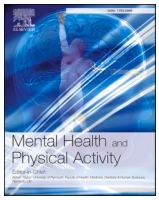
Mental Health and Physical Activity 26 (2024) 100564

Contents lists available at ScienceDirect

Mental Health and Physical Activity

journal homepage: www.elsevier.com/locate/menpa



Cross-cultural adaptation and validation of the Spanish version of the Exercise and Eating Disorders Questionnaire

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ARTICLE INFO

Keywords:
Eating disorders
Dysfunctional exercise
Adaptation
Validation
Questionnaire

ABSTRACT

Purpose: This study aimed to adapt and assess the validity and reliability of the Spanish version of the Exercise in Eating Disorders Questionnaire (EED-Q) in order to diversify and offer a more comprehensive, effective, and standardized assessment of maladaptive exercise (ME) in ED.

Methods: The EED-Q is a self-reported questionnaire that assesses eating disorders (ED) patients' attitudes towards exercise. Based on the four-factor model of the original version, the EED-Q was adapted through forward and back-translation and inconsistencies were addressed through a committee of experts. Then, the EED-Q Spanish version (S-EED-Q) was administered to 172 patients with eating disorders (age = 15.28 ± 1.64 years). An exploratory factor analysis was computed to assess the construct validity. Inter-item correlations, item-factor correlations, McDonald's Omega, and Cronbach's Alpha were estimated to test the internal consistency (reliability). In addition, convergent validity was tested by relating EED-Q and the Eating Disorders Inventory 2 (EDI-2) scores, discriminant validity was assessed comparing EED-Q item-factor correlations, and divergent validity was conducted by analyzing EED-Q factor correlations.

Results: The S-EED-Q revealed significant generalized correlations among the scale items and showed good reliability scores (McDonald's Omega and Cronbach's alpha >0.7) except for Factor 2 (McDonald's Omega = 0.63 and Cronbach's alpha = 0.58). After eliminating items 8 and 15 due to their low factor loadings, the EFA revealed a robust empirical factor structure, adequate to the theoretical model, with good levels of total explained variance (65%). Convergent, discriminant and divergent validity showed good performance: results showed expected correlations between EED-Q and EDI-2, all items achieved higher item-factor correlations in their theoretical factor than in the others, and all factor-factor correlations were as expected.

Conclusion: This study is the first to adapt and validate the S-EED-Q. The psychometric properties of the S-EED-Q compared to the original version were supported with some limitations. Although the psychometric properties of the scale are adequate and the construct, convergent, discriminant and divergent validity are endorsed, some of the original items are questionable. Likewise, the items of the positive and healthy exercise factor require an in-depth revision.

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https://doi.org/10.1016/j.mhpa.2023.100564
Received 10 July 2023; Received in revised form 20 November 2023; Accepted 22 November 2023
Available online 26 November 2023

1. Introduction

The prevalence of eating disorders (ED) has increased and expanded over the last decade (Galmiche et al., 2019; James et al., 2018; Schmidt et al., 2016), resulting in a similar economic and healthcare burden caused by anxiety and depression (Murray et al., 2017; Schmidt et al., 2016). Despite best efforts, the treatment of ED is characterized by high dropout rates (DeJong et al., 2012), especially in anorexia, where responses to available therapies are characterized by partial and low recovery rates (Goddard et al., 2013; Hay, 2013; Reel, 2013). Factors associated with relapse include ED symptomology, comorbid illness, and process treatment variables (Berends et al., 2018).

Among ED symptoms, engaging in maladaptive movement (MM) (Schaumberg et al., 2023) is often the first presenting and last remaining ED symptom and a significant predictor of relapse (Davis et al., 1997; Strober et al., 1997). MM is characterized qualitatively by psychological features. When one's engagement and relationship with movement becomes compulsive, obsessive, rigid, driven by shape and weight, and used as a primary way to regulate affect. Together these qualifying criteria define MM (Cook & Hausenblas, 2008; Hausenblas et al., 2008; Schaumberg et al., 2023). Beyond this, MM can be present across types of movement such as sport, exercise and incidental activity (i.e. walking to the bus stop). Individuals who engage in MM experience greater ED pathology, longer time spent in treatment, and greater illness chronicity (Dalle Grave et al., 2008). As a result of these adverse outcomes, abstinence from movement (exercise, sport and incidental physical activity) has long been recommended (Davies, 2015; Quesnel et al., 2018). Clinicians have typically understood that one's relationship with movement is an important factor in the recovery of an ED (Hechler et al., 2005). For this and other reasons, the practice of recommending abstinence has been increasingly questioned by clinicians and researchers alike (Quesnel et al., 2018). Supportively, when exercise has been incorporated into treatment in a manner that is supervised, nutritionally supported, and aligned with the client's mental and physical health status, it has been associated with physiological and psychological benefits (Cook & Hausenblas, 2008; Hausenblas et al., 2008). Some of the proposed benefits of exercise include decreased mortality and morbidity for disease and reduced risk factors for ED (i.e. self-esteem, anxiety, depression, stress, bodily tensions, mood and body image) (Cook et al., 2011). Additionally, several studies in ED have shown that patients involved in supervised exercise programs during treatment improve body composition, quality of life, and ED symptomatology (Toutain et al., 2022). Moreover, despite a lack of guidance, up to 50% of surveyed treatment centers incorporated some type of exercise program into their treatment regime (Quesnel et al., 2018). Movement plays a significant role in every ED, highlighting the need to assess patient's relationship with movement is imperative to treatment outcomes.

