution, obtaining non-adequate adjustment (RMSEA = 0.14, CFI = 0.814, TLI = 0.782, SRMR = 0.087, and CD = 0.046).

## Capacity of the PBS to discriminate between study groups

Table 3 contains the results of the ANOVA (adjusted for the participants' sex and age) comparing the PBS mean raw scores between the groups. The factor *loss of control/consequences* achieved statistical discriminative capacity to differentiate between HC and the clinical groups, but no

*Table 1.* Sample description

| | Healthy control (n = 151) | | Eating disorder (n = 176) | | Gambling disorder (n = 184) | | $\chi^2$ | df | p |
|---|---|---|---|---|---|---|---|---|---|
| | *n* | *%* | *n* | *%* | *n* | *%* | | | |
| Sex | | | | | | | | | |
| Female | 130 | 86.1 | 157 | 89.2 | 12 | 6.5 | 320.50 | 2 | <.001* |
| Male | 21 | 13.9 | 19 | 10.8 | 172 | 93.5 | | | |
| Origin | | | | | | | | | |
| Spanish | 151 | 100.0 | 159 | 90.3 | 176 | 95.7 | 16.48 | 2 | <.001* |
| Foreign | 0 | 0.0 | 17 | 9.7 | 8 | 4.3 | | | |
| Civil status | | | | | | | | | |
| Single | 146 | 96.7 | 123 | 69.9 | 95 | 51.6 | 82.80 | 4 | <.001* |
| Married – partner | 3 | 2.0 | 38 | 21.6 | 67 | 36.4 | | | |
| Divorced – separated | 2 | 1.3 | 15 | 8.5 | 22 | 12.0 | | | |
| Education level | | | | | | | | | |
| Primary | 3 | 2.0 | 94 | 53.4 | 127 | 69.0 | 205.79 | 4 | <.001* |
| Secondary | 148 | 98.0 | 65 | 36.9 | 43 | 23.4 | | | |
| University | 0 | 0.0 | 17 | 9.7 | 14 | 7.6 | | | |
| Employment | | | | | | | | | |
| Unemployed | 46 | 35.4 | 44 | 28.9 | 64 | 37.2 | 2.63 | 2 | .268 |
| Employed | 84 | 64.6 | 108 | 71.1 | 108 | 62.8 | | | |
| | Mean | SD | Mean | SD | Mean | SD | F | df | p |
| Age (years old) | 21.44 | 3.48 | 31.71 | 12.84 | 41.04 | 12.86 | 132.90 | 2, 508 | <.001* |
| Body mass index (kg/m²) | 22.11 | 4.05 | 28.40 | 11.57 | 26.51 | 4.73 | 25.18 | 2, 508 | <.001* |
| Duration of the disorder (years) | – | – | 9.12 | 9.75 | 14.62 | 11.22 | 20.82 | 1, 358 | <.001* |
| PBS: loss of control – consequences | 3.66 | 4.22 | 8.79 | 9.23 | 4.98 | 6.83 | 23.14 | 2, 508 | <.001* |
| PBS: excessive buying behavior | 3.91 | 2.73 | 4.21 | 3.37 | 2.10 | 2.62 | 26.97 | 2, 508 | <.001* |

*Note.* SD: standard deviation; *df*: degrees of freedom; PBS: pathological buying screener; –: not applicable for the group.
*Significant comparison (.05 level).

*Table 2.* Confirmatory factor analysis (standardized results): results adjusted for sex and age

