Factors that influence coping with chronic non-cancer pain in European countries. A systematic review of measuring instruments

Running Head: Assessment of coping with chronic non-cancer pain

Rocío Cáceres-Matos, PhD student[1]
Eugenia Gil-García, PhD (corresponding author)[1]
Andrés Cabrera-León, PhD[2]
Ana María Porcel-Gálvez, PhD[1]
Sergio Barrientos-Trigo, PhD[1]

1. Department of Nursing, University of Seville, Spain
2. Andalusian School of Public Health (Escuela Andaluza de Salud Pública), Spain

Correspondence author: Eugenia Gil-García
Address: C/ Avenzoar 6, 41009, Seville, Spain
Tel.: +34 954 555 953
E-mail: egil@us.es

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Introduction

Chronic pain is characterized as a personal, sensory, and emotional experience, composed of biological, psychological, and socio-cultural processes of more than three months' duration (International Association for the Study of Pain, 1986). When chronic pain is not associated with an oncologic condition, it is referred to as Chronic Non-Cancer Pain or CNCP (Cunha et al., 2016). Chronic pain is a health condition affecting 1.5 billion people worldwide (Global Industry Analysts, 2011). The estimated prevalence of chronic pain in Europe is 19% of the population (Bushnell et al., 2013). Spain has the lowest prevalence of CNCP, at 17% (Fricker, 2010; Cabrera-León, Rueda & Cantero-Braojos, 2017). The cost of chronic pain in Europe exceeds 300 trillion euros, about 1.5-3% of the Gross Domestic Product (Torralba, Miquel & Darba, 2014).

Individuals with CNCP generate adaptive and coping responses different from those of individuals with neurodegenerative diseases or oncological conditions. In these cases, coping is determined by expectations for prognosis, aggressiveness of treatment, and level of dependence (Ferrer-Peña, Gil-Martinez & Pardo-Montero, 2016).

Coping is defined as the cognitive and behavioral efforts that individuals make in situations they consider to be stressful (Lazarus & Folkman, 1984). Due to its complexity and subjectivity, coping requires an integrative understanding of the resources influencing it (Carvajal, Centeno, Watson, Martínez & San-Rubiales, 2011; Ferrer-Peña et al., 2016). Coping is influenced by biological, psychological, and socio-cultural resources that individuals learn and develop throughout their lives. Research shows that different resources can hinder and/or improve coping. High levels of pain intensity, disability (Ferrer-Peña et al., 2016), stress (Catalano et al., 2011), anxiety/depression (Bushnell et al., 2013), and pain catastrophizing (Tsang et al., 2008) act as resources that hinder adaptation to pain. In contrast, resilience (Catalano et al.,

2011), self-esteem (Hegarty, 2014), high levels of perceived quality of life (Von Korff, 2011), and social support act as resources that favor coping with CNCP (Cabrera-Leon & Cantero-Braojos, 2017; De Sola, Salazar, Dueñas, Ojeda & Failde, 2016; Norrefalk, 2011).

Due to the high prevalence of chronic pain, the limitations that chronic pain creates for people who suffer from it, and the high healthcare costs it causes (Registered Nurses' Association of Ontario, 2013), many authors and organizations call for a change of perspective and approach (Breivik et al., 2013; Wranker et al., 2014). Thus, the Pain Proposal initiative, endorsed by the European Pain Federation (EFIC), proposed that the assessment be carried out in a comprehensive manner (Torralba, Miquel & Darba, 2014). A few years later, the Registered Nurses' Association of Ontario stressed the importance for healthcare professionals to be aware of the tools available to assess resources that influence coping (Registered Nurses' Association of Ontario, 2013).

For all of these reasons, the two principal aims of this systematic review were to: (a) identify instruments, developed and tested in Europe, that measure coping with CNCP; and (b) assess the reported psychometric properties of the instruments identified.

The literature search attempted to answer the following two research questions: (a) What are the instruments, developed and tested in Europe, that measure coping with CNCP in non-hospitalized adults?; and (b) what are the quality criteria of the instruments assessed on the basis of their psychometric properties?

Methods

Design

The systematic review was conducted in accordance with the PRISMA guidelines (Urrutia & Bonfill, 2010) and the Joanna Briggs Institute methodological framework (Aromataris & Munn, 2017). The review protocol was registered in PROSPERO under the registration number CRD42017059693, available at: http://www.crd.york.ac.uk/PROSPERO/display_record.php?ID=CRD42017059693

Literature search strategy

The literature search was carried out in four international databases (the Web of Science, CINAHL, PubMed, and Scopus) between January and February 2017. Two reviewers conducted the search independently and discussed their results with a third reviewer. All studies, regardless of the year of publication, were considered in the search.

Table 1 shows the terms used.

[Table 1]

Study selection. Eligibility criteria

The studies that met the following inclusion criteria were considered to be eligible for the review: (a) psychometric studies of some of the biological, psychological, and/or socio-cultural resources that influence coping; (b) in adults with CNCP; (c) who are not hospitalized; and (d) developed and tested in a European setting.

The exclusion criteria were the following: (a) validated studies in adult patients with CNCP with co-occurring neurodegenerative diseases; (b) chronic infectious diseases, or (c) cognitive impairment.

The titles and abstracts of all of the identified studies were reviewed. Duplicate citations, articles that did not meet each of the inclusion criteria, as well as articles the full texts of which were not available to the authors were eliminated. The full-text articles were then read and, finally, the studies that met all the inclusion criteria and that had been published in a European context were included.

Any discrepancies among the reviewers were resolved by team consensus.

Data collection

A double-entry table was designed with the following sections: instrument name, version and year, sample, content, criterion validity, reliability, construct validity. Two reviewers conducted the data collection independently and discussed their results with a third reviewer.

Assessment of psychometric properties

The psychometric properties of the validation studies included were analyzed using the COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN) checklist. Each of the included studies was assessed for internal consistency, reliability, measurement error, validity, and responsiveness (Terwee, 2011):

Internal consistency is defined as the degree of interrelation between items; reliability is understood as the proportion of total variance in measurements that is between patients; and measurement error is the systematic and random error of patient scores.

