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Reliability of the Spanish version of the pain beliefs and perceptions inventory among women with fibromyalgia in Catalonia, Spain

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ABSTRACT

Purpoe: Fibromyalgia presents a significant challenge to individsuals due to its pervasive pain symptoms. The Pain Beliefs and Perceptions Inventory (PBPI) offers a structured tool to delve into the nuanced beliefs surrounding pain. We aim to explore the feasibility of a condensed version of PBPI in assessing pain perceptions among individuals living with fibromyalgia in Catalonia, Spain.
Methods: During February 2020 and March 2021, 419 individuals above 18 years old (91% women) were administered a short version of the PBPI to streamline the questionnaire while retaining its core components. This reduced version was subjected to rigorous evaluation to ascertain its internal reliability.
Results: The condensed 12-factor inventory exhibited promising internal consistency, with a Cronbach's Alpha coefficient of .72. This reliability suggests that the abbreviated PBPI maintains its integrity in capturing diverse facets of pain beliefs and perceptions among fibromyalgia patients.
Conclusion: Findings underscore the utility of the shortened Spanish PBPI questionnaire in assessing the multifaceted landscape of pain beliefs among individuals diagnosed with fibromyalgia. Despite the sample is mostly represented by women, and the results need to be taken with precaution in men, this streamlined version offers an efficient tool for clinicians and researchers alike to delve into the intricate interplay between perceptions, beliefs, and the experience of pain.

1. Background

Fibromyalgia is a complex long-term condition affecting around 2% of the general population in Spain and a range between .2 and 7 % worldwide. This population suffers from physical and psychosocial issues, including chronic widespread musculoskeletal pain, fatigue, depression, anxiety, and sleep disturbances (Font et al., 2020; Queiroz, 2013).

Living with fibromyalgia is a complex, dynamic, cyclic, and multidimensional process that embraces internal processes such as acceptance and coping with the situation, self-management of the symptoms, and integration of the disease in daily living and adjustment to the new life generated by the condition (Ambrosio et al., 2015). Therefore, healthcare professionals need to understand from the patient's perspective what daily living with fibromyalgia is. This understanding will generate the required knowledge to provide holistic and

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individualized care to the person. There is an important need for multidisciplinary teams to address the physical, psychological, and social needs of patients living with fibromyalgia according to a biopsychosocial approach (Turk and Adams, 2016; Macfarlane et al., 2017; Kundakci et al., 2022).

Widespread musculoskeletal pain is one of the most defining and disabling features in this population, along with non-restorative sleep, fatigue, mood, and cognitive disturbances (Serrat et al., 2021; Andrade et al., 2018; Climent-Sanz et al., 2023). Cognitive impairments in fibromyalgia, often referred to as "fibro fog," commonly manifest as difficulties with memory and concentration are particularly significant in tasks requiring sustained mental effort (Kravitz and Katz, 2015). Research indicates that cognitive load can exacerbate survey fatigue, particularly when questionnaires are lengthy and demanding (Jeong et al., 2023). This contributes to inaccuracies in responses, such as misclassification errors (Egleston et al., 2011). These findings emphasize the importance of condensing questionnaires, especially for individuals with fibromyalgia, where concentration and cognitive function are often compromised.

The Pain Beliefs and Perceptions Inventory (PBPI) evaluates "a subset of a patient's belief system which represents a personal understanding of the pain experience." PBPI presents 16-items divided into four dimensions of pain beliefs: Mystery, Permanence, Constancy, and Self-blame (Williams and Thorn, 1989). In this vein, some authors suggest different types of beliefs about pain: basic philosophical beliefs about the nature of oneself and the world, general and stable beliefs, and lastly, the beliefs related to the context of pain and its treatment (DeGood et al., 1992).

In the absence of a visual or clinical explanation of the origin of their pain, patients living with chronic pain, and specifically with fibromyalgia, create their own meaningful explanation about the source, process, or consequences of their pain and it has a direct relation with their coping strategies and capacity to understand and overcome their condition (Climent-Sanz et al., 2023; Jensen et al., 2007). Moreover, people with adequate coping resources, such as a good internal locus of control, will have less pain intensity and disruptions than others with worse coping strategies (Moretti and Medrano, 2019). Finally, the beliefs about pain origin and management will be key factors in these patients' rehabilitation process in the way they modulate behaviour, physical condition, and response to treatment (Dysvik et al., 2004). In this line, research shows how beliefs about Permanence and Constancy dimensions of pain correlate with greater disability (Turner et al., 2000; Vanhaudenhuyse et al., 2018), and the belief of their pain being mysterious made the patient suffer more pain catastrophizing and have fewer coping resources (Jackson et al., 2014; Stroud et al., 2000).