In the same way that there are different tools for diagnosing EDs, there are several measures for identifying MM (i.e. Exercise Addiction Inventory, Exercise Belief Questionnaire, Bodybuilding Dependence Scale, Exercise Dependence Assessment Scale, or Athletes' Relationships with Training Scale, among others) (Chapa et al., 2018; Loumidis & Wells, 1998; McNamara & McCabe, 2012; Smith et al., 1998; Terry et al., 2020). However, many of the measures were not initially designed for ED populations. Consequentially, their ability to identify MM in ED populations has been called into question. A recent systematic review by Harris and collaborators (2020) analyzed the psychometric properties of instruments assessing MM in patients with EDs (Harris et al., 2020). The results of their review outlined that the Compulsive Exercise Test (CET) (Taranis et al., 2011) and the Exercise and Eating Disorders Questionnaire (EED-Q) (Danielsen et al., 2012, 2015) were valid for use in ED populations.

The EED-Q was created based on a practical, patient, and clinician-centred approach and did not rely exclusively on 'academic-research knowledge'. It was developed to evaluate both the positive and negative aspects of one's relationship with movement. Consisting of 18 items, its psychometric properties have been analyzed through three studies: a pilot study, (Danielsen et al., 2012) a validation study that included inpatient females with EDs (Danielsen et al., 2015), and second validation study carried out in outpatient and inpatient males with EDs (Danielsen et al., 2018). Psychometric properties in all of the studies were adequate within a four-factor solution. The measure accurately discriminated patients from healthy controls on all subscales. Satisfactory reliability (>0.85) and convergent validity ($r \geq 0.65$) were also confirmed in the trials (Danielsen et al., 2015, 2018). The initial version of the EED-Q had overlaps between items of different factors (Danielsen et al., 2012). The overlapping items (i.e. 'intentions to exercise factor' thematically overlaps with 'Positive and Healthy Exercise' and Weight and Shape Exercise) continued to be included in the reviewed version (Danielsen et al., 2015). Therefore, it was concluded that EED-Q required a more in-depth evaluation to confirm the factor structure and validate its use in more diverse ED samples (Harris et al., 2020). One avenue by which to enhance and diversify the EED-Q's validation is through cross-culture validation. Further, this validation effort is essential for a more effective and standardized assessment of MM in EDs worldwide (Berends et al., 2018).

As a result, this study aimed to adapt and assess the validity and reliability of the Spanish version of the EED-Q. We hypothesize that the psychometric properties of the Spanish version of the EED will be similar (factor structure, validity, and reliability) to the original study. In addition, Spanish EED version scores will be associated with ED symptomatology evaluated via the Eating Disorders Inventory 2 (EDI-2).

2. Methods

2.1. Design and procedure

This cross-sectional study was conducted in accordance with the Declaration of Helsinki and was approved by the Ethics Committee (ID: R0049/16; date: 12/29/2016) from the Hospital Infantil Universitario Niño Jesus (HIUNJ) Madrid. The study was conducted from January 2017 to January 2019. Informed consent was obtained from all participants and legal guardians before inclusion in the study.

2.2. Measures

2.2.1. Exercise and Eating Disorders Questionnaire (EED-Q)

The EED-Q is a brief self-reported questionnaire that assesses ED patients' attitudes toward exercise developed by Danielsen and collaborators (Danielsen et al., 2015). It has 18 items on a 6-point Likert response scale (0–5) divided into four factors – compulsive exercise (Factor 1), positive and healthy exercise (Factor 2), awareness of bodily signals (Factor 3), and weight and shape related exercise (Factor 4) – and a global score where higher scores reveal increased severity.

2.2.2. Eating Disorders Inventory 2 (EDI-2)

The EDI-2 is a validated self-report instrument to assess issues relevant to ED. It is composed of 91 items divided into eight subscales that measure two aspects of the pathology: 1) ED pathology [Drive for Thinness (DT), Bulimia (B), and Body Dissatisfaction (BD)]; and 2) psychological correlates often associated to – but not exclusive – patients with ED [Interpersonal Distrust (ID), Perfectionism (P), Ineffectiveness (I), Interoceptive Awareness (IA), Maturity Fears (MF), Ascetism (A), Impulse Regulation (IR) and Social Insecurity (SI)]. Items are presented in a 6-point format (always, usually, often, sometimes, rarely, or never). The reliability of the EDI-2 was adequate, as shown by Cronbach's alpha coefficients (>0.80) (Garner, 1998).