To measure validity, we took into account content validity, construct validity, and criterion validity. Content validity is the degree to which an instrument reflects the

theoretical construct that it is supposed to measure; construct validity measures the characteristic to be assessed, and criterion validity measures the degree to which the scores of an instrument reflect the "gold standard."

Finally, responsiveness, which is defined as the ability of an instrument to detect changes over time in the construct to be measured, was also assessed.

A standard template was drawn up to collect the scores obtained by the instruments for each of the psychometric properties analyzed.

Each psychometric property was assigned the lowest score attained: "Excellent" (+++), "Good" (++), "Fair" (+), or "Poor" (0) (Mokkink et al., 2012). This process was independently carried out by two reviewers, who discussed their results with a third reviewer.

Risk of bias

In systematic reviews, it is necessary to analyze risk of bias due to the heterogeneous results obtained on some occasions (Whiting, Rutjes, Reitsma, Bossuyt & Kleijnen, 2003). The QUADAS-2 tool assesses both risk of bias and applicability: (a) systematic flaws or limitations in the design or conduct of a study which distort the results; and (b) the extent to which primary studies are applicable to the research question of the review (Whiting et al., 2011).

This tool analyzes four domains (Ciapponi, 2015):

1. Definition of the review question: evaluation of the authors' descriptions of the diagnostic test, the reference test, and the illness or situation under study.

2. Tailoring of the tool: evaluation of the instrument's adaptation to the study that is being carried out.

3. Revision of the flow diagram published for the primary study: revision of the flow diagram of each primary study to determine the method used for including patients.

4. Judgment of bias and applicability of the first three domains: assessing the risk of bias and applicability of the study by addressing four areas: patient selection, interpretation of the test under study, use of gold standard, and patient flow and timing.

Each study is assigned the lowest score obtained for each domain ("low," "high" and "unclear"). If a study is judged as "low" on all domains relating to bias or applicability, the overall study is considered to have a "low risk of bias." If judgments are "high" or "unclear," the study is considered to be "at risk of bias" or as having "concerns regarding applicability," respectively.

Risk of bias was assessed by two reviewers independently.

Results

Study selection

Titles and abstracts from 9,850 studies were reviewed and duplicate citations and studies that met the exclusion criteria were eliminated. One-hundred-and-six full-text articles were read, which eventually resulted in 36 studies involving 24 different instruments that assessed coping mechanisms. The selection process is shown in figure 1.

[Figure 1]

Study characteristics

Two studies were published in the 1990s. The number of studies published per year has been increasing since the beginning of the 2000s until present, with 2004 and 2016 being the years of highest scientific output.

The studies reviewed addressed pain intensity, anxiety, resilience, fear-avoidance, catastrophizing, self-esteem, disability, or dependence. The Fear-Avoidance Beliefs Questionnaire (FABQ), the Roland Morris Disability Questionnaire (RMDQ), and the Quebec Back Pain Disability Scale (QBPDS) are the instruments for which the highest quantity of translations into other languages have been validated. Spain, Germany, the United Kingdom, and France have the highest number of psychometric studies published.

Table 2 presents the main characteristics of the studies included.

[Table 2]

Assessment of psychometric properties

Table 3 shows the results obtained by applying the COSMIN checklist to the included studies. Reliability, validity, and responsiveness have been analyzed.

[Table 3]

Reliability

The reliability analysis assessed internal consistency and inter-rater reliability. Internal consistency was assessed in 32 studies (89%). All of them used the overall Cronbach's alpha coefficient of the instrument, and 10 of them (28%) also showed the value for each subscale, which had to be greater than 0.70. The assessment conducted with the COSMIN checklist showed that 19 studies (59%) had "good" or "excellent" scores in terms of internal consistency. The rest of studies scored low, either because they did not calculate internal consistency for each subscale or because the sample size was too small.

Inter-rater reliability was assessed in 21 studies (58%) by calculating the Intraclass Correlation Coefficient. Eleven of them (52%) scored "excellent" or "good." Measurement error was assessed in 36 studies, of which 13 (36%) showed "excellent" or "good" scores.

The instruments which showed the best reliability scores were the Spanish versions of the Graded Chronic Pain Scale (GCPS) (Ferrer-Peña, 2016), the Pain Catastrophizing Scale (PCS) (García-Campayo, 2007), the Pain Self-Perceptions Scale (PSPS-Spanish) (García-Campayo, 2010), and the Roland-Morris Questionnaire (RMQ) (Kovacs, 2002); the Swiss and Italian validations of the Fear-Avoidance Beliefs Questionnaire (FABQ) (Staerkle, 2004; Pruneti, 2014); and the Avoidance-Endurance Questionnaire (AEQ) (Hasenbring, 2009), the Pain Beliefs and Perceptions Inventory (PBPI) (Azevedo, 2016), and the Pain Disability Index (PDI) (Soer, 2013) validated in Germany, Portugal, and the Netherlands, respectively.

Validity

Among the properties related to validity, no studies included the hypothesis test. Content validity was analyzed in two studies (6%), one of which scored "good." In contrast, measurement error and construct validity were assessed in all of the studies, with 13 (36%) scoring "good" or "excellent" for measurement error and 26 (72%) for construct validity. Construct validity was assessed in 29 (81%) studies. In 10 of them (28%), construct validity was assessed using Exploratory Factor Analysis (EFA), while in 19 of them (53%) it was assessed using Confirmatory and Exploratory Factor Analysis. Cross-cultural validity was assessed in 26 of the studies (72%), with 8 (31%) scoring "good" or "excellent." Criterion validity was assessed in 21 studies (58.3%). In 8 of them (22.2%) "excellent" or "good" scores were obtained.

The instruments which showed the best validity scores were the Spanish versions of the Graded Chronic Pain Scale (GCPS) (Ferrer-Peña, 2016), the Pain Self-Perception Scale (PSPS-Spanish) (García-Campayo, 2010), and the Roland-Morris Disability Questionnaire (RMDQ) (Kovacs, 2002); the Pain Catastrophizing Scale (PCS) (Meyer, 2007) and the Psychological Inflexibility Pain Scale (PIPS) (Wicksell, 2007) validated in Switzerland; the German versions of the Avoidance-Endurance Questionnaire (AEQ) (Hasenbring, 2009) and the Quebec Back Pain Disability Scale (QBPDS) (Riecke, 2016); and the Fear-Avoidance Beliefs Questionnaire (FABQ) (Grotle, 2006) and the Pain Beliefs and Perceptions Inventory (PBPI) (Azevedo, 2016) validated in Norway and Portugal, respectively.