The PBPI has been previously validated in other languages, such as French (Dany et al., 2009), Chinese (Wong et al., 2011), Italian (Monticone et al., 2014), Russian (Goli et al., 2015), or Portuguese (Azevedo et al., 2017). The French version showed good internal consistency, with a Cronbach Alpha of .70 in a four-factor structure (Dany et al., 2009). The Chinese version also yielded four factors and showed a Cronbach alpha ranging between .60 and .70 (Wong et al., 2011). The Italian version adapted the three-factors scale and showed a Cronbach alpha ranging between .91 and .96 (Monticone et al., 2014). The Russian version showed an internal consistency of .73 with the four-factor structure (Goli et al., 2015). And the Portuguese validation showed a Cronbach alpha ranging between .62 and .88 with the four-factor scale (Azevedo et al., 2017).

The PBPI scale was validated in Spanish with a sample of 225 patients suffering from chronic pain (Ferrer-Pérez et al., 1997). This study found a good internal consistency with a Cronbach Alpha between .52 and .82. In addition, less pain intensity was found in those patients with lower Mystery results, as expected. Beliefs about Constancy also modulated the perceived intensity of pain (Blanch and Solé, 2023). Another study analyzed the reliability of the Spanish version of PBPI in a sample of 382 Argentinian people with chronic headache, showing again a good Cronbach Alpha (.80) with a three-factors structure (Moretti and Medrano, 2019).

To our knowledge, there are no studies analyzing the internal consistency of the PBPI scale in individuals with fibromyalgia. Understanding this aspect could be crucial for better comprehending the patient's pain experience. Additionally, if a reduced version of the scale demonstrates similar internal consistency to the standard version, it could be easier for people diagnosed with fibromyalgia, reducing the survey fatigue and misclassification errors (Jeong et al., 2023; Egleston et al., 2011).

2. Methods

2.1. Subjects

After obtaining the ethics committee's approval, patients were recruited from the fibromyalgia unit and two primary care centers from Catalonia between February 2020 and March 2021. Patients were invited to participate in this study during their regular visits. The inclusion criteria were having a diagnosis of fibromyalgia by a general practitioner, being more than 18 years of age, and being fluent in reading and speaking Spanish. The exclusion criteria were having central or peripheral neurological signs or mental impairments. The pain and sociodemographic characteristics were personally collected by a research assistant at the first visit and through online surveys during the COVID-19 lockdown and restrictions.

A total number of 419 patients participated in the study, 380 women and 39 men (Table 1). The sample reported a severe intensity of pain, and this pain was present for the last six years. This sample was also characterized by having high perceived stress and moderate levels of rumination.

A post-hoc power analyses conducted with the pwr R package indicates that the current sample size is appropriate to detect a significant correlation ($p < .01$) with a probability above 90% of rejecting the null hypothesis when it is false.

Table 1
Demographic and clinical characteristics.

Variable	Statistics
Sex, n(%)	
Female	380(91%)
Male	39(9%)
Duration of pain [years]	6.22(8.83)
VAS (0–10)	7.18(1.69)
Sleep [hours/day]	6.02(1.79)
BMI	27.39(5.45)
Civil status, n(%)	
Single	90(21.5%)
Married	222(53%)
Divorced	90(21.5%)
Widow	17(4.1%)
Educational level, n(%)	
Without studies	6(1.4%)
Primary education	88(21%)
Secondary education	97(23.2%)
Professional training	139(33.2%)
Higher education	89(21.2)
Employment situation, n(%)	
Unemployed	120(28.6%)
Active	176(42%)
Retired	116(27.7%)
Other	7(1.7%)
Tobacco use, n(%)	115(27.5)
PCS (0–52)	26.69(12.85)
RRS (22–88)	54,36(16.09)
PSS (0–40)	32.30(6.79)

Visual Analogue Scale (VAS); Pain Catastrophizing Scale (PCS); Ruminative Response Scale (RRS); Perceived Stress Scale (PSS). Mean (standard deviation).