| | Total sample (n = 511) | | | Model assessing invariance by study group | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Healthy control (n = 151) | | | Eating disorder (n = 176) | | | Gambling disorder (n = 184) | | |
| | Coef. | SE | p | Coef. | SE | p | Coef. | SE | p | Coef. | SE | p |
| Factor F1: loss of control – consequences | | | | | | | | | | | | |
| Cannot stop thinking about buying | 0.706 | 0.024 | <.001 | 0.361 | 0.035 | <.001 | 0.769 | 0.028 | <.001 | 0.692 | 0.035 | <.001 |
| Feel embarrassed due to buying | 0.754 | 0.021 | <.001 | 0.531 | 0.040 | <.001 | 0.800 | 0.026 | <.001 | 0.699 | 0.032 | <.001 |
| Financial difficulties due to buying | 0.818 | 0.016 | <.001 | 0.634 | 0.043 | <.001 | 0.864 | 0.019 | <.001 | 0.757 | 0.030 | <.001 |
| Suffer distress from buying habits | 0.771 | 0.020 | <.001 | 0.493 | 0.037 | <.001 | 0.807 | 0.027 | <.001 | 0.753 | 0.029 | <.001 |
| Problems at work, school, and other areas | 0.724 | 0.023 | <.001 | 0.748 | 0.033 | <.001 | 0.669 | 0.036 | <.001 | 0.653 | 0.038 | <.001 |
| Feel better when go buying | 0.602 | 0.030 | <.001 | 0.246 | 0.027 | <.001 | 0.689 | 0.040 | <.001 | 0.613 | 0.038 | <.001 |
| Hide buying habits from others | 0.787 | 0.018 | <.001 | 0.597 | 0.041 | <.001 | 0.757 | 0.032 | <.001 | 0.793 | 0.025 | <.001 |
| Cannot stop buying despite economy | 0.851 | 0.014 | <.001 | 0.732 | 0.040 | <.001 | 0.873 | 0.018 | <.001 | 0.832 | 0.024 | <.001 |
| Try to limit buying unsuccessfully | 0.836 | 0.015 | <.001 | 0.553 | 0.043 | <.001 | 0.853 | 0.021 | <.001 | 0.813 | 0.024 | <.001 |
| Problems with others due to buying | 0.703 | 0.024 | <.001 | 0.664 | 0.035 | <.001 | 0.584 | 0.042 | <.001 | 0.645 | 0.040 | <.001 |

*(Continued)*

*Table 2. (Continued)*

| | Total sample (n = 511) | | | Model assessing invariance by study group | | | | | | | | |
| | | | | Healthy control (n = 151) | | | Eating disorder (n = 176) | | | Gambling disorder (n = 184) | | |
| | Coef. | *SE* | *p* | Coef. | *SE* | *p* | Coef. | *SE* | *p* | Coef. | *SE* | *p* |
| Factor F2: excessive buying behavior | | | | | | | | | | | | |
| Spend more time buying than intended | 0.737 | 0.023 | <.001 | 0.648 | 0.037 | <.001 | 0.727 | 0.036 | <.001 | 0.772 | 0.029 | <.001 |
| Buy more than needed | 0.876 | 0.014 | <.001 | 0.926 | 0.023 | <.001 | 0.837 | 0.024 | <.001 | 0.861 | 0.026 | <.001 |
| Buy more than planned | 0.879 | 0.014 | <.001 | 0.857 | 0.025 | <.001 | 0.891 | 0.021 | <.001 | 0.818 | 0.029 | <.001 |
| Internal consistency (α) | | | | | | | | | | | | |
| F1 | .923 | | | .793 | | | .942 | | | .918 | | |
| F2 | .863 | | | .819 | | | .870 | | | .843 | | |
| Correlation between factors | .774 | | | .680 | | | .860 | | | .841 | | |
| Fitting indexes | | | | | | | | | | | | |
| RMSEA | 0.087 | | | 0.099 | | | | | | | | |
| CFI | 0.901 | | | 0.912 | | | | | | | | |
| TLI | 0.902 | | | 0.922 | | | | | | | | |
| SRMR | 0.068 | | | 0.068 | | | | | | | | |
| CD | 0.330 | | | 0.071 | | | | | | | | |