Responsiveness

Responsiveness was analyzed in 19 studies (53%), with 11 of them (58%) scoring "good" or "excellent."

The instruments which showed the best responsiveness scores were the Spanish versions of the Activity Patterns Scale (APS) (Esteve, 2016), the Graded Chronic Pain Scale (GCPS) (Ferrer-Peña, 2016), the Pain Catastrophizing Scale (PCS) (García-Campayo, 2008), and the Resilience Scale (RS-18) (Ruíz-Párraga, 2010); the Fear-Avoidance Beliefs Questionnaire (FABQ) (Chaory, 2004; Staerkle, 2004; Grotle, 2006) validated in France, Switzerland, and Norway; the Swiss versions of the Oswestry Disability Index (ODI) (Mannion, 2006) and the Pain Catastrophizing Scale (PCS) (Meyer, 2007); and the French validation of the Roland-Morris Questionnaire (RMQ) (Zerzack, 2008).

Risk of bias

Ten studies (28%) have been found to have "high risk of bias" scores, 6 studies (16%) have been found to have "unclear risk of bias" scores, and 20 studies (56%) have been found to have "low risk of bias" scores. Table 4 shows the scores obtained by each study.

[Table 4]

Discussion

The present systematic review identified 36 studies which, altogether, assess the different versions of 24 instruments related to coping with CNCP and developed and tested in Europe. To this date, this is the first systematic review that analyzes both the instruments in this field and the quality of their psychometric properties using the COSMIN checklist.

Most of the studies assess pain intensity, anxiety, resilience, fear-avoidance, catastrophizing, self-esteem, disability, and dependence. However, no instrument was found that assesses other key resources such as stress, a factor that various authors consider to be closely related to pain (Tsang et al., 2008; Lumley et al., 2011), or social and family support, which improves the level of satisfaction in 73.2% of individuals with CNCP (Amaya-Ropero & Carrillo-González, 2015). In addition, no instrument was found that assesses resources related to self-care such as adherence to treatment, despite the fact that almost 80% of this population take medication regularly (Breivik, Eisenberg, & O´Brien, 2013).

With regard to validation on a country-by-country basis, Spain is the country with the highest number of instruments (30%) but the lowest prevalence of CNCP (17%) (Cabrera-León & Cantero-Braojos, 2017). Norway, Poland, and Italy, with the highest prevalence of CNCP in Europe (Fricker, 2010), have the fewest instruments assessed.

In relation to psychometric properties, most research has shown good or excellent levels of the properties assessed in the studies (Mokkink et al., 2012). However, some properties such as hypothesis testing have only been assessed in two studies. The instrument with the most psychometric properties described and the highest methodological quality was the Graded Chronic Pain Scale (GCPS) (Ferrer-Peña, 2016), followed by the Pain Beliefs and Perceptions Inventory (PBPI) (Azevedo et al., 2016) and the Avoidance-Endurance Questionnaire (AEQ) (Hasenbring, Hallner & Rusu, 2009).

With regard to the risk of bias, most of the studies (84%) had an "unclear risk of bias" or a "high risk of bias" as measured with QUADAS-2. Most of the studies which presented a high risk of bias did so due to sample attrition and failure to administer both the reference standard and the index test to patients at the same time. In addition, the authors of some of the studies do not correctly specify the reference standard or its threshold value.

Similar studies that have used this tool recognize that it sometimes overestimates the risk of bias, especially with respect to flow and timing, since it is difficult to avoid sample losses, and also regarding the reference standard, because both the index test and the reference standard are often conducted at the same time (Ciapponi, 2015; Higgins & Green, 2011).

After applying the COSMIN checklist and the QUADAS-2 tool, the instruments with the highest quality were the Portuguese version of the Pain Beliefs and Perceptions Inventory (PBPI) (Azevedo et al., 2016), which assesses catastrophizing, and the Spanish version of the Roland-Morris Questionnaire (RMQ) (Kovacs et al., 2002), which assesses disability. Although the authors stress the importance of having measuring instruments to assess coping with CNCP in a comprehensive manner

(Carvajal et al., 2011; Ferrer-Peña et al., 2016), no instrument was found that assesses all three resources (i.e., biological, psychological, and sociocultural), as proposed by Lazarus & Folkman (1984). As a future line of research, it would be necessary to create an instrument that brings together all the resources that influence coping with CNCP. This instrument would facilitate a comprehensive approach to coping, thus improving feasibility and usability in the measurement of this construct (Norrefalk, 2011).

The main limitation of this review is the well-known publication bias, since selecting as inclusion criteria the articles available in full text or published in Spanish or English may lead to the exclusion of relevant research (Argimón-Pallás & Jiménez-Villa, 2012).

Conclusions

Despite the importance of CNCP and the recommendations made by international organizations, this is the first systematic review in the literature that has been conducted on the quality of the psychometric properties of instruments measuring pain management in European countries.

Although there are two instruments that have been shown to have the best methodological quality and bias control, i.e. the Portuguese version of the Pain Beliefs and Perceptions Inventory (PBPI), which assesses catastrophizing, and the Spanish version of the Roland-Morris Questionnaire (RMQ), which assesses disability, there are important gaps in the measurement of different aspects of pain coping, such as stress, social and family support, or self-care. In addition, the present systematic review suggests the need to develop instruments that comprehensively assess the resources that influence coping with CNCP.

Clinical implications

For a proper assessment of pain coping, nursing professionals must take into account the intensity of pain perceived, the psychological resources, and the social and family support available to the individual. In this respect, the present systematic review provides knowledge on the quality of the instruments that measure these resources in European countries and suggests future lines of research that may be developed in other countries and/or continents. In addition, this systematic review highlights the scarcity of specific instruments to measure and assess aspects such as self-care capacity, stress, and social and family support.

This systematic review may be the first step in the construction of an instrument that measures coping comprehensively and which may be subsequently validated in different settings and countries. This would help to better understand the consequences of pain and guide self-care strategies that take into account the family and social resources available to the individual and thereby mitigate the effects of pain on patients and their families.