2.2. Measures

The PBPI is a questionnaire with 16 items that comprises four main dimensions of pain beliefs: Mystery, Permanence, Constancy, and Self-blame (Williams and Thorn, 1989) The Mystery dimension refers to the mystery and understanding of the pain's origin and process (items 1, 4, 8, 14). The Permanence dimension evaluates whether it is believed that pain is part of life (items 2, 5, 9, 12, 15). The Constancy dimension evaluates the belief in the endurance of pain throughout daily life (items 3, 6, 10, 16). The Self-Blame dimension evaluates whether one is believed to be solely responsible for experiencing pain (items 7, 11, 13). The patient must answer every item using a 4-point Likert Scale, from a −2 value (very disagree) to a +2 value (very agree). The total score summarizes the 16 items, except for items 3,9,12, and 15, which are reverse scored. This questionnaire has shown a good internal consistency (Cronbach α: .64–.83) (Monticone et al., 2014).

2.3. Data analyses

We explored whether a shorter version of the instrument could show appropriate alpha reliabilities, and could recover the original four-factor structure of the instrument. To this end, we evaluated the resulting alpha reliabilities with the cocron R (Diedenhofen and Musch, 2016). Moreover, we conducted an exploratory factor analysis of the 16-items version of the PBPI, bearing in mind two main criteria for item removal. First, items with a commonality below .30, and second, items with secondary loadings in different factors above .30. According to previous studies, a four-factor structure was defined with a varimax rotation because the four-factors are hypothesized as relatively uncorrelated. A parallel analysis was conducted to determine the number of factors to be extracted (Horn, 1965). The factors were extracted with the minimum residual method, an unweighted least squares solution, with the fa function from the psych R package (http://www.R-project.org. R Development Core Team, 2014). The research team underwent training to standardize the data collection process and minimize missing data. Despite these efforts, any missing data during the analysis phase were addressed by imputing the mean value of the corresponding item for participants with incomplete responses, ensuring consistency across the dataset. A confirmatory factor analysis (CFA) was not conducted with the current data, because it is preferable to implement both an EFA and a CFA with two different samples, respectively (Browne, 2000). Further construct validity of the current instrument should be therefore evaluated in a different study with a new fresh sample.

3. Results

Table 2 shows the number of items and the Cronbach's alpha reliabilities for each of the four factors in both versions of the PBPI with 16 and 12-items. For the 16-items version, alpha reliabilities ranged between .67 (Permanence) and .76 (Mystery) and yielded .80 for the whole 16-items test. For the 12-items version, alpha reliabilities ranged between .69 (Permanence) and .86 (Constancy), and with .72 for the whole 12-items test. The contrasts of the alpha reliabilities across both forms of the test indicated a statistically significant improvement from the 16 to the 12-item version for the Constancy scale ($\chi^2 = 21.03$, $p < .001$), although a milder worsening for the whole test ($\chi^2 = 10.19$, $p = .0014$). These findings suggest that removing items 2, 3, 4, and 5 from the 16-items version has a minimal impact on the psychometric alpha reliability.

The outcomes supporting the rationale for removing these items are shown by the factor analyses conducted with the data from the PBPI. A previous parallel analysis suggested a four-factors solution as Table 3 (top-half) shows the factor analysis conducted with the 16-items version of the PBPI. Items 4 and 5 from the constancy factor showed factor loadings above .30 in the mystery factor (.42 and .42), and in the self-blame factor (.31). Item 2 in the mystery factor showed another factor loading above .30 in the constancy factor (.34). Finally, item 3 from the self-blame factor showed the lowest communality (.24). The second half in Table 2 shows another factor analysis with the 12-item version. These outcomes highlight a clearer factor structure with no secondary factor loadings and with generally larger commonalities than in the 16-item version, which explains a similar amount of variance compared to the 16-item version. Moreover, Fig. 1 shows that a parallel analysis suggests a four-factor solution for the 12-items version of the PBPI. Table 4 shows

Table 3
Exploratory factor analysis of the Pain Beliefs and Perceptions Inventory (PBPI) with 16-items (top-half) and 12-items (bottom-half). Underlined items in the 16 version were those removed in the 12-items version in accordance with item removal criteria.