2.3. Cross-cultural adaptation process of the EED-Q

The cross-cultural adaptation of the EED-Q included a combined translation, and a back translation approach was utilized to avoid

imprecisions. The process consisted of a translation, semantic assessment, and evaluation of the final version. The questionnaire was translated based on the recommendations for cross-cultural adaptation of research instruments (Gjersing et al., 2010). Following the guidelines, two independent native Spanish speakers with a good understanding of the original language (both bilinguals) translated the original EED-Q from English to Spanish to obtain semantic and idiomatic equivalence. Translators were instructed to avoid using challenging or technical words when creating the questionnaire. Sports medicine, psychology, and psychiatry specialists assessed the conceptual concordance between translations. Discrepancies found were discussed, clarified, and incorporated into the questionnaire. Subsequently, two native English speakers without prior knowledge of the original questionnaire translated the Spanish version back to English (back-translation). Both versions of the questionnaire were checked, and in the final meeting, the specialists' committee reviewed the equivalence of original and Spanish sentences to ensure the quality of the translated version. A synthesis version of the back-translation was created (see **Online Resource 1**), and the questionnaire was administered to a small group of patients who provided feedback before conducting the study.

2.4. Validation process of the EED-Q

Attending to the general norms and standards in psychometry (Anthoine et al., 2014), a sample of approximately 10 participants per item was needed to validate the Spanish version of the EED-Q. Considering an estimated loss of 10 %, a total of 176 participants was required to complete this study.

The study comprised 213 patients with EDs. Participants with EDs were recruited from the unit of Psychiatry and Psychology at the Pediatric Hospital Niño Jesus of Madrid. The participants were adolescents between 12 and 18 years old and with anorexia nervosa (AN), bulimia nervosa (BN), binge eating disorder (BED) and ED not otherwise specified (EDNOS) diagnosed by specialists using clinical interviews and the criteria from the international classification of diseases version 10 (ICD-10). The exclusion criteria for the study were as follows: physical disability or mental deficiency that prevented participants from completing the questionnaires and having difficulty understanding the Spanish language. Participants recruited for this study included men and women.

A total of 213 patients with EDs were approached for eligibility. Fifteen patients refused to participate in the study. From the 198 patients enrolled, data was missing or incorrect in the following categories body weight or height (n = 7), date of birth (n = 3), education level (n = 5), treatment stage (n = 5) and assessment date (n = 6) for twenty-six participants. As a result, data from 172 patients (4 % males, 96 % females) was analyzed (see Fig. 1).

Demographic information was collected from all participants and included year of birth, sex, education level, diagnosis, stage of treatment. Weight and height measurements were taken to calculate body mass index. Education level included primary education (12 years old only), secondary education or *ESO* (12–16 years old), vocational training and pre-college (15–18 years old), and college education (18 years old only). Stages of treatment were characterized as hospitalization, post-hospitalization (1–3 months), weekly program (1 visit per week), and follow-up (1 visit every 1–6 months).

Questionnaires were administered in the same environmental conditions (i.e., light, temperature, and noise) to ensure the validity of the data collected. In addition, participants' stress and fatigue levels were controlled by providing them with sufficient time to complete the questionnaire. All participants were provided with the same instructions and booklet. Additionally, the researchers ensured participants understood that there was no "right" or "wrong" answer to the questions. The participants completed the questionnaires in a single session. Upon booklet collection, the researcher checked for mistakes or omissions (i.e., all questions were answered) and thanked the patients for participating in the study.

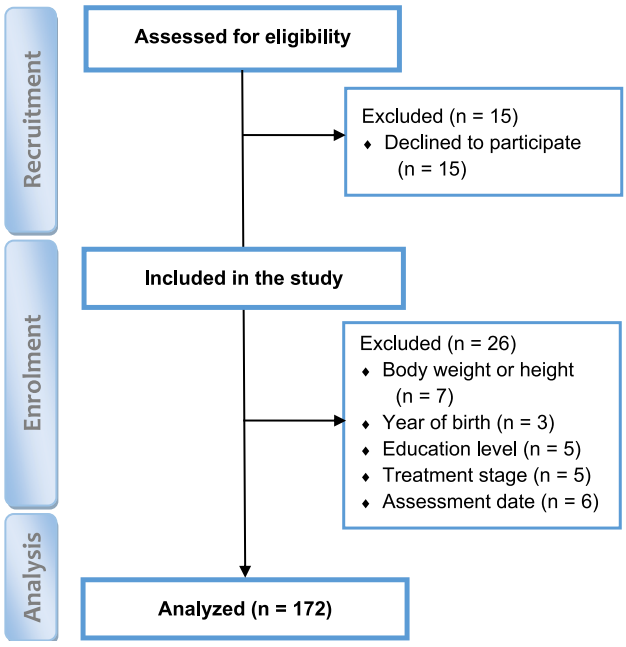

Fig. 1. Flow diagram.

2.5. Statistical analysis

Statistical analysis was conducted using the *JASP open-source software version 0.16.3* (Garner, 1998). First, the descriptive statistics (mean, SD, frequency) of the general variables were calculated. The reliability (internal consistency) of the items and scales was evaluated through Pearson's correlations (inter-item and item-factor bivariate associations) and estimating both McDonald's Omega and Cronbach's Alpha scores in each factor. We decided to use Pearson's correlation coefficient for consistency with the EFA, whose calculation is also based on Pearson's correlation matrix. All correlation effect size scores were interpreted using the general Cohen recommendations (Cohen, 1988): r = 0.1 (small correlation), r = 0.3 (medium correlation), and r = 0.5 (large correlation).