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Author contributions: RCM designed the research methodology, carried out the database search and data extraction, selected the eligible studies, and drafted the first version of the manuscript. EGG devised the main idea of the systematic review, designed the research methodology, and verified the methodological quality of the documents included, performed the database search, and reviewed the final manuscript. ACL and AMPG both participated in the methodological design of the systematic

review and in the review of the final manuscript. SBT designed the systematic review methodology, carried out the database search and data extraction, and drafted the first version of the manuscript. The manuscript has been translated from Spanish into English by a professional translator and revised by a native English speaker.

Figure 1. Flow diagram

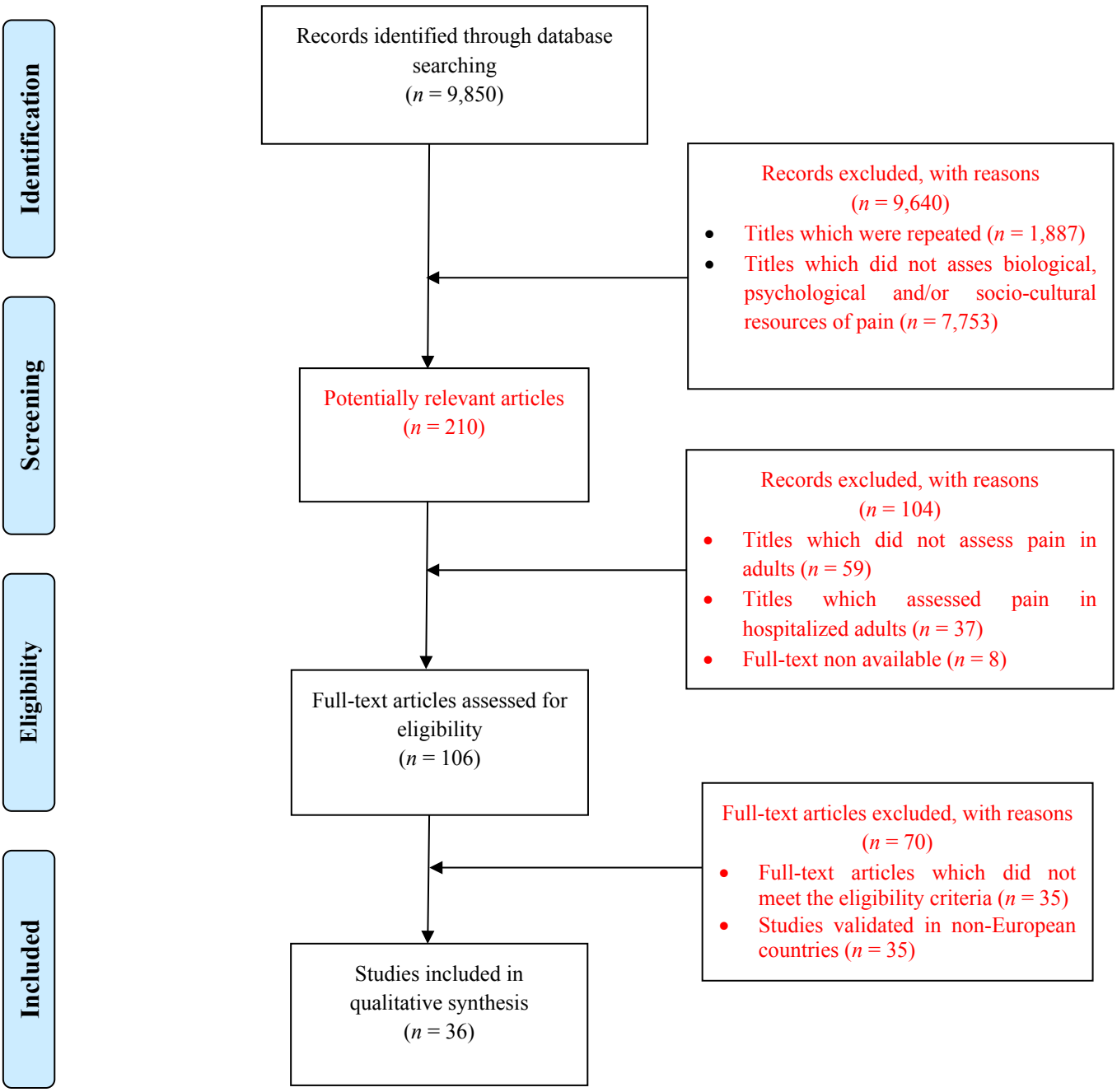

Table 1.
Search strategy terms.

Type of study	Health condition	Factors that influence coping with chronic non-cancer pain	
Validation studies	Chronic pain	Stress, psychological	Dependence
Validation scales	Persistent pain	Perceived stress	Social support
Instrument validation	Long-term pain	Anxiety	Social networks
		Depression	Social relationships
		Resilience	Family
		Psychological, flexibility	Friends
		Catastrophizing	Quality of life
		Fear-avoidance	Well-being
		Pain beliefs	Health-related quality of life
		Pain perceptions	Interference
		Pain measurement	Self-concept
		Pain assessment	Self-worth
		Disability	Self-perception
		Handicap	Self-esteem
			Self-care