*Note.* SE: standard error; RMSEA: root mean squared error of approximation; CFI: comparative fit index; TLI: Tucker–Lewis index; SRMR: standardized root mean squared residual; CD: coefficient of determination; α: Cronbach's α.
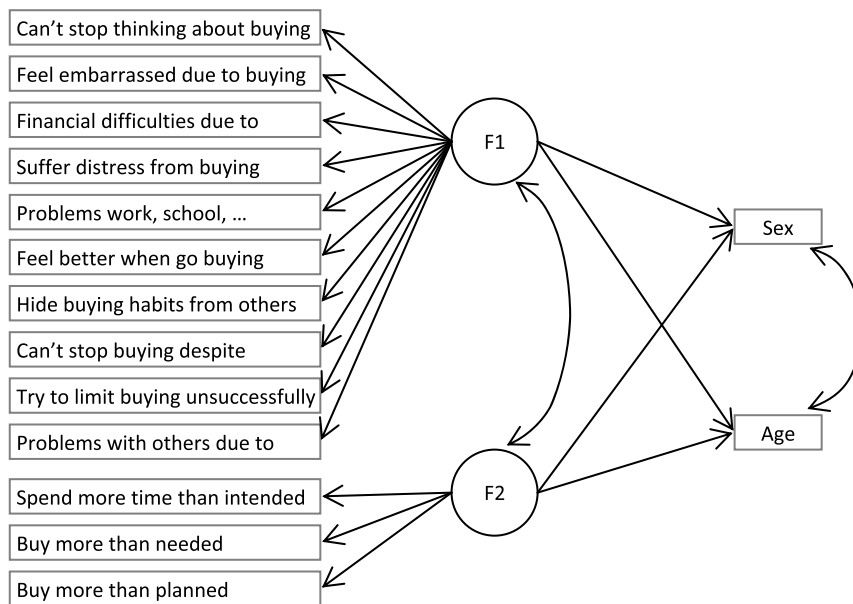


*Figure 1.* Path diagram of the MIMIC CFA in the study

*Table 3.* Comparison of the PBS between study groups: ANOVA adjusted for sex and age

| | Healthy control (HC; n = 151) | | Eating disorder (ED; n = 176) | | Gambling disorder (GD; n = 184) | | Pairwise comparisons | | | | | |
| | | | | | | | HC vs. ED | | HC vs. GD | | ED vs. GD | |
| | Mean | *SD* | Mean | *SD* | Mean | *SD* | *p* | \|d\| | *p* | \|d\| | *p* | \|d\| |
| F1: Loss of control – consequences | 3.15 | 4.22 | 7.96 | 9.23 | 6.20 | 5.13 | <.001* | 0.67** | <.001* | 0.65** | .140 | 0.24 |
| F2: Excessive buying behavior | 3.35 | 2.73 | 3.74 | 3.37 | 3.01 | 2.62 | .263 | 0.13 | .524 | 0.14 | .137 | 0.23 |

*Note.* SD: standard deviation; PBS: pathological buying screener; ANOVA: analysis of variance.
*Significant comparison (.05 level). **Effect size in the moderate (\|d\| > 0.50) to high range (\|d\| > 0.80).

statistical differences emerged for this factor comparing GD versus ED. The factor *excessive buying behavior* registered statistically equal means in the three study groups.

The first part of Supplementary Table S2 contains the results of the logistic regression models (also adjusted for sex and age) assessing the discriminative capacity of the PBS global score, with the cut-off points of 29 and 39 (considered as the most optimal in the original version of the scale). Using the cut-off point 29, the prevalence of positive screening scores was 1.3% for HC, 2.7% for GD patients, and 12.5% for ED patients. This threshold obtained discriminative capacity to identify ED compared with both HC and GD, but it was not able to differentiate between GD and HC. The cut-off point 39 obtained very low prevalence for positive screening scores (0% in the HC group, 1.1% in the GD group, and 5.7% in the ED group). This threshold did not achieve discriminative capacity between the groups. Goodness-of-fit was obtained for both logistic regressions measuring PBS accuracy to discriminate between groups for the cut-off points 29 and 39 (non-significant results in the Hosmer–Lemeshow test: $p = .122$ and $p = .348$).

The second part of Supplementary Table S2 contains the study of the discriminative capacity for the PBS considering the cut-offs obtained in this own study (estimated as the mean + 2 *SD*) into the HC (cut-off 20) and into the clinical subsample (cut-off 35). Prevalences for the cut-off of 20 were 5.3% for HC, 25.0% for ED, and 13.0% for GD, with statistical capacity to differentiate between ED versus HC and between GD versus HC (adequate fitting was obtained for this model, with Hosmer–Lemeshow test: $p = .498$).

Regarding cut-off of 35, point prevalences were 0.7% for HC, 6.8% for ED, and 1.1% for GD, and no statistical differences emerged in the pairwise comparisons (goodness-of-fit achieved, with Hosmer–Lemeshow test: $p = .143$).