Item	Constancy	Mystery	Self-blame	Permanence	h^2
6	**.84**	.17	.16	.10	.77
16	**.79**	.18	−.04	.01	.66
10	**.77**	.19	−.01	.08	.63
5	**.54**	.42	.31	.17	.60
4	**.48**	.42	−.06	.21	.46
8	.17	**.72**	−.13	.09	.57
1	.08	**.67**	.02	.14	.47
14	.25	**.63**	−.15	.13	.50
2	.34	**.58**	.21	.07	.50
15	−.06	.09	**.68**	.01	.48
9	.05	−.02	**.65**	−.11	.44
12	−.03	−.05	**.65**	.06	.43
3	.15	−.10	**.45**	−.01	.24
11	.08	.07	−.05	**.68**	.48
13	.10	.13	−.05	**.66**	.47
7	.03	.14	.07	**.61**	.40
% Variance	17	14	11	9	–
6	**.85**	.18	.11	−.13	.77
10	**.78**	.20	.09	.02	.66
16	**.77**	.14	.03	.06	.61
8	.17	**.75**	.09	.08	.61
1	.09	**.67**	.15	−.04	.49
14	.25	**.65**	.14	.12	.52
11	.07	.07	**.69**	.07	.50
13	.09	.13	**.66**	.03	.46
7	.03	.12	**.61**	−.08	.40
15	.04	−.05	−.01	**.70**	.50
9	−.08	.07	.11	**.67**	.47
12	.01	.08	−.06	**.60**	.38
% Variance	17	13	11	11	–

Table 2
Number of items and Cronbach's alpha reliabilities in two versions of the instrument, 16 and 12 items.

Factor	16-item version			12-item version			χ^2	p-value
	Items	Alpha	95% CI	Items	Alpha	95% CI		
Permanence	5	.67	(.62, .72)	3	.69	(.64, .74)	.23	.6299
Constancy	4	.74	(.70, .78)	3	.86	(.83, .88)	21.03	.0000
Mystery	4	.76	(.72, .80)	3	.77	(.73, .80)	.10	.7484
Self-blame	3	.70	(.65, .75)	3	.70	(.65, .75)	.00	1
Whole test	16	.80	(.78, .83)	12	.72	(.69, .77)	10.19	.0014

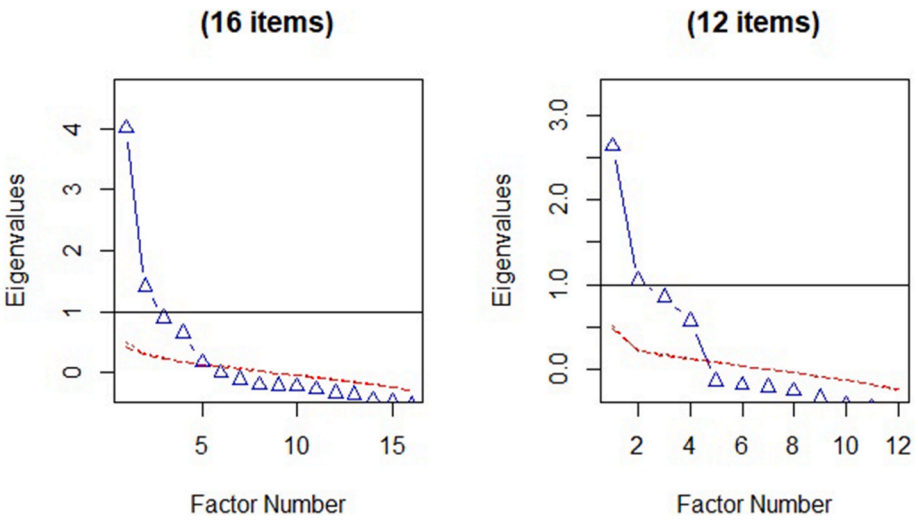

Fig. 1. Parallel analysis suggesting 4 factors for the PBPI (16 and 12 items versions).

Table 4
Items in English and Spanish language of the Pain Beliefs and Perceptions Inventory (PBPI). The items removed in the Spanish language version are shown in boldface.

ENGLISH LANGUAGE	SPANISH LANGUAGE
1. No one's been able to tell me exactly why I'm in pain	Nadie ha sido capaz de explicarme exactamente por qué tengo dolor
2. I used to think my pain was curable but now I'm not so sure	**Antes creía que mi dolor se podría curar pero ahora ya no lo tengo tan claro**
3. There are times when I am pain free	**Hay ratos en los que no tengo dolor**
4. My pain is confusing to me	**El dolor que tengo me desconcierta**
5. My pain is here to stay	**Este dolor no se va a ir**
6. I am continuously in pain	Tengo dolor constantemente
7. If I am in pain it is my own fault	Si tengo dolor es por mi culpa
8. I don't know enough about my pain	No sé lo suficiente sobre mi dolor
9. My pain is a temporary problem in my life	El dolor que tengo es un problema temporal en mi vida
10. It seems like I wake up with pain and I go to sleep with pain	Es como si tuviera dolor desde que me levanto hasta que me acuesto
11. I am the cause of my pain	Soy la causa de mi dolor
12. There is a cure for my pain	Hay una cura para mi dolor
13. I blame myself if I am in pain	Si tengo dolor, me culpo a mí misma/o
14. I can't figure out why I'm in pain	No logro descubrir por qué tengo dolor
15. Someday I'll be 100 % pain free again	Algún día volveré a estar 100% libre de dolor
16. My pain varies in intensity but is always with me	Mi dolor cambia de intensidad, pero está siempre conmigo