Table 2.
Descriptive analysis of the instruments

INSTRUMENT / FIRST AUTHOR (YEAR) / VERSION	SAMPLE / COUNTRY	CONTENT VALIDITY	CONSTRUCT VALIDITY	RELIABILITY	CRITERION VALIDITY	INTERNAL CONSISTENCY	TOPIC
Avoidance-Endurance Questionnaire (AEQ) Hasenbring (2009) German version	*n* = 191 patients with chronic low back pain (86 men and 105 women) Germany	60 items 4 factors	KMO: 0.86 EFA/CFA: 4 factors account for 62.6% of the variance	-	-	-	b
Activity Patterns Scale (APS) Esteve (2016) Spanish version	*n* = 74 patients with chronic pain (29 men and 45 women) Spain	21 items 6-point Likert scale 8 factors	EFA: 8 factors	ICC = 0.81 *n* = 18 patients 1-5 days	-	α = 0.85-0.91 Pain avoidance: α = 0.80 Pacing to increase activity: α = 0.76 Pacing to reduce pain: α = 0.76	c
Avoidance-Endurance Questionnaire (AEQ) Ruiz-Párraga (2015) Spanish version	*n* = 150 patients with chronic back and neck pain (57 men and 93 women) Spain	60 items 4 factors	KMO: 0.60 Bartlett's sphericity test: $p < 0.001$ EFA/CFA: 4 factors account for 58.54% of the variance	-	PPDS: *r* = 0.26/0.55 IPS: *r* = -0.30 HS: *r* = -0.13 FAR: *r* = 0.25/0.58 ER: *r* = -0.25/-0.38	α = 0.73	b
Connor-Davidson Resilience Scale (CD-RISC) Notario-Pacheco (2014) Spanish version	*n* = 208 patients with fibromyalgia (9 men and 199 women) Spain	10 items 5-point Likert scale 1 factor	KMO: 0.91 EFA/CFA: 1 factor accounts for 50.4% of the variance	ICC = 0.87 *n* = 191 patients 48 days	HADS-d: *r* = -0.57 HADS-a: *r* = 0.62 CPAQ: *r* = 0.44	α = 0.88	b
Chronic Pain Grade Questionnaire (CPG) Klasen (2004) German version	*n* = 130 patients with back pain (50 men and 80 women) Germany	13 items 7-point Likert scale 2 factors	EFA/CFA: 2 factors account for 62.7% of the variance	-	RMQ: *r* = -0.01 VAS: *r* = 0.21	α = 0.88	a

Graded Chronic Pain Scale (CPGS) Ferrer-Peña (2016) Spanish version	*n* = 75 patients with lower back pain (20 men and 55 women) Spain	8 items 11-point numerical scale 2 factors	KMO: 0.82 EFA/CFA: 2 factors account for 72.37% of the variance	ICC = 0.81 *n* = 46 patients 10 days	RMQD: *r* = 0.509 FABQ: *r* = 0.495 PCS: *r* = 0.543 TSK-11: *r* = 0.309	α = 0.87	a
Chronic Pain Self-Efficacy Scale (FC-CPSES) Lacasse (2015) French version	*n* = 143 patients with fibromyalgia and low back pain France	33 items 7-point Likert scale 10 factors	EFA: 10 factors	ICC = 0.70-0.90 *n* = 143	-	α = 0.93 Exercise regularly: α = 0.88 Communicate: α = 0.92 Do chores: α = 0.88 Control depression: α = 0.96	b
Fear-Avoidance Beliefs Questionnaire (FABQ) Waddell (1993) British version	*n* = 184 patients with low back pain (102 men and 82 women) United Kingdom	16 items 7-point Likert scale 2 factors	EFA/CFA: 2 factors account for 49% of the variance	ICC = 0.88-0.95 *n* = 26 patients 2 days	-	α = 0.88 Fear-avoidance beliefs: α = 0.88 Fear-avoidance beliefs: α = 0.77	b
Fear Avoidance Belief Questionnaire (FABQ) Chaory (2004) French version	*n* = 174 patients with chronic low back pain (113 men and 142 women) France	15 items 7 -point Likert scale 3 factors	EFA/CFA: 3 factors account for 68.5% of the variance	ICC = 0.72-0.88 *n* = 31 patients 14 hours	-	-	b
Fear-Avoidance Beliefs Questionnaire (FABQ) Staerkle (2004) Swiss version	*n* = 255 patients with low back pain (113 men and 142 women) Switzerland	16 items 7-point Likert scale 2 factors	EFA/CFA: 2 factors account for 57.68% of the variance	ICC = 0.88-0.95 *n* = 30 patients 2 days	-	α = 0.89-0.91	b
Fear-Avoidance Beliefs Questionnaire (FABQ) Grotle (2006) Norwegian version	*n* = 50 patients with chronic low back pain (19 men and 31 women) Norway	15 items 7-point Likert scale 3 factors	EFA/CFA: 3 factors account for 69% of the variance	ICC = 0.82 *n* = 28 patients 2 days	-	α = 0.90	b
Fear-avoidance beliefs questionnaire (FABQ) Pruneti (2014) Italian version	*n* = 250 patients with chronic back pain (130 men and 120 women) Italy	15 items 7-point Likert scale 4 factors	EFA/CFA: 4 factors account for 74.6% of the variance	ICC = 0.883 *n* = 30 patients 90 days	RMQD: *r* = 0.414 VAS: *r* = 0.335 TSK-11: *r* = 0.440	α = 0.885	b

Fear-Avoidance Model Measures (FAM) George (2010) British version	*n* = 53 patients with chronic low back pain (10 men and 43 women) United Kingdom	16 items	-	ICC = 0.90-0.96 *n* = 53 patients 48 hours	-	-	b
Lattinen Index (LI) González-Escalada (2012) Spanish version	*n* = 283 patients with chronic pain Spain	5 items 5-point Likert scale 5 factors	EFA: 5 factors	ICC = 0.95 *n* = 83 patients 15 days	VAS: *r* = 0.66738	α = 0.88 Pain intensity: α = 0.71 Pain frequency: α = 0.80 Functional ability: α = 0.80 Hours of sleep: α = 0.87	a
Short-Form McGill Pain Questionnaire (MPQ) Georgoudis (2000) Greek version	*n* = 60 patients with chronic pain (23 men and 37 women) Greece	15 items 4-point Likert scale 2 factors	EFA: 2 factors	-	RMQ: *r* = -0.01 VAS: *r* = 0.21	α = 0.71	a
Oswestry Disability Index (ODI) Mannion (2006) Swiss version	*n* = 100 patients with chronic low back pain Switzerland	10 items 6-point Likert scale	-	ICC = 0.96 *n* = 39 patients 14 days	RMDQ: *r* = 0.72	α = 0.90	c
Pain Anxiety Symptoms Scale (PASS-20) McCracken (2002) British version	*n* = 282 patients with chronic pain United Kingdom	10 items 4-point Likert scale 4 factors	EFA/CFA: 4 factors account for 75% of the variance	-	-	α = 0.91 Avoidance: α = 0.75 Fear: α = 0.82 Cognitive: α = 0.86	b
Pain Anxiety Symptoms Scale (PASS) Roelofs (2004) Dutch version	Maastricht University Hospital *n* = 910 patients with fibromyalgia The Netherlands	40 items 4-point Likert scale 4 factors	EFA: 4 factors	-	Cognitive-20: *r* = 0.85 Fear-20: *r* = 0.87 Physiology-20: *r* =0.80	α = 0.94 Cognitive anxiety: α = 0.84 Fear: α = 0.84 Escape/avoidance: α = 0.73 Physiology: α = 0.74	b
Pain Beliefs and Perceptions Inventory (PBPI) Azevedo (2016) Portuguese version	*n* = 122 patients with chronic pain Portugal	16 items 4-point Likert scale	Bartlett's sphericity test: $p < 0.001$ EFA/CFA: 4 factors account for 63% of the variance	ICC = 0.801 *n* = 122 patients 7 days	-	α = 0.620	b