The first part of Supplementary Table S3 assessed the capacity of the cut-off points 29 and 39 (obtained in the original validation) to discriminate between the ED subtypes included in the study (AN, BN, BED, and OSFED). Prevalence for positive screening scores based on the cut-off 29 ranged between 9.9% for OSFED and 17.1% for BN, whereas prevalence for the cut-off point 39 ranged between 2.7% for AN and 7.3% for BN. No statistical differences were found in the pairwise comparisons between groups for any of the two thresholds (good fit was obtained with non-significant results in Hosmer–Lemeshow tests: $p = .156$ and $p = .715$). Considering the cut-off points estimated in the study sample (20 and 35), prevalence with a cut-off of 20 was 18.9% for AN, 29.3% for BN, 18.5% for BED, and 28.2% for OSFED. Considering a cut-off of 35, 5.4% prevalence was found for AN, 7.3% for BN, 7.4% for BED, and 7.0% for OSFED. No statistical pairwise comparison was obtained for these thresholds (good fitting was achieved, with $p$ values in the Hosmer–Lemeshow tests of $p = .495$ and $p = .864$).

### Associations between the PBS with external measures

Table 4 contains the partial correlations (adjusted for sex and age) between the PBS raw scores and global psychopathological state (SCL-90-R scores) and personality traits

*Table 4.* Association between PBS and external measures: partial correlations adjusted for sex and age

| | Total sample ($n = 511$) | | Healthy control ($n = 151$) | | Eating disorder ($n = 176$) | | Gambling disorder ($n = 184$) | |
|---|---|---|---|---|---|---|---|---|
| | F1 | F2 | F1 | F2 | F1 | F2 | F1 | F2 |
| **Psychopathology: SCL-90-R** | | | | | | | | |
| Somatization | .294* | .147 | .407* | .332* | .187 | .099 | .184 | .106 |
| Obsessive–compulsive | .318* | .177 | .240* | .124 | .240* | .208 | .285* | .184 |
| Interpersonal sensitivity | .343* | .215 | .361* | .270* | .245* | .239 | .267* | .176 |
| Depressive | .288* | .138 | .286* | .161 | .176 | .139 | .207 | .149 |
| Anxiety | .336* | .157 | .385* | .250* | .247* | .135 | .291* | .162 |
| Hostility | .306* | .165 | .302* | .287* | .201 | .119 | .286* | .175 |
| Phobic anxiety | .384* | .182 | .430* | .225 | .315* | .187 | .326* | .198 |
| Paranoid ideation | .326* | .209 | .357* | .294* | .284* | .219 | .242* | .154 |
| Psychotic | .324* | .167 | .310* | .210 | .276* | .207 | .239* | .141 |
| GSI score | .367* | .194 | .422* | .298* | .265* | .192 | .297* | .189 |
| PST score | .361* | .235 | .395* | .325* | .274* | .232 | .293* | .244* |
| PSDI score | .261* | .098 | .291* | .189 | .170 | .100 | .145 | .054 |
| **Personality: TCI-R** | | | | | | | | |
| Novelty seeking | .283* | .254* | .248* | .261* | .399* | .342* | .121 | .160 |
| Harm avoidance | .159 | .097 | .139 | .090 | .126 | .169 | .004 | −.021 |
| Reward dependence | −.127 | −.082 | −.070 | −.045 | −.136 | −.095 | −.087 | −.102 |
| Persistence | −.075 | −.078 | .075 | −.006 | −.147 | −.212 | .025 | .041 |
| Self-directedness | −.359* | −.235 | −.276* | −.163 | −.289* | −.297* | −.321* | −.239 |
| Cooperativeness | −.306* | −.230 | −.297* | −.182 | −.234 | −.200 | −.379* | −.314* |
| Self-transcendence | .192 | .094 | .069 | .108 | .175 | .028 | .288* | .153 |

*Note.* F1: loss of control – consequences; F2: excessive buying behavior; SCL-90-R: Symptom Checklist-90 Items – Revised; TCI-R: Temperament and Character Inventory – Revised; GSI: global severity index; PST: positive symptom total; PSDI: positive symptom distress index; PBS: pathological buying screener.
*Effect size in the moderate ($|r| > .24$) to high range ($|r| > .30$).

(TCI-R scores). In the total sample, the factor *loss of control/consequences* obtained positive associations with all SCL-90-R scales and novelty seeking, and negative associations with self-directedness and cooperativeness. The factor *excessive buying behavior* only obtained positive associations with novelty seeking scores.

