Cross-cultural adaptation and validation of the shoulder rating questionnaire in Spanish patients with chronic nonsurgical shoulder pain

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Background: Chronic shoulder pain is characterized by persistent discomfort in the shoulder joint that can be due to various causes, affecting the patient's quality of life.

Methods: One hundred twenty three participants (54.83 ± 11.73 years) completed the Spanish SRQ. Internal consistency, floor and ceiling effect, and test-retest reliability were analyzed. We also studied construct validity, as well as convergent (quick Disabilities of the Arm, Shoulder, and Hand questionnaire) and concurrent (12-item Short Form Health Survey) validity. The ability and accuracy to discriminate between patients with and without anxiety and depression cases was evaluated with the Hospital Anxiety and Depression Scale; a receiver-operating characteristic curve analysis was used.

Results: The Spanish SRQ showed an appropriate level of internal consistency and test-retest reliability. Factor analysis revealed a 2-factor structure. The Spanish SRQ total score and domains showed good convergent and concurrent validity. The total score was significantly able to discriminate between participants with and without symptoms related to probable presence of anxiety or depression (cut-off point of 34.17).

Conclusion: The Spanish SRQ was found to be a valid and reliable instrument for assessing shoulder symptoms and function and discriminating the probable presence of anxiety and depression in patients with chronic nonsurgical shoulder pain.

Shoulder pain is a very common condition involving the musculoskeletal system, with a lifetime incidence of $\geq 60\%$ and with a prevalence ranging from 7% to 26% in the general population.[15] The rate of shoulder pain is higher in women than in men and usually increases with age.[25] This pain is frequently caused by inflammatory, traumatic, or degenerative factors[40,41] and is associated with mechanical exposure inter-related with work, such as that involving uncomfortable postures and vibrations or that involving repetitive movements.[21]

The most characteristic symptoms of shoulder dysfunction are popping and cracking, limb weakness, a feeling that the joint is giving way, and repeated episodes of joint dislocation. It has been reported to have the longest mean recovery time of all musculoskeletal injuries, which affects the performance of activities of daily living such as driving, bathing, dressing, and doing housework and therefore the quality of life of people.[28] In addition to the symptoms mentioned above, shoulder dysfunction is often accompanied by pain and stiffness that can be extremely debilitating.[26] Pain, which can range from constant discomfort to sharp, intense episodes, is often a prominent feature of this condition. This pain can radiate from the shoulder to the neck, arm, and even back, which can make it even more difficult to perform everyday activities.[38] On the other

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JSES International 8 (2024) 1095–1101

hand, stiffness in the shoulder joint is another common symptom that significantly affects the patient's mobility and comfort, reducing their independence and ability to carry out simple tasks.[29]

The evaluation of the etiology of shoulder pain is a crucial process in the diagnosis and treatment of this condition, based on a combination of factors, with the patient's symptoms being one of the main elements to consider.[20] To carry out this evaluation, several techniques and clinical tests are used. Physical examination tests are essential to collect valuable information about the condition of the patient's shoulder. You can measure strength and joint range of motion,[1] and intensity and location of pain, and how it effects the functional capabilities of the shoulder in terms of stability and the ability to perform specific movements.[12] In addition to those mentioned above, imaging tests play a fundamental role in diagnosing the etiology of shoulder pain, including imaging techniques such as plain radiographs, computed tomography, ultrasound, and magnetic resonance imaging.[23]

However, in addition to this type of test, it is necessary to analyze the general impact that this problem can have when carrying out activities of daily living and the psychosocial health of patients.[33] For this, it is essential to know the patient's perspective rather than that of the professional, and this is possible thanks to the reported outcome measures that are essential for therapeutic management to remain patient-centered.[39] These patient-reported outcome measures are an important part of the management and assessment of shoulder pain and provide valid and reliable measures to guide treatment and to monitor progress, as well as to be used as secondary outcomes, usually accompanied by primary clinical outcomes that offer more objective findings.[46]

The Shoulder Rating Questionnaire (SRQ), originally developed by L'Insalata et al[24] in 1997, is a patient-reported outcomes scale for assessing the severity of symptoms and function related to shoulder problems. It is an easily administered tool to assess shoulder symptoms and function, and it has been used more frequently in patients with impingement syndrome and instability, which makes this questionnaire more applicable to these pathological conditions than to general shoulder disability.[14,31,34] The SRQ has been validated for several languages and populations,[7,13,43,46] but, and to the extent of our knowledge, the validation of the Spanish version of the SRQ has not yet been carried out. Therefore, the objective of the present study was to evaluate the psychometric properties and validity of the Spanish version of the Shoulder Rating Scale in patients with shoulder pain. In addition, we set out to assess the ability of the Spanish Shoulder Rating Scale to discriminate between patients with and without anxiety and depression.