After verifying previous assumptions using the Kaiser-Meyer-Olkin (KMO) and the Barlett's Sphericity tests, construct validity was tested through an explanatory factor analysis (EFA) with *principal axis* factoring method and *Promax* oblique rotation. KMO >0.8 indicate adequate sampling (Kaiser & Rice, 1974), and Barlett Sphericity test p value of ≥0.05 indicates lack of sphericity. Pearson's correlation matrix was used for the application of the factor analysis. Considering the factorial structure proposed by Danielsen et al., 2015, the extraction of 4 empirical factors was manually established. Based on the common recommendations (Tinsley & Brown, 2009), items with factor loadings below 0.4 were removed from the EFA model. The overall variance contributed by the items to the associated factors was analyzed using the percentage of variance extracted.

Convergent (adjustment of factors to an external criterion), discriminant (the items of each dimension correlate more with its own dimension than with the rest of the defined dimensions) and divergent validity (each factor is differentiated from the others and the correlations between factors are as expected) were also assessed: convergent validity was tested analysing the correlation between EED and EDI-2 scores in a subsample of 57 subjects included in the overall sample; Pearson's correlations between factors and items were analyzed to assess discriminant validity; and finally, divergent validity was tested through the analysis of factor correlations.

3. Results

3.1. Sample characteristics

The general characteristics of the sample are shown in Table 1. The distribution based on diagnosis is as follows: 126 (73%) AN, 26 (15%) BN, 13 (7.5%) BED, and 7 (5%) EDNOS. According to the treatment stage, 14 (8.1%) were hospitalized patients, 16 (9.3%) were under post-hospitalization treatment, 105 (61%) were following a weekly treatment program, and 37 (21.6%) were under follow-up care. Education level was distributed as 2 (1.2%) Primary School 6th grade, 11 (6.4%) ESO 1st grade, 24 (14%) ESO 2nd grade, 23 (13.4%) ESO 3rd grade, 36 (21%) ESO 4th grade, 3 (1.7%) vocational training, 35 (20%) pre-college 1st year, 28 (16.3%) pre-college 2nd year, and 10 (6%) college.

3.2. Internal consistency and reliability

Internal consistency of the initial model proposed by Danielsen et al., 2015 was assessed using both bivariate correlations between items and reliability indices McDonald's Omega and Cronbach's Alpha. Inter-item correlations of all pairs of EED-Q items ranged from r = - 0.001 (item 1 with item 10) and r = 0.923 (item 16 with item 17), indicating each item contributes to the EED-Q score individually and is sufficiently associated with the other. These results revealed significant generalized correlations among the scale items (see **Online Resource 2**).

An analysis of the obtained correlations by theoretical factors extracted from the original study (Danielsen et al., 2015) revealed some issues:

- Item 8 had non-significant or close to 0 correlations with some items of the first factor. In the same way, the correlations of item 1 with the first dimension are weaker than the rest of the bivariate correlations in this dimension.
- The correlations of items 9 and 15 with their respective factors were significant but weak.
- Although the items of the fourth factor (items 16, 17 and 18) had great significant common correlations, they also had important significant correlations with most of the items of the first theoretical factor.
- Two sets of items (Items 6–7 in the first factor and Items 16–17 in the last factor) revealed moderate collinearity (p = 0.908 and p = 0.923, respectively).

Table 2 presents the item-factor correlations between items and factors proposed by Danielsen et al., 2015. In line with previous observations, items 8, 9 and 15 showed weak relationships with their factors.

Table 3 shows the reliability indices obtained in each factor. Factors 1, 3 and 4 achieved adequate reliability scores in both indices. However, Factor 2 showed poor reliability scores.

Despite these results, given that the objective of this study was to confirm the factorial structure proposed in the exploratory work of Danielsen et al., 2015, we will maintain the structure proposed by these authors in our initial EFA model.

3.3. Construct validity: Explanatory factor analysis

Both previous assumptions were met. While the KMO score was adequate (0.890), the Barlett test was highly significant (p.<0.001), indicating non-sphericity of data.

Based on the above results, we considered applying an initial explanatory factor analysis (EFA) model by testing the 18 scale items and their original theoretical factors. Two successive steps were taken until the final model was obtained:

1. First EFA model applied: As expected, based on the initial analysis, the factor loading of item 8 in the first model revealed inappropriate factor loadings (less than 0.3 for all factors). Thus, we decided to remove it from the final model.
2. Second EFA model applied: After removing item 8, we found a factor loading below the baseline between item 15 and Factor 3 (0.262), with loadings below 0.4 for all other factors.

The rotated matrix from the final EFA model (third model) is outlined in Table 4. All items achieved factor loadings above the 0.4 cutoff on their corresponding factors, and only item 6 achieved a loading above this cutoff on another factor (Factor 4. Weight and Shape Exercise). However, the loading of this item in its own factor (Factor 1. Compulsive Exercise) was higher. The overall percentage of extracted variance of the model was good (65.0%). The distribution of this total variance across the factors was relatively balanced: 25.9% in Factor 1, 8.3% in Factor 2, 10.2% in Factor 3, and 20.6% in Factor 4.