Considering the partial correlations stratified by group, the results for the factor *loss of control/consequences* were similar across groups, but no association was found between this factor and cooperativeness in the ED group and an additional association emerged with self-transcendence in the GD group. For the clinical subsamples, this factor did not obtain relevant correlations with SCL-90-R subscales. Regarding the factor *excessive buying behavior*, in the HC group, many positive associations emerged with the SCL-90-R subscales, whereas in the ED group, a negative association with self-directedness was found, and in the GD group, this factor positively correlated with the SCL-90-R PST score and negatively correlated with cooperativeness.

Supplementary Table S4 compares ED patients with a negative screening and a positive screening on the PBS (for the cut-off point 29) in psychopathological and personality scores. Statistical differences emerged for all the comparisons on the SCL-90-R and the TCI-R, except for in self-transcendence. As a whole, the clinical groups presented higher levels of psychopathology than the HC group, as well as more dysfunctional personality traits than HCs.

## DISCUSSION

This study, besides aiming to test the validity of the PBS in a large clinical Spanish sample including GD and ED patients, and in HC participants, explored the prevalence of PB among the groups and the associations between PB, psychopathological symptoms, and personality traits. Three strengths of the study are its sample size, the inclusion of different clinical groups (including GD patients and ED patients), but also HC, having used a validated comprehensive psychometric screening procedure, and the use of MIMIC CFA procedures adjusted for the covariates participants' sex and age. The rationale of selecting these clinical conditions is based on the evidence of shared comorbidity and clinical features, but also some personality traits, between PB, GD and ED (Claes et al., 2012; Davenport, Houston, & Griffiths, 2012; Fernández-Aranda et al., 2008; Granero, Fernández-Aranda, Mestre-Bach, et al., 2016; Granero, Fernández-Aranda, Steward, et al., 2016; Jiménez-Murcia et al., 2015; Mestre-Bach et al., 2017; Müller et al., 2011; Robbins & Clark, 2015).

The first main finding of the study was that the CFA confirmed the original structure of PBS in two-factors (*loss of control/consequences* and *excessive buying behavior*), while additional psychometrical analyses obtained good convergent validity compared with external measures and adequate discriminative capacity to differentiate between study groups.

The second main finding was that the prevalence levels of PB obtained in the ED and GD groups in this study coincided with previous studies (Fernandez-Aranda et al., 2008; Jimenez-Murcia et al., 2015), with sex being

especially relevant in this clinical condition, given that the prevalence of women who present PB is generally higher than in men (Granero, Fernández-Aranda, Mestre-Bach, et al., 2016; Jimenez-Murcia et al., 2015).

The association between the PBS dimension scores with psychopathological state and personality is also a relevant result, and it is congruent with empirical findings in the scientific literature. In fact, one of the most salient characteristics of PB as a clinical condition within the impulsive–compulsive spectrum is the nature of the behavior in itself. The impulsive–compulsive nature of PB, as well as in other behavioral addictions such as GD, is characterized by a failure to resist the impulse to carry out a specific act to obtain immediate gratification or relieve negative emotions, despite the harmful long-term (Choi et al., 2014; El-Guebaly, Mudry, Zohar, Tavares, & Potenza, 2012; Granero, Fernández-Aranda, Baño, et al., 2016; Grant & Chamberlain, 2014; Thompson & Prendergast, 2015; Yi, 2013). This can explain the positive association between PBS scores and novelty seeking, a personality trait measuring an individual's tendency to explore and impulsiveness, as described previously in samples with EDs (Jimenez-Murcia et al., 2015). The same argument could be the rationale of the negative association between PBS scores and self-directedness, a domain measuring the ability to auto-regulate and to reach chosen goals. In fact, other studies have found a moderate association between impulsiveness–compulsiveness and deficits in self-regulatory capacity (Billieux et al., 2012; Claes et al., 2010). As previously suggested (Jimenez-Murcia et al., 2015), multiple comorbid conditions around the impulsive spectrum are generally associated with higher psychopathology and poorer prognosis (Kim et al., 2018). The extent to which this clinical cluster could be a homogeneus endophenotype needs to be further tested in future studies, while also considering specific biomarkers and genetic factors (Slane, Klump, McGue, & Iacon, 2014).