Methods

Participants

A total of 234 Spanish people were initially contacted to participate in this study from January 2022 through June 2022. While 12 declined to participate and 99 did not correctly complete all of the questionnaires, 123 patients were included in this study (Fig. 1). Sample size was considered appropriate according to the psychometric recommendations described by Kline (at least 100 participants).[22]

All participants were adults (aged $\geq$ 18 years) native Spanish speakers from Spain, with nonsurgical shoulder pain of more than 3 months of evolution, and able to understand and complete the questionnaires involved in the study. Patients were excluded if they had neuropsychiatric disorder that could influence their responses to the questionnaire, underwent previous shoulder surgery, had chronic inflammatory disease (ie, rheumatoid arthritis or ankylosing spondylitis), had neck pain or widespread pain (such as
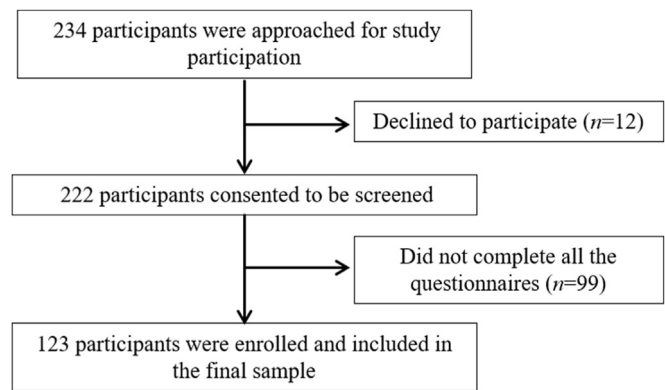

Figure 1 Flow diagram of study participants.

fibromyalgia or myofascial pain), or failed to provide their written informed consent to participate in the study.

Questionnaires

Shoulder symptoms and function

The SRQ consists of 21 items, of which 1 is a visual analog scale that provides a global assessment of the shoulder scale (10 cm, where 0 indicates "very poorly" and 10 indicates "very well"). The other 20 items score from 1 (the poorest) to 5 (the best). The SRQ provides 7 domains related to "Global assessment" (visual analog scale, item 1), "pain" (items 2-5), "daily activities" (items 6-11), "sports/recreation" (items 12-14), and "work" (items 15-19), as well as "satisfaction" and "areas of improvement" which have no score. It also provides a total score, which ranges from 17 (worst) to 100 (better).

Following the recommendations of the International Quality of Life Assessment Project for cross-cultural translation,[6] the original version of the SRQ was independently translated into Spanish by 2 bilingual experts. Next, this version was revised by 2 clinical professionals who were familiar with the topic, reaching a consensus version, which was administered to 20 patients (57.30 $\pm$ 12.68 years, 60% women, 55% secondary studies or higher) to check the understanding of the translated questionnaire. Finally, the Spanish version of the SRQ was translated back into English, and was compared with the original version to assess conceptual, semantic, and linguistic equivalence. To evaluate test-retest reliability of the Spanish version of the SRQ, 31 randomly chosen patients completed again the questionnaire between 5 and 7 days later. This time interval was set to reduce the time the patient had to wait to start treatment.

Upper limb disability

The quick Disabilities of the Arm, Shoulder, and Hand (quickDASH) questionnaire was used to assess disability in the upper limb.[3] It consists of 11 questions answered on a 5-point Likert scale. The total score value ranges between 0 (no disability) and 100 (most severe disability). In the present study, we employed the Spanish version of the quickDASH, which has been previously validated by Rosales et al.[32]

Health-related quality of life

The 12-item Short Form Health Survey (SF-12) was used to assess health-related quality of life.[45] This is a 12-item questionnaire generates a Physical Component Summary scale score (PCS-SF-12) and a Mental Component Summary scale score (MCS-SF-12), which are graded from 0 to 100, where higher scores indicate better health-related quality of life. The Spanish version of the SF-12, whose psychometric properties have been previously demonstrated, was used in this study.[44]

Table I
Descriptive characteristics of the simple (n = 123).