Pain Belief Screening Instrument (PBSI) Sandborgh (2008) Swedish version	*n* = 168 patients with chronic musculoskeletal pain (72 men and 211 women) Sweden	7 items 11-point numerical scale	-	-	-	α = 0.80-0.85	b
Pain Catastrophizing Scale (PCS) Meyer (2007) Swiss version	*n* = 111 patients with chronic low back pain (36 men and 75 women) Switzerland	13 items 5-point Likert scale 3 factors	EFA/CFA: 3 factors account for 69.6% of the variance	ICC = 0.75 *n* = 100 patients 7 days	-	α = 0.92 Helplessness: α = 0.89 Magnification: α = 0.67 Rumiation: α =0.88	b
Pain Catastrophizing Scale (PCS) García-Campayo (2008) Spanish version	*n* = 230 patients with fibromyalgia (35 men and 195 women) Spain	13 items 5-point Likert scale 3 factors	EFA/CFA: 3 factors account for 60% of the variance	ICC = 0.89 *n* = 64 patients 7 days	-	α = 0.79	b
Pain Catastrophizing Scale (PCS) Fernandes (2012) Norwegian version	*n* = 122 patients with chronic low back pain (38 men and 52 women) Norway	13 items 5-point Likert scale 3 factors	EFA/CFA: 3 factors account for 64.5% of the variance	ICC = 0.74-0.87 *n* = 61 patients 7 days	FABQ-PA: *r* = 0.34 FABQ-W: *r* = 0.25 RMDQ: *r* = 0.27	-	b
Pain Disability Index (PDI) Soer (2013) Dutch version	*n* = 968 patients with chronic pain (571 men and 397 women) The Netherlands	7 items 11-point numerical scale 7 factors	EFA: 7 factors	ICC = 0.76 *n* = 50 patients 14 days	-	α = 0.65-0.89 Fact 1: α = 0.89 Fact 2: α = 0.65	c
Pain Interference Index (PII) Kemani (2016) Swedish version	Karolinski Hospital *n* = 239 patients with non-specific chronic pain (34 men and 205 women) Sweden	6 items 3 factors	KMO: 0.826 EFA/CFA: 3 factors account for 57.2% of the variance	-	SF12-P: *r* = -0.571 HADS-d: *r* = 0.549	α = 0.85	b
Psychological Inflexibility Pain Scale (PIPS) Wicksell (2007) Swedish version	*n* = 203 patients with low back pain (37 men and 164 women) Sweden	16 items 7-point Likert scale 2 factors	KMO: 0.87 EFA/CFA: 2 factors account for 51.7% of the variance	-	-	α = 0.89 Avoidance: α = 0.90 Cognitive function: α = 0.75	b

Pain Self-Perception Scale (PSPS-Spanish) García-Campayo (2010) Spanish version	Miguel Servet Hospital *n* = 250 patients with fibromyalgia (21 men and 221 women) Spain	24 items 5-point Likert scale	KMO: 0.81 Bartlett's sphericity test: $p <$ 0.001	ICC = 0.78 *n* = 75 patients 14 days	HADS-a: *r* = 0.57 VAS: *r* = 0.42 FIQ: *r* = 0.41 PC: *r* = 0.40	α = 0.87-0.93	b
Quebec Back Pain Disability Scale (QBPDS) Shoppink (1996) Dutch version	University of Limburg *n* = 120 patients with chronic pain The Netherlands	20 items 6-point Likert scale 2 factors	EFA: 2 factors account for 81% of the variance	ICC = 0.90 *n* = 120 patients 7-30 days	-	α = 0.95	c
Quebec Back Pain Disability Scale (QBPDS) Yvanes-Thomas (2002) French version	*n* = 32 patients with chronic low back pain France	20 items 6-point Likert scale	-	-	VAS: *r* = 0.448 HADS: *r* = 0.43	-	c
Quebec Back Pain Disability Scale (QBPDS) Riecke (2016) German version	*n* = 180 patients with chronic low back pain (40 men and 140 women) Germany	20 items 6-point Likert scale 4 domains	KMO: 0.92 Bartlett's sphericity test: $p <$ 0.001 EFA: 4 domains account for 57.43% of the variance	-	PDI: *r* = 0.78 RMD: *r* = 0.54 NRS: *r* = 0.46 TSK: *r* = 0.22 PCS: *r* = 0.37	α = 0.94	c
Roland-Morris Disability Questionnaire (RMDQ) Buchanan (2007) German version	*n* = 42 patients with chronic mechanical low back pain (16 men and 42 women) Germany	24 items 9 domains	EFA: 9 domains account for 59% of the variance	-	-	α = 0.92	c
Roland-Morris Questionnaire (RMQ) Kovacs (2002) Spanish version	*n* = 145 patients with chronic low back pain (72 men and 73 women) Spain	24 items	-	ICC = 0.874 *n* = 50 patients 14 days	-	α = 0.8375	c