3.4. Convergent, discriminant and divergent validity

First, Table 5 presents the correlations between each EDI-2 subscale score and EED-Q factors. All expected correlations were significant with medium-high intensities, and the direction of the correlations were consistent. Specifically, Factors 1 and 4 correlated positively with all EDI-2 subscales related to ED pathology (Drive for Thinness, Bulimia and Body Dissatisfaction) in addition to most psychological correlates' subscales (Ineffectiveness, Interoceptive Awareness, Ascetism, and Impulse Regulation). Additionally, higher values of EDI-2 subscales

Table 1
Body composition and age values expressed as means and standard deviations.

	Mean		SD
Age (years)	15.28	±	1.64
BW (kg)	50.61	±	7.02
Height (m)	1.61	±	0.06
BMI (kg/m^2)	19.50	±	2.41

BW – body weight, BMI – body mass index.

Table 2
Item-factor Pearson's correlations between items.

Factor	Item	Correlation
Factor 1.	Item 1	0.515
Compulsive exercise	Item 2	0.806
	Item 3	0.633
	Item 4	0.789
	Item 5	0.873
	Item 6	0.830
	Item 7	0.784
	Item 8	−0.219
Factor 2.	Item 9	0.257
Positive and healthy exercise	Item 10	0.413
	Item 11	0.522
Factor 3.	Item 12	0.522
Awareness of bodily signals	Item 13	0.560
	Item 14	0.580
	Item 15	0.353
Factor 4.	Item 16	0.899
Weight and shape exercise	Item 17	0.919
	Item 18	0.811

*Item-factor correlations excluding item.

Table 3
Factor reliability. McDonald's Omega and Cronbach's Alpha.

Factor	McDonald's Omega	Cronbach's Alpha
Factor 1. Compulsive exercise	0.907	0.865
Factor 2. Positive and healthy exercise	0.633	0.577
Factor 3. Awareness of bodily signals	0.720	0.711
Factor 4. Weight and shape exercise	0.943	0.939
Whole scale	0.819	0.778

Table 4
Final EFA model. Rotated matrix.

	Factor 1. Compulsive exercise	Factor 2. Positive and healthy exercise	Factor 3. Awareness of bodily signals	Factor 4. Weight and shape exercise
Item 1	0.530			
Item 2	0.770			
Item 3	0.821			
Item 4	0.842			
Item 5	0.861			
Item 6	0.566			0.453
Item 7	0.528			
Item 9		0.587		
Item 10		0.561		
Item 11		0.637		
Item 12			0.672	
Item 13			0.785	
Item 14			0.702	
Item 16				0.920
Item 17				0.867
Item 18				0.904

*Factor loadings below 0.4 were not included.

correlated to lower scores on Factor 2 (Positive and Healthy Exercise) and Factor 3 (Awareness of Bodily Signals). In particular, "Positive and Healthy Exercise" was associated with low scores in Ineffectiveness (I), Interpersonal Distrust (ID), Interoceptive Awareness (IA) and Social Insecurity (SI). In contrast, "Awareness of bodily signals" was associated with all EDI-2 subscales except bulimia (B) and interpersonal distrust (ID).

Regarding discriminant validity, Table 6 shows that the item-factor correlations were higher in all items in their corresponding factors except item 9, which correlated slightly better with Factor 1.

Finally, Table 7 presents correlations between factors. Results showed direct high correlations between Factors 1 and 4 and negative medium correlations between Factor 3 and Factors 1 and 4. All other correlations were low or trivial.

4. Discussion

This study aimed to test the psychometric properties of the Spanish version of the EED-Q in a sample of Spanish individuals with an ED. Our study supported the psychometric properties of the EED-Q compared to the original version (Danielsen et al., 2015) with some limitations.

First, our study encountered issues related to item 8 ("I listen to my body") from Factor 1 (Compulsive Exercise). Our results exposed a weak correlation between item 8 ("I listen to my body") and the other items within the same factor. Before our findings, the principal component analysis conducted in Danielsen and collaborators' (2015) development article revealed low factor loadings for patients (0.46) and healthy controls (0.37). At this time, item 8 was retained because it had clinical relevance to EDs. With that, the factor loading was exclusively below the threshold (0.40) for healthy controls rather than for the clinical population (Danielsen et al., 2015). The issues surrounding the factor loading of item 8 may be linked to the semantics of the item ("I listen to my body"). The wording of this item 8 could easily fit with the physical awareness topic of Factor 3 (Awareness of Bodily Signals). The original article reported a factor loading of −0.38 between item 8 and Factor 3 (Danielsen et al., 2015), suggesting the topic of item 8 may not be the best match for Factor 1 (Compulsive Exercise). Awareness of bodily signals, also known as *interoceptive awareness* is impaired in patients with EDs (Merwin et al., 2009). Patients show a decreased capacity to perceive signals or changes in the body (e.g., emotions, hunger, thirst, body temperature, pain, tiredness, muscular pain, etc.). Interoceptive awareness has two components within EDs: acceptance of experiences and clarity regarding emotional responses. Given the well-documented role of exercise being used for affect regulation (Merwin et al., 2009), some research has theorized dysregulated interoceptive awareness as a key factor for continued engagement in MM (Kaye et al., 2015). On the other hand, supervised progressive resistance training and yoga have shown positive improvements in interoceptive awareness in patients with AN in the short term (Demartini et al., 2021; Szabo & Green, 2002). Adding specificity to item 8 may help clarify it's meaning to respondents. In addition, the heterogenous nature of EDs might also be impacting patient's responses to item 8, as there can be varying levels of introspection across EDs, thus removing it from Factor 1 (Compulsive Exercise) and adding it to a more relevant Factor (i.e., body awareness) may offer more accuracy.