the items in both English and Spanish language.

4. Discussion

This study aimed to explore the reliability of a short version of the PBPI. The current outcomes suggest that a shorter 12-items version of the PBPI might yield reliable and valid outcomes in applied research addressing pain beliefs.

These results support the four-factor version, which is consistent with other previous studies where the PBPI scale has been applied across different cultures (Wong et al., 2011; Herda et al., 1994; Morley and Wilkinson, 1995). In this line, some researchers have found cross-cultural differences in pain beliefs, with fewer self-management strategies when managing chronic pain in patients identifying themselves as Hispanics in front of third-generation Caucasian US-born or even Italians, Canadians, Irish or Polish. It seems that culture can affect pain beliefs, as it is explained in the biocultural model of Bates (Bates et al., 1993). The present study expands the current evidence of the use of the PBPI with Spanish native speakers and it is the first time that it is used with the fibromyalgia population to the best of our knowledge. Future studies will be needed to validate this short version of the PBPI in samples of patients from other cultures and living with other diseases.

Cognitive dysfunction is a common complaint of patients suffering from fibromyalgia that affects their concentration, reducing attention, focus, and mental clarity (Ibraheem et al., 2021). The term coined in fibromyalgia is "fibro fog" and it has been reported in 50–80% of subjects (Torta et al., 2016). In 2017, González-Villar (González-Villar et al., 2017) suggested that an increase in neural noise is also responsible for cognitive dysfunction, and another study confirmed that attentional processing was reduced in patients with fibromyalgia (Samartin-Veiga et al., 2019). Among other reasons, a shorter 12-items version of the PBPI is more suitable for patients suffering from these difficulties.

Many studies consider the belief system of a person living with chronic pain as a determinant factor for coping strategies and the evolution of the treatment (Moretti and Medrano, 2019; La Roche et al., 2017). Valid and reliable scales may be helpful for physicians and researchers to make a better biopsychosocial approach for this population's benefit.

Beliefs and perceptions are cognitive factors that can modify the conceptualization of pain. How individuals perceive and interpret their pain can significantly affect their emotional and physiological responses (Hannibal and Bishop, 2014). Negative cognitive appraisals, such as viewing pain as a threat, can trigger heightened autonomic responses and worsen pain (Hannibal and Bishop, 2014). Moreover, chronic pain often involves dysregulation of the autonomic nervous system (ANS), which controls involuntary bodily functions like heart rate and digestion (Solberg et al., 2009). Cognitive factors, such as stress and anxiety, can influence ANS activity, leading to increased pain sensitivity and other symptoms. Effective emotion regulation can help stabilize ANS responses, reducing the impact of chronic pain (Solberg et al., 2009). In fibromyalgia, modifying beliefs and perceptions through neuroscience education adds effectiveness to rehabilitation programs (Saracoglu et al., 2022). Education in pain neuroscience may decrease the sensitivity of the nervous system and brain activity, changing the evaluative errors of pain and helping emotional regulation (Malfliet et al., 2018). Research has shown that one of the primary roles of emotions is to bring the autonomic processes of our bodies into awareness, providing "somatic markers" that guide our choices and actions (Calsius et al., 2016; Damasio, 1999). It is, therefore, relevant to provide an instrument to assess perceptions and beliefs in fibromyalgia patients.

The resulting 12-items version of the PBPI derived from the current

study can be used in applied research with fibromyalgia patients and probably with people enduring other chronic pain disorders. The internal consistency decreases from the 16 to the 12-item version for the whole test, which is statistically significant. Nonetheless, the resulting alpha of .72 in the 12-item version remains within the generally acceptable standard above .70, which renders the whole scale psychometrically reliable. Without a meaningful loss in reliability, it is worth to use a shorter scale with clinical populations. While holding an acceptable reliability, this 12-items version recovers well the original four-factor structure (permanence, constancy, mystery, and self-blame). This shorter instrument may, in addition, contribute to saving time during both data collection and test evaluation.