Due to past indications of PB comorbidity with ED (prevalence between 12 and 18%) or GD (prevalence around 0.75%; Fernández-Aranda et al., 2006, 2008; Jimenez-Murcia et al., 2015), the administration of instruments with adequate psychometric properties, such as the PBS, is essential in order to provide a more accurate diagnosis of PB. Further research should be undertaken to detect PB in clinical populations and in understudied groups, such as older adults. The higher clinical severity shown in multiple diagnostic conditions associated with high impulsivity (e.g., ED or GD with comorbid PB), which are frequently associated with more psychopathology, dysfunctional personality traits, and poorer prognosis, may lead us to design new strategies to combine with usual therapy approaches (e.g., CBT) in order to target underlying vulnerabilities (e.g., impulsivity or emotional dysregulation; Fernández-Aranda et al., 2015; Giner-Bartolomé et al., 2015; Granero, Fernández-Aranda, Baño, et al., 2016; Tárrega et al., 2015). It is also worth noting that the excessive buying behavior factor did not discriminate between HC and the clinical groups. This suggests that loss of control may be more clinically relevant in discriminating between conditions than self-reported buying habits. Regarding the cut-off points, we have assessed the discriminative capacity of the thresholds

29 and 39 defined in the original PBS, because it is relevant to obtain psychometrical evidence about the effectiveness–usefulness of previously available versions during the adaptation phase of the assessment tools. If the factor structure and the cut points are equally valid in the different adaptations (and ideally with the original version), the instrument will feature greater external/ecological validity because it will allow for the comparison of results obtained in studies carried out in multiple/different populations. In this study, the cut-off point of 39 was found to be too high and lacked sensitivity to identify the presence of the disorders analyzed in our work. The cut-off point of 29 resulted optimal to differentiate between ED with the other two diagnostic subtypes (GD and HC), as well as to differentiate the psychopathological and personality traits in the ED subsample.

### Limitations

The two main limitations of this work are the absence of an external reference measure for PB and the lack of a subsample of participants who met clinical criteria for PB. However, it must be argued that despite the high prevalence of PB in the population (Maraz et al., 2016), the number of patients seeking treatment for this condition is low, even in a hospital unit specialized in behavioral addictions. This may be explained by shame and embarrassment due to financial problems (or even illegal behaviors) those patients exhibit. The low frequency of treatment-seeking patients in hospital settings makes the recruitment of a sample to validate an instrument especially difficult, still the second factor evaluating excessive buying behavior could be especially relevant in populations in patients with PB, since it could serve as an indicator of self-reported distress stemming from buying habits. Future studies are needed to assess the validity of this factor in clinical PB patients. Other potential limitations could be the lack of adjustment for other sociodemographic variables apart from sex and age, which were significantly different between the groups, but it must be argued that this study includes two MIMIC CFAs. PB has received little attention in scientific research, but the cumulate evidence suggests a strong association of these problems with sex and age, and this was the justification to consider these both variables as potential confounders in the factorial structure of the PBS. Finally, it should be considered that the results of the psychometric analysis of this study provide empirical evidence on the validity of the bifactor structure for the 13-item PBS, which facilitates the comparison of the potential results obtained in different populations that use this version of the questionnaire. However, it cannot be ruled out that other versions of the PBS (with a different number of items or a different number of factors) may also be valid (we have tested the goodness-of-fit of the one-factor solution and it was not appropriate).

## CONCLUSIONS

To date, the PBS is the most complete screening tool for measuring PB symptomatology. This study provides empirical evidence on the psychometric robustness and the screening accuracy of the Spanish version of the PBS and sheds light on its clinical correlates in different patient populations, mainly higher psychopathology and dysfunctional personality traits. Its application in moderate- to high-risk populations would enable early identification of individuals with high vulnerability for developing PB and its related adverse psychosocial consequences. Future research should assess the usefulness of this self-report in samples of treatment-seeking patients who meet criteria for PB, to confirm the best cut-off points of this tool and to assess its capacity to change according to the developmental course of the disorder.

*Authors' contribution:* FF-A, RG, AM, SJ-M, and JMM contributed to the development of the study concept and design and supervised the study. RG performed the statistical analysis. FF-A, GM-B, TS, CV-A, and MB aided with our interpretation of data. TM-M, CV-A, GM-B, AdP-G, LM, NM-B, NA, MG-P, and ML-M collected data. FF-A and RG shared first authorship.

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