Another point of discrepancy is item 1 ("I am physically active to avoid dealing with negative emotions"). The correlations of item 1 within Factor 1 (Compulsive Exercise) may be weaker than the other

Table 5
Convergent validity. Pearson's correlations between EED-Q factors and EDI-2 subscales.

	Factor 1. Compulsive exercise	Factor 2. Positive and healthy exercise	Factor 3. Awareness of bodily signals	Factor 4. Weight and shape exercise
DT (Drive for Thinnes)	0.860***	−0.074	−0.416**	0.883***
B (Bulimia)	0.477***	−0.107	−0.258	0.544***
BD (Body Dissatisfaction)	0.761***	−0.245	−0.392**	0.769***
I (Ineffectiveness)	0.458***	−0.379**	−0.503***	0.490***
P (Perfectionism)	0.286*	−0.023	−0.485***	0.239
ID (Interpersonal Distrust)	0.103	−0.384**	−0.158	0.106
IA (Interoceptive Awareness)	0.439***	−0.272*	−0.467***	0.427***
MF (Maturity Fears)	0.361**	−0.146	−0.377**	0.222
A (Ascetism)	0.591***	−0.173	−0.475***	0.626***
IR (Impulse Regulation)	0.457***	−0.227	−0.487***	0.514***
SI (Social Insecurity)	0.328*	−0.425***	−0.551***	0.317*
EDI-2 mean score	0.641***	−0.305*	−0.554***	0.646***

Significant values: *p.<0.05; **p.<0.01; ***p.<0.001.

Table 6
Discriminant validity. Item-factor correlations.

	Factor 1. Compulsive exercise	Factor 2. Positive and healthy exercise	Factor 3. Awareness of bodily signals	Factor 4. Weight and shape exercise	Whole scale
Item 1	0.508	0.197	−0.158	0.350	0.606
Item 2	0.816		−0.268	0.652	0.808
Item 3	0.644		−0.208	0.495	0.625
Item 4	0.798		−0.382	0.586	0.733
Item 5	0.893		−0.330	0.730	0.817
Item 6	0.865	−0.153	−0.359	0.846	0.786
Item 7	0.811	−0.175	−0.442	0.777	0.706
Item 9	0.385	0.257	−0.172	0.253	0.491
Item 10	−0.263	0.413	0.293	−0.349	0.023
Item 11		0.522	0.281	−0.273	0.197
Item 12	−0.354	0.168	0.562	−0.318	−0.078
Item 13	−0.223	0.261	0.589	−0.217	0.089
Item 14	−0.338	0.079	0.546	−0.307	−0.062
Item 16	0.699	−0.198	−0.352	0.899	0.657
Item 17	0.764	−0.270	−0.360	0.919	0.720
Item 18	0.702		−0.259	0.811	0.717

*Only significant correlations are presented. Item-factor correlations excluding item.

Table 7
Divergent validity. Inter-factor correlations.

	Factor 1. Compulsive exercise	Factor 2. Positive and healthy exercise	Factor 3. Awareness of bodily signals	Factor 4. Weight and shape exercise
Factor 1	–	0.083	−0.476	0.748
Factor 2		–	0.188	−0.182
Factor 3			–	−0.489
Factor 4				–

bivariate correlations within the factor – uncovering the issue between item 8 and item 1 and their relationship to Factor 1. Compared with the rest of the items in Factor 1, "I am physically active to avoid dealing with negative emotions" item 1 seems to differ in terms of semantics. While the remaining items in Factor 1 relate to the "effects of not exercising," item 1 could also be interpreted as relating to affect regulation (Meyer et al., 2011). That is, patients engage in MM as a distraction, an escape or to alleviate distress (da Silva Freire et al., 2020; Bratland-Sanda & Vrabel, 2018). A patient must have insight into the presence of this relationship to recognize that they are "physically active to avoid dealing with negative emotions". However, this awareness might not be present as insight and cognitive capacity are known to be impacted by starvation and lack of nutrition (McCormick et al., 2008). Supportively, studies have shown that up to 25% of individuals with AN-R and AN-BP can be characterized as having "a severe lack of insight" into their ED (Konstantakopoulos et al., 2011).