This study may have limitations that warrant consideration. Firstly, while the shortened 12-item version of the PBPI demonstrated acceptable internal consistency and a robust four-factor structure, its applicability to populations beyond individuals with fibromyalgia remains untested. Additional validation across other chronic pain conditions is essential to generalize these findings. Moreover, with a more extensive sample a confirmatory factor analyses could have been applied to further evaluate the construct validity of the instrument. Future studies with the shortened 12-item PBPI form could attempt to replicate the four-factor structure of the instrument by means of confirmatory factor analyses. Secondly, the study relied on self-reported measures, which can be subject to biases such as social desirability and recall inaccuracies.

Another limitation is the predominance of female participants (91%), reflecting the higher prevalence of fibromyalgia in women but potentially limiting the scale's applicability to male patients or non-binary individuals. Furthermore, while the condensed version aims to mitigate cognitive fatigue associated with "fibro fog," other external factors affecting concentration were not controlled, which could influence the reliability of responses.

Finally, the study's cross-sectional design precludes evaluation of the scale's predictive validity or sensitivity to changes over time, such as in response to therapeutic interventions. Longitudinal studies are needed to establish the instrument's utility in tracking treatment outcomes. Future research should also explore cross-cultural validation and potential linguistic nuances in translation that may influence the psychometric properties of the PBPI.

5. Conclusions

This research demonstrates that the condensed 12-factor version of the Spanish PBPI is a reliable and valid tool for assessing pain beliefs and perceptions among individuals diagnosed with fibromyalgia. The results show that this shortened inventory retains strong internal consistency, with a Cronbach's Alpha coefficient of .72, indicating its robustness in capturing the diverse facets of pain beliefs and perceptions in this population.

The abbreviated Spanish PBPI serves as a valuable instrument for exploring pain beliefs and perceptions, providing an essential resource for enhancing the management and treatment of fibromyalgia. Future research should continue to evaluate its applicability across different cultural contexts and its potential to predict treatment outcomes.

6. Relevance for practice

The utility of the streamlined PBPI is significant for both clinical and research settings. It offers a practical and efficient means for healthcare professionals to understand the complex biopsychosocial dimensions of pain in fibromyalgia patients, which can facilitate more targeted and effective interventions. Additionally, researchers can employ this condensed tool to investigate the psychological and social factors associated with chronic pain, thereby contributing to a broader understanding of fibromyalgia.

CRediT authorship contribution statement

Sílvia Solé: Writing – review & editing, Writing – original draft, Visualization, Data curation, Conceptualization. **Mayte Serrat:** Writing – original draft, Supervision, Resources, Investigation, Data curation. **David Martínez-Rubio:** Writing – review & editing, Writing – original draft, Visualization, Conceptualization. **Oriol Martínez-Navarro:** Writing – review & editing, Writing – original draft, Visualization, Resources, Methodology, Data curation. **Andrea Fuente-Vidal:** Writing – review & editing, Writing – original draft, Investigation. **Cristina Bravo:** Writing – review & editing, Writing – original draft, Resources, Investigation. **Leire Ambrosio:** Writing – review & editing, Writing – original draft, Supervision, Methodology. **Angel Blanch:** Writing – review & editing, Writing – original draft, Visualization, Supervision, Methodology, Data curation, Conceptualization.

Informed consent

An informed consent was obtained from the participants.

Key points

- Instruments like the Pain Beliefs and Perceptions Inventory (PBPI) are essential for assessing pain experiences and associated psychosocial factors, influencing patients' coping strategies and treatment outcomes.
- The condensed 12-factor inventory demonstrated promising internal consistency with a Cronbach's Alpha coefficient of .72. This suggests that the abbreviated PBPI maintains its integrity in capturing diverse facets of pain beliefs and perceptions among fibromyalgia patients.
- The findings highlight the utility of the shortened Spanish PBPI questionnaire in assessing the multifaceted landscape of pain beliefs among individuals with fibromyalgia. This streamlined version offers a practical and efficient tool for clinicians and researchers to understand and manage pain beliefs in this population.

Ethical approval

The study complied with ethical standards. The ethical committee IDIAP Jordi Gol (P18/221) approved the study.

Data availability statement

The data supporting this study's findings are available from the corresponding author upon reasonable request.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ssmmh.2025.100404.

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