Roland-Morris Questionnaire (RMQ) Zerzak (2008) French version	*n* = 58 patients with chronic low back pain (38 men and 20 women) France	24 items	-	ICC = 0.89 *n* = 58 patients 2 days	DPQ: *r* = 0.514 QBPDS: *r* = 0.713	α = 0.84	c
Resilience Scale (RS-18) Ruiz-Párraga (2010) Spanish version	*n* = 300 patients with chronic musculoskeletal pain Spain	18 items	KMO: 0.93 Bartlett's sphericity test: $p < 0.001$ EFA: 2 factors account for 52.43% of the variance	*n* = 102 patients 180 days	-	α = 0.92	b
Tampa Scale for Kinesiophobia (TSK) Gómez-Pérez (2011) Spanish version	*n* = 125 patients with chronic pain (29 men and 45 women) Spain	11 items 2 factors	EFA: 2 factors	-	-	α = 0.79	c
WHOQOL-pain Mason (2009) British version	*n* = 133 patients with chronic low back pain (47 men and 86 women) United Kingdom	100 items 5-point Likert scale 4 domains	-	-	-	α = 0.88 Facets: Anger and frustration: α = 0.81 Uncertainty: α = 0.79 Pain relief: α = 0.66	b

Topics: a = Biological resources. b = Psychological resources. c = Socio-cultural resources. α = Cronbach's alpha coefficient. KMO = Kaiser-Meyer-Olkin. EFA = Exploratory Factor Analysis. CFA = Confirmatory Factor Analysis. ICC = Intraclass Correlation Coefficient. FABQ-PA = Fear-Avoidance Beliefs Questionnaire - Psychological Assessment. FABQ-W = Fear-Avoidance Beliefs Questionnaire - Work. HADS = Hospital Anxiety and Depression Scale. HADS-d = Hospital Anxiety and Depression Scale - Depression. HADS-a = Hospital Anxiety and Depression Scale - Anxiety. NRS = Numerical Rating Scale. VAS = Visual Analogue Scale. FIQ = Fibromyalgia Impact Questionnaire. PC = Pain Catastrophizing. SF12-P = Medical Outcome Study Short Form 12 Health Survey - Psychological. PPDS = Pain Persistence and Distraction. IPS = Inflexibility Pain Scale. HS = Humor Scale. FAR = Fear-Avoidance Responses. ER = Endurance-related responses. DPQ = Dallas Pain Questionnaire.

Table 3.
Scores of the psychometric properties after applying the COSMIN criteria.

AUTHOR (YEAR) / COUNTRY	INSTRUMENTS	IRT or CTT	A	B	C	D	E	F	G	H	I
Hasenbring (2009) / Germany	Avoidance-Endurance Questionnaire (AEQ)	CTT	+++	++	++		+++		+++		
Esteve (2016) / Spain	Activity Patterns Scale (APS)	CTT	+++	0	0		+++				++
Ruiz-Párraga (2015) / Spain	Avoidance-Endurance Questionnaire (AEQ)	CTT	0	0	0		+++		0	++	
Notario-Pacheco (2014) / Spain	Connor-Davidson Resilience Scale (CD-RISC)	CTT	+++	0	0		+++		0	+	+
Klasen (2004) / Germany	Chronic Pain Grade Questionnaire (CPG)	CTT	0	0	0		0		0	+	0
Ferrer-Peña (2016) / Spain	Graded Chronic Pain Scale (CPGS)	CTT	++	+++	++		++		++	++	+++
Lacasse (2015) / France	Chronic Pain Self-Efficacy Scale (FC-CPSES)	CTT	0	0	0		0	0	0		
Waddell (1993) / United Kingdom	Fear-Avoidance Beliefs Questionnaire (FABQ)	CTT	+++	0	0		+++				
Chaory (2004) / France	Fear Avoidance Belief Questionnaire (FABQ)	CTT	0	++	++		++		0		+++
Staerkle (2004) / Switzerland	Fear-Avoidance Beliefs Questionnaire (FABQ)	CTT	++	++	++		+++		0		+++
Grotle (2006) / Norway	Fear-Avoidance Beliefs Questionnaire (FABQ)	CTT	0	0	0		++		++		+++
Pruneti (2014) / Italy	Fear-avoidance beliefs questionnaire (FABQ)	CTT	++	++	++		++		0	+++	
George (2010) / United Kingdom	Fear-Avoidance Model Measures (FAM)	CTT	0	+	+		++				
González-Escalada (2012) / Spain	Lattinen Index (LI)	CTT	0	+	+		0			+	0
Georgoudis (2000) / Greece	Short-Form McGill Pain Questionnaire (MPQ)	CTT	0	0	0		0		0	+	0

Mannion (2006) / Switzerland	Oswestry Disability Index (ODI)	CTT	0	+	+		0	0	+	+++
McCracken (2002) / United Kingdom	Pain Anxiety Symptoms Scale (PASS-20)	CTT	++	0	0		++			0
Roelofs (2004) / The Netherlands	Pain Anxiety Symptoms Scale (PASS)	CTT	0	0	0		+++		0	0
Azevedo (2016) / Portugal	Pain Beliefs and Perceptions Inventory (PBPI)	CTT	+++	++	++		+++	+++		
Sandborgh (2008) / Sweden	Pain Belief Screening Instrument (PBSI)	CTT	++	0	0		++	0		+
Meyer (2007) / Switzerland	Pain Catastrophizing Scale (PCS)	CTT	0	0	0		+++	+++		++
García-Campayo (2008) / Spain	Pain Catastrophizing Scale (PCS)	CTT	+++	++	++		+++	0		+++
Fernandes (2012) / Norway	Pain Catastrophizing Scale (PCS)	CTT	+	++	++		+	0	++	
Soer (2013) / The Netherlands	Pain Disability Index (PDI)	CTT	++	++	++		++	0		+++
Kemani (2016) / Sweden	Pain Interference Index (PII)	CTT	+++	0	0		+++		+++	
Wicksell (2007) / Sweden	Psychological Inflexibility Pain Scale (PIPS)	CTT	+++	0	0	+++	+++			0
García-Campayo (2010) / Spain	Pain Self-Perception Scale (PSPS-Spanish)	CTT	++	++	++	++	++	++	++	
Schoppink (1996) / The Netherlands	Quebec Back Pain Disability Scale (QBPDS)	CTT	0	0	++		++	0		
Yvanes-Thomas (2002) / France	Quebec Back Pain Disability Scale (QBPDS)	CTT	0	0	0		0	0	0	
Riecke (2016) / Germany	Quebec Back Pain Disability Scale (QBPDS)	CTT	++	0	0		++	++	++	
Buchanan (2007) / Germany	Roland Morris Disability Questionnaire (RMDQ)	CTT	0	0	0		0			

Kovacs (2002) / Spain	Roland-Morris Questionnaire (RMQ)	CTT	++	++	++	++	++		
Zerzak (2008) / France	Roland-Morris Questionnaire (RMQ)	CTT	0	0	0	0	0	+++	++
Ruiz-Párraga (2010) / Spain	Resilience Scale (RS-18)	CTT	+++	0	++	+++	0		+++
Gómez-Pérez (2011) / Spain	Tampa Scale for Kinesiophobia (TSK)	CTT	+++	0	0	+++	0		
Mason (2009) / United Kingdom	WHOQOL-pain	CTT	0	0	0	0			

COSMIN psychometric property boxes: A = internal consistency, B = reliability, C = measurement error, D = content validity, E = structural validity, F = hypothesis testing, G = cross-cultural validity, H = criterion validity. 4-point scale rating: +++ = excellent, ++ = good, + = fair, 0 = poor, empty space = COSMIN rating not applicable. IRT = item response theory; CTT = classical test theory.