Similarly, item 9 ("I enjoy being physically active") from Factor 2 (Positive and Healthy Exercise) revealed some issues. The internal consistency (Cronbach's α) results were similar to those reported by both the original validation study of the EED-Q and the validation study conducted in males (Danielsen et al., 2015, 2018). It could be that the cause of these variations is related to methodological differences. An aspect that may have impacted item 9 ("I enjoy being physically active") is that patients with EDs may perceive "enjoying" being physically active regardless of the pain, or distress it is causing them. A core quality of MM is its use in affect regulation (Meyer et al., 2011). As previously mentioned, patients engage in MM as a distraction to alleviate distressing emotions, to manage their distress about eating, or to burn calories and modify their shape or weight (da Silva Freire et al., 2020; Bratland-Sanda & Vrabel, 2018). Thus, patients' understanding of "enjoying" activity may diverge significantly from those without maladaptive relationships with activity. That said, including questions surrounding exercise enjoyment can be a marker of treatment progression. Helping a patient find joy in activity is a core component of remedying a maladaptive relationship with activity (Calogero & Pedrotty, 2004). Thus, it may be unnecessary to remove items surrounding finding joy in exercise fully. Rather, refining and tailoring the items to represent both the experience of engaging in exercise for unadulterated enjoyment, as well as for "enjoyment" that is related to affect regulation or control of shape or weight may be a way to include the item and make it clinically relevant to recovery. However, additional investigation is required to support these hypotheses.

Lastly, item 15 ("I notice when I feel fit/in shape") did not fit well with "Awareness of bodily signals" examined in Factor 3. Moreover, item 15 showed interactions across Factors 1 (Compulsive Exercise) and 2 (Positive and Healthy Exercise). First, a core symptom of EDs is a disconnection from the body, which has guided programs aimed at rehabilitating relationship with movement to explicitly focus on bringing awareness to the body (Calogero & Pedrotty, 2004; Duesund & Skårderud, 2003). Moreover, ED patient's perception of their "fitness" can be distorted, explaining why there is a discrepancy in the association between their awareness of body signals (Factor 3) and the feeling of being "fit" (item 15). Furthermore, body dissatisfaction is mediated by "changes in individual perceptions of their physical fitness and competence" (Jáuregui-Lobera et al., 2013). Varying levels of body dissatisfaction could have been present in the sample, particularly since our sample was curated from different levels of patient care. Thus, for patients with EDs, the relationship between feeling "fit," positive, and healthy exercise could be confounded by the mediating factor of MM. In other words, patients may feel they are engaging in healthy and positive exercise as it relieves their sense of body dissatisfaction (leading them to feel "fit"). However, they lack insight and are perpetuating a maladaptive relationship with movement. These outcomes reinforce the need to keep Factor 2 and engage in research to determine what "positive and healthy" exercise is for this population and what is not.

Our sample was significantly younger (15.28 ± 1.64) than the sample in Danielsen et al., 2015's validity study (27.1 ± 9.5), which may have impacted the interpretation of the items. Concerning item 9 ("I enjoy being physically active") and in relation to affect regulation, a study of clinical profiles using the Compulsive Exercise Test in adolescents with AN found that the mood improvement subscale relating to the positive reinforcement value of exercise was not significantly associated with psychopathology. Instead, the role of MM in facilitating the avoidance of emotions had a greater relation to psychopathology (Noetel et al., 2016). Not only this, but youth populations often have different engagement in activity than adults, participating more

regularly in recreational or school-led sports (Doré et al., 2022; Frederick & Ryan, 1993). Which, for youth with EDs, has been shown as a protective factor against MM (Madison & Ruma, 2003).

Along with this, the current sample differed in the representation of EDs, with a greater proportion of our sample being patients with AN and a lower BMI. Having a lower BMI has been related to greater overall ED psychopathology and, with that, MM (Danielsen et al., 2016). The sample differences may have contributed to their interpretation of the items and could explain some of the outcome variance.

In terms of the EDI-2 and its relationship with the EED-Q, convergent validity was demonstrated by the high correlations between compulsive exercise (measured by the EED-Q) and eating disorder symptoms (measured by the EDE-Q). MM is characterized by a motivation to control shape and weight (Meyer et al., 2011). Thus, individuals with a higher drive for thinness and body dissatisfaction will unsurprisingly endorse greater compulsive exercise tendencies (Factor 1) and weight- and shape-driven exercise (Factor 4) (Ruiz-Turrero et al., 2022; Solenberger, 2001). In fact, across EDs, higher body dissatisfaction has been noted to facilitate engagement in MM. However, the function and motivation to engage in MM is different between ED (Peñas-Lledó et al., 2002). Unlike AN-R, MM can hold a more prominent role in AN-BP and BN as a compensatory mechanism for "binging." With that, bulimic tendencies have also been shown to be stronger in samples who engage in MM. At the same time, other compensatory mechanisms (laxative use, etc.) are used in those who do not engage in MM (Solenberger, 2001), which may have underscored the relationship between the "Bulimia" subscale and Factor 1 (Compulsive Exercise).

Of significant value is the guidance that can be found in the relationship between the factor of the EED-Q and the items of the EDI-2 in helping provide a path forward to define "Positive and Health Exercise" for this population. Undoubtedly, everyone will have a unique version of their "healthy and positive" relationship with movement. However, the relationships between the EDI-2 and the EED-Q highlighted in our results could provide some basic characteristics to help researchers and clinicians determine a patient's progress toward a more fulfilling relationship with movement.

