Development and Psychometric Properties of the Barriers Questionnaire for Physical Activity (BQPA) in a representative sample of the Spanish adult population: A preliminary study

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Abstract

Objective: This study aimed to develop the BQPA and evaluate its psychometric properties, which covers all the relevant barriers for Physical Activity (PA) reported in the literature. Method/Design: A cross-sectional study was performed in 2019 through a dedicated online panel. A sample of 610 participants was selected using a stratified random sampling. We tested the factorial structure of the BQPA through an Exploratory Factor Analysis (EFA) with half of the sample, and replicated the structure in the other half through Confirmatory Factor Analysis (CFA). Internal consistency was also analyzed. Results: The proposed BQPA consists of 61 items measured by a 5-point Likert scale, which cover three dimensions of barriers: psychological (42), physical (5) and contextual barriers (14). The first-order three-factor model exhibited a good fit [CFI=0.948; TLI=0.945; RMSEA=0.054 (90% CI=0.049-0.059); WRMR=1.159]. Cronbach's Alpha values were satisfactory for each factor: "Personal" (22 items; α=0.93), "External" (10 items; α=0.82) and "Predisposition to Physical Activity"(8 items; α=0.90). Conclusions: The developed BQPA shows adequate psychometric properties. It can detect specific barriers for PA and could be useful to design interventions for promoting PA adapted to each person or specific groups.

Keywords: Barriers; Factor analysis; Physical inactivity; Psychometric properties; Questionnaire

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1. Introduction

The benefits of physical activity (PA) are well known. However, physical inactivity is a worldwide problem. Therefore, the promotion of PA is a public health priority (Beighle & Morrow, 2014).

Theories of behavioral change have emerged in order to understand PA and how to promote it (Rhodes, 2017). However, they have been questioned in terms of effectiveness. For example, various meta-analyses for theories-based interventions have reported small to moderate effect sizes (d=0.20; Conn et al., 2011, d=0.27, Rhodes et al., 2017). An alternative approach would be to study the components of these theories, in order to understand which variables affect PA and inform theories to refine them and increase their effectiveness (Baranowski et al., 1998). Under these inductive approaches, various authors have studied the barriers for engaging in PA (e.g lack of motivation; low self-efficacy). The identification of these barriers is vital for effective interventions (Miles, 2007).

To systematize the study of these barriers, various classifications have been proposed (e.g. internal, interpersonal and environmental, Brinthaupt et al., 2010; internal and external, Hsu et al., 2011). However, despite the fact that psychological variables play a key role in PA (Nigg & Geller, 2012), they have not received a complete treatment in the current classifications. On the other hand, numerous psychometric instruments (Self-Report on Barriers to Exercising, Niñerola i Maymí et al., 2006; San Diego Health and Exercise Questionnaire, Rauh et al., 1992; Perceived Barriers Questionnaire, O'Neill & Reid, 1991) have been developed but most have focused on specific populations such as ethnics groups (Jackson et al., 2016), adults with chronic diseases (Desveaux et al., 2016; van Adrichem et al., 2016) or specific sociodemographic characteristics (Cary et al., 2016; Cramp & Bray, 2009) limiting the generalization of these results in the general population.

For all this reasons, the purpose of this study was to develop and evaluate the psychometric properties of the Barriers Questionnaire for Physical Activity (BQPA) in a general representative sample of the Spanish adult population.

2. Method

2.1. Recruitment and Participants

A cross-sectional study was conducted in 2019. The data for this analysis were collected through a dedicated online panel. 610 Spanish adults filled out the questionnaires. The sample was stratified respect to gender and age range (18-24, 25-34, 35-44, 45-54, 55-64, 65-74 and 75 or older). Eligible participants were required: (a) to be ≥18 years; (b) not to have known medical issues for which PA was contraindicated; and (c) to provide informed consent. The study was conducted in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and approved by the local Ethics Committees.

We controlled the existence of outliers administering the Short International Physical Activity Questionnaire (IPAQ-SF) (Hallal & Vectora. 2004), which resulted in 116 subjects being excluded from the sample. The final sample comprised 494 participants, representative of the Spanish population, which age ranged between 18 and 65 years (M = 40.34; SD = 13.30). 51.2 % were men (M = 43.25; N=253) and 48.8 % women (M = 37.27; N=241). Regarding educational level, 0.4% (N=2) had not completed basic education, 32% of subjects (N=158) had reached primary/secondary studies, 17.2% higher studies (N=85), and 50.4% university studies (N=249). With respect to employment, 27.3 % (N=134) were working, 36.5% (N=180) were unemployed and 32.4% (N=160) had retired. Finally, most participants (23.1 %, N=114) had a gross monthly salary between 1101€ and 1800€, lower (23.7 %; N=117) or no income (13.8%; N=68) while 15.6% had an income 1801€ - 2700€ or higher (5.8%; N=25).

2.2 Instruments

Barriers Questionnaire for Physical Activity (BQPA). The BQPA derives from the findings of our original previous literature review (Rick et al., 2020). The proposed dimensions are based on a framework presented by Singh (2016) (psychological, contextual/personal and physical variables). 38 variables were identified as PA barriers/facilitators who were turned into 61 items: 42 items for the psychological dimension (e.g "I'm not into exercising"), 14 items for the contextual dimension (e.g "I don't have equipment for physical activity") and 5 items for the physical dimension (e.g "I feel pain when exercising"). The response format is a 5-point Likert scale, ranging from 0 (not at all) to 4 (a lot).