Table 4.
QUADAS-2 analysis

AUTHOR (YEAR) / COUNTRY	INSTRUMENTS	RISK OF BIAS				APPLICABILITY CONCERNS		
		PATIENT SELECTION	INDEX TEST	REFERENCE STANDARD	FLOW AND TIMING	PATIENT SELECTION	INDEX TEST	REFERENCE STANDARD
Hasenbring (2009) / Germany	Avoidance-Endurance Questionnaire (AEQ)	Low	Low	Low	Low	Low	Low	Low
Esteve (2016) / Spain	Activity Patterns Scale (APS)	?	?	Low	Low	Low	Low	Low
Ruiz-Párraga (2015) / Spain	Avoidance-Endurance Questionnaire (AEQ)	High	High	Low	Low	Low	Low	?
Notario-Pacheco (2014) / Spain	Connor-Davidson Resilience Scale (CD-RISC)	Low	Low	Low	Low	Low	Low	Low
Klasen (2004) / Germany	Chronic Pain Grade Questionnaire (CPG)	High	High	Low	Low	Low	Low	Low
Ferrer-Peña (2016) / Spain	Graded Chronic Pain Scale (CPGS)	High	High	Low	Low	Low	Low	Low
Lacasse (2015) / France	Chronic Pain Self-Efficacy Scale (FC-CPSES)	High	High	Low	Low	Low	Low	Low
Waddell (1993) / United Kingdom	Fear-Avoidance Beliefs Questionnaire (FABQ)	Low	Low	Low	Low	Low	Low	Low
Chaory (2004) / France	Fear-Avoidance Belief Questionnaire (FABQ)	Low	Low	Low	Low	Low	Low	Low
Staerkle (2004) / Switzerland	Fear-Avoidance Beliefs Questionnaire (FABQ)	?	?	?	?	Low	Low	Low

Grotle (2006) / Norway	Fear-Avoidance Beliefs Questionnaire (FABQ)	Low	Low	Low	Low	Low	Low	Low
Pruneti (2014) / Italy	Fear-Avoidance Beliefs Questionnaire (FABQ)	?	Low	Low	Low	Low	Low	High
George (2010) / United Kingdom	Fear-Avoidance Model Measures (FAM)	Low	High	?	High	Low	High	?
González-Escalada (2012) / Spain	Lattinen Index (LI)	Low	Low	Low	Low	High	High	Low
Georgoudis (2000) / Greece	Short-Form McGill Pain Questionnaire (MPQ)	?	?	Low	Low	?	?	Low
Mannion (2006) / Switzerland	Oswestry Disability Index (ODI)	Low	Low	Low	Low	Low	Low	Low
McCracken (2002) / United Kingdom	Pain Anxiety Symptoms Scale (PASS-20)	?	?	Low	Low	Low	Low	Low
Roelofs (2004) / The Netherlands	Pain Anxiety Symptoms Scale (PASS)	?	?	Low	Low	Low	Low	Low
Azevedo (2016) / Portugal	Pain Beliefs and Perceptions Inventory (PBPI)	Low	Low	Low	Low	Low	Low	?
Sandborgh (2008) / Sweden	Pain Belief Screening Instrument (PBSI)	?	?	Low	Low	Low	Low	Low
Meyer (2007) / Switzerland	Pain Catastrophizing Scale (PCS)	?	Low	Low	Low	Low	Low	?
García-Campayo (2008) / Spain	Pain Catastrophizing Scale (PCS)	Low	Low	Low	Low	?	?	Low

Fernandes (2012) / Norway	Pain Catastrophizing Scale (PCS)	?	?	Low	Low	Low	Low	?
Soer (2013) / The Netherlands	Pain Disability Index (PDI)	Low	Low	Low	Low	?	?	?
Kemani (2016) / Sweden	Pain Interference Index (PII)	Low	Low	Low	Low	Low	Low	High
Wicksell (2007) / Sweden	Psychological Inflexibility Pain Scale (PIPS)	?	?	Low	Low	Low	Low	Low
García-Campayo (2010) / Spain	Pain Self-Perception Scale (PSPS-Spanish)	High	High	Low	Low	Low	Low	Low
Schoppink (1996) / The Netherlands	Quebec Back Pain Disability Scale (QBPDS)	?	?	Low	Low	?	?	?
Yvanes-Thomas (2002) / France	Quebec Back Pain Disability Scale (QBPDS)	Low	Low	Low	Low	?	?	?
Riecke (2016) / Germany	Quebec Back Pain Disability Scale (QBPDS)	Low	Low	Low	Low	?	?	?
Buchanan (2007) / Germany	Roland Morris Disability Questionnaire (RMDQ)	High	High	Low	Low	?	?	High
Kovacs (2002) / Spain	Roland-Morris Questionnaire (RMQ)	High	High	Low	Low	Low	Low	?
Zerzak (2008) / France	Roland-Morris Questionnaire (RMQ)	?	?	Low	Low	Low	Low	?
Ruiz-Párraga (2010) / Spain	Resilience Scale (RS-18)	Low	Low	Low	Low	Low	Low	Low
Gómez-Pérez (2011) / Spain	Tampa Scale for Kinesiophobia (TSK)	?	?	Low	Low	Low	Low	Low

Mason (2009) / United Kingdom	WHOQOL-pain	Low	Low	Low	Low	Low	Low	Low