Finally, the EED-Q was developed to capture the clinically relevant constructs absent from other questionnaires, such as negative emotions or consequences of exercise if delayed or interrupted, body signal interpretation, and body perception upon exercise restriction. Uniquely, Danielsen et al., 2015 relied on research, along with clinical observation, to develop the items of the EEQ-D. Factor 2 (Positive Exercise and Health Exercise) had the least successful validity within the Spanish population. Cultural differences may explain this outcome. Although there is widespread agreement about the importance of addressing MM in treatment. Cross-cultural differences have previously been identified in how clinicians understand the link between exercise and EDs (Hechler et al., 2005). Not only this, but while Europe and the USA utilized the Feldenkrais method to remediate exercise in treatment, others (New Zealand and Australia) utilized yoga. Further, limiting movement in patients with low BMI was most favoured by the Swedish, while units in Norway differed from this opinion (Bratland-Sanda et al., 2010). Clearly, therapeutic strategies used to manage MM differ among countries (Hechler et al., 2005). These discrepancies highlight the need to garner clinical experiences and opinions of practitioners across various cultures.

Overall, correlations showed a strong direct relationship between Factors 1 (Compulsive Exercise) and 4 (Weight and Shape), as well as in Factors 2 (Positive and Healthy Exercise) and 3 (Awareness of Body Signals) as indicated by their covariance. This means that patients tend to endorse items similarly within these factors. Given individuals' consistent and robust motivation to engage in MM to change their shape and weight, the relationship between Factors 1 and 4 is understandable and supports the scale's validity (Meyer et al., 2011). That said, Factor 2 scores seemed independent of Factors 1 and 4. Endorsing items related to having Positive and Healthy Exercise should not relate to Factor 1 and Factor 4 as this would directly oppose having a positive relationship with activity. However, as previously mentioned, the clinical utility of Factor 2 is valuable in helping determine patient progress toward a health-enhancing relationship with exercise. Meanwhile, Factor 3 shows an inverse relationship with Factors 1 and 4. Having greater awareness of the body is related to lower engagement in MM. Promoting body awareness is a tool used to help an individual with an ED reclaim a health-enhancing relationship with movement (Calogero & Pedrotty, 2004; Calogero & Pedrotty-Stump, 2010).

5. Strengths and limitations

This is the first study to validate a Spanish translation of the EED-Q. A strength of our research is the high standards of practise we adhered to in the translations/back-translation. We ensured to thoughtfully considered grammar, cultural and process discrepancies during the validation of this questionnaires in a new language. Further, we included a large patient sample with diverse ED diagnoses in hopes of replicating the original validation study. Lastly, our results can be utilized to tailor the semantics for Spanish populations. Nonetheless, this study is not without limitations. The sample recruited were adolescents (12–18 years of age), which may have affected the results, and prevented us from applying a complete factor analysis (confirmatory factor analysis and EFA). In addition, item 9 was eliminated based on the results, leaving a dimension consisting of only two items, which is not the recommended practice (factors should have three or more items). In addition, the reliability was assessed mainly by evaluating the homogeneity. However, conducting a test-retest examination to determine the stability of reliability over time could have strengthened this study. Future studies should address the methodological limitations of adaptation, reliability, subgroup differences, and analysis approach. The "Positive and Healthy Exercise" dimension should be expanded and/or improved. Collectively, these actions will contribute to developing measurement of MM in EDs that is standardize across genders, age groups, and territories.

6. Conclusion

This is the first study to translate the EED-Q to Spanish (S-EED-Q) and validate its structure. Results support the psychometric properties of the S-EED-Q compared to the original version with some limitations. Overall, the EED-Q and S-EED-Q's attempt to capture a patient's progress from MM to a health fulfilling relationship with activity is notable. The initiative warrants further research that enhances the questionnaire's ability to evaluate its progress in treatment. Overall, this measurement offers a valuable step diversifying the assessment of MM treatment on EDs.

Ethics approval

This study was conducted in accordance with the Declaration of Helsinki and was approved by the Ethics Committee (ID: R0049/16; date: 12/29/2016) from the Hospital Infantil Universitario Niño Jesus (HIUNJ) Madrid.

CRediT authorship contribution statement

María Fernandez-del-Valle: Conceptualization, Data curation, Formal analysis, Funding acquisition, Methodology, Supervision, Visualization, Writing – original draft, Writing – review & editing. **Margarita Pérez Ruiz:** Conceptualization, Data curation, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Visualization, Writing – original draft, Writing – review & editing. **Danika A. Quesnel:** Visualization, Writing – original draft, Writing – review & editing. **Alejandro F. San Juan:** Data curation, Investigation, Writing – review & editing. **Andrea Barrios-Hernández:**

Investigation, Resources, Writing – review & editing. **Montserrat Graell-Berna:** Investigation, Resources, Writing – review & editing. **Fernando Martínez-Abad:** Data curation, Visualization, Writing – original draft, Writing – review & editing.

Declaration of competing interest

The authors have no relevant financial or non-financial interests to disclose.

Data availability

Data will be made available on request.

Acknowledgments and funding

We would like to thank Sofía Pedraza Cabrera and Eneko Larumbe-Zabala for their initial support, and all the patients that participated in the study. This research was funded by the European University of Madrid (project ID: 2017/UEM11).

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.mhpa.2023.100564.

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