2.3. Statistical Analysis

Descriptive statistics were used to describe the characteristics of the sample. The adequacy of the sample for this procedure was measured by Kaiser-Meyer-Olkin (KMO) (Kaiser, 1970) and Barlett's sphericity test (Barlett, 1950). For construct validity, the whole sample was randomly split into two sets for exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). The number of factors extracted was based on three different criteria: a) dimensions on witch the BQPA was based; b) factor loadings of items; c) and Parallel Analysis based on Minimum Rank Factor Analysis (PA-MRFA) with a 95% threshold (Lorenzo-Seva, 2011). We conducted the EFA (N=248) using the Principal Axis Factoring extraction method with Promax rotation, which allows correlation between factors (Brown, 2015). The factor structure was further investigated using CFA (N=246) throught the Weighted Least Squares Means And Variance (WLSMV) (Muthen, 1993) estimation method, which is appropiate for skewed items (Brown, 2015). Model fit was evaluated with the following goodness-of-fit indices: Comparative Fit Index (CFI) and Tucker and Lewis Index (TLI) between .90 and .95; Root Mean Square Error of Approximation (RMSEA) less than .08; non-significant Test of Approximate Fit of

RMSEA; and Weighted Root Mean Square Residual (WRMR) around 1.0 (Hooper et al., 2008; Hu & Bentler 1999). Cronbach's alpha and coefficient Omega were used to analyzed internal consistency (Cronbach, 1951; McDonald, 1999). FACTOR v.10.05.02 software was used for the PA (Lorenzo-Seva & Ferrando, 2006), MPLUS 8.4 for EFA and CFA (Muthen & Muthen , 2017), and IBM SPSS Statistics version 25.0 for the remaining analyses (IBM, 2017). All statistical procedures adopted a significance level ≤ .05.

3. Results

3.1 Evidences of Construct Validty

The KMO verified the adequacy of the sample for the analysis (KMO=.89), and Bartlett's Test of Sphericity was significant (p<.01). Results from the Mardia's multivariate normality test (1970) showed non-normality (Mardia's=46.692; p<0.05). PA-MRFA with a 95% threshold suggested the retention of 3 factors. Prior to the EFA, items with standard deviation (SD) below <1.00 were removed (items: 16, 39, 44, 56, 59); 56 items remained. Next, we ran a principal axis factoring (PFA) with Promax Rotation. Items with cross-loadings below <0.20 were removed. Taking into account the aforementioned criteria, a three factor model was more adequate (RMSEA=0.044) than a two-factor model (RMSEA=0.050) or four-factor model (RMSEA=0.042). For the three-factor model, the following items were eliminated one by one: 8, 13, 14, 18, 21, 22, 24, 31, 34, 38, 40, 41, 49, 50, 51, 54 (40 items remained). For the CFA, we tested a first-order three-factor model. This showed an adequate data-fit [CFI=0.948; TLI=0.945; RMSEA=0.054 (90% CI=0.049-0.059); WRMR=1.159]. Inter-factor correlations (F1-F2=0.78; F2-F3=0.64; F1-F3= 0.69) showed moderate discriminant validity. Standardized factor loadings ranged from .89 to .49 (p < .001). Residual variances ranged from .75 to .19 and the item R-square ranged from .80 to .29. No post-hoc modifications were conducted. F1 is mainly formed by Personality, Mental Health, Physical Status and Affect barriers (Personal), F2 by Infraestructure-Daily Life Demands (External) and F3 by Motivation-Behavior (Predisposition to Physical Activity).

3.2 Reliability

Table 1. Reliability through different dimensions. Note: Ω (CR)= composity reliability; α= Chronbach's Alpha; AEV= Average Extracted Variance

Dimensions	Ω (CR)	α	AEV
Personal	0.96	0.93	0.52
External	0.88	0.82	0.43
Predisposition to Physical Activity	0.93	0.90	0.65
Total	0.97	0.95	0.52

Cronbach's Alpha and Omega values were satisfactory. Table 1 summarizes the main results for each dimension.

4.Conclusions

The objective of this study was to develop the BQPA and to evaluate its psychometric properties. The BQPA showed moderate psychometric properties in terms of validity and reliability for the population under study. The BQPA could be useful for interventions promoting PA and here we recommended it for further investigations. However, several limitations exist. First, in terms of reliability, direct measures like the use of speedometers or accelerometers are recommended when measuring PA (Ahmad et al., 2018). In our case, like in other studies (Gobbi et al., 2012), the large sample under study prevents this recommendation. Second, polychoric-based Parallel Analysis is recommended with ordinal data (Dominguez-Lara, 2014); however, we experienced convergence problems that prevented its application (Lorenzo-Seva & Ferrando, 2020). To solve this problem, we used Pearson-based PA, which is recommended under these circumstances (Timmerman & Lorenzo-Seva, 2011). Finally, the use of WLSMV yields moderate overestimation of the interfactor correlations when the sample is relatively small or moderately non-normal (e.g N=200) (Li, 2016), similar to the findings of previous studies (Wegmann et al., 2011). Future research should replicate these findings in broader samples.

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