	Mean	SD
Age (y)	54.83	11.73
BMI (kg/m^2)	26.36	3.99

	Frequency	Percentage
Sex		
Men	41	33.33
Women	82	66.67
Occupational status		
Retired	23	18.70
Worker	81	65.85
Unemployed	19	15.45
Marital status		
Single	21	17.07
Married	21	17.07
Divorced/separated/widowed	81	65.85
Education		
No studies	10	8.13
Primary	28	22.76
Secondary	48	39.02
University	35	28.46
Smoker		
No	108	87.80
Yes	14	11.38
Dominant arm		
Left	4	3.25
Right	119	96.75
Shoulder pain		
Left	41	33.33
Right	54	43.90
Both	28	22.76
Previously treated shoulder		
Left	45	36.59
Right	78	63.41
Anxiety		
No	101	82.11
Yes	22	17.89
Depression		
No	98	79.67
Yes	25	20.33

	Mean	SD
SRQ		
Global assessment	6.18	3.11
Pain	19.69	8.04
Daily activities	10.81	3.95
Sports/recreation	7.50	2.67
Work	5.29	2.85
Total score	49.47	18.64
QuickDASH total score	50.52	23.40
SF-12		
PCS	41.50	25.67
MCS	58.48	27.47

BMI, Body Mass Index; *MCS*, Mental Component Summary; *PCS*, Physical Component Summary; *SD*, Standard Deviation; *SF-12*, 12-Item Short Form Health Survey; *SRQ*, Shoulder Rating Questionnaire.

Anxiety and depression

To evaluate anxiety and depression, we used the Hospital Anxiety and Depression Scale (HADS).[47] It is a widely used questionnaire that is comprised of 14 items, 7 for anxiety and 7 for depression symptoms subscales. Each subscale has a score ranging from 0 to 21, where higher scores indicate greater symptoms. Scores ≥ 11 indicate probable presence of both anxiety or depression disorders cases. The Spanish version of the HADS was validated in Spanish population by Herrero et al.[20]

Statistical analysis

Mean and standard deviation were used for the continuous variables, whereas frequencies and percentages were employed for the categorical ones. The Kolmogorov-Smirnov test was used to determine the normality of the data. Internal consistency was evaluated by the Cronbach's α coefficient. Values ≥ 0.70 were considered acceptable for general research purposes.[13] Item to total and domain to total correlations assessed by the Pearson's correlation coefficient (r) were also determined for the internal consistency analysis. Values > 0.50 were classified as strong, while those between 0.30 and 0.50 were classified as moderate.[11] The intraclass correlation coefficient (ICC$_{2,1}$) by Shrout and Fleiss was used to evaluate the test-retest reliability. According to the ICC values, the reliability was considered as poor when < 0.40, moderate when 0.40-0.75, substantial when 0.75-0.90, and excellent when > 0.90.[35] The percentage of participants that obtained the minimum or maximum scores was used to determine floor and ceiling effects, respectively, when 15% or more of the participants indicated the minimum or maximum possible score, respectively.[27] As for the construct validity, an exploratory factor analysis was performed (principal component analysis), with a varimax-rotated principal components analysis, and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy. A KMO of ≥ 0.60 was considered as acceptable.[18] Convergent validity (the grade in which the same quality is evaluated by 2 different tests)[7] was analyzed by using the MCS and the PCS of the SF-12. For the criterion validity, concurrent validity (the grade in which the results of an instrument can be trusted)[16] was assessed by using the total score of the quickDASH questionnaire. Both concurrent and convergent validity analysis employed Pearson's correlation coefficient (r). Values more than 0.50 were considered to be strong, and those between 0.30 and 0.50 were deemed to be moderate.[38] Finally, to study the discriminant validity, we analyzed the possible differences among participants with and without anxiety and depression (assessed with the HADS), regarding the SRQ total score (Student's *t*-test). The accuracy in distinguishing the probable presence of anxiety and depression was calculated by performing a receiver operating characteristic (ROC) curve analysis and the area under the ROC curve (AUC). The binomial exact test and the Hanley and McNeil method[19] were used to calculate the confidence interval and the standard error for the AUC, respectively. For the statistical analysis, the SPSS 20.0 statistical package (IBM Corp., Armonk, NY, USA) was used. The level of statistical significance was set at *P* < .05.

Results

A total of 123 patients (82 women) were included in the study. Table I displays the descriptive characteristics of participants. Mean age was 54.83 ± 11.73 years and most of the participants were working (65.85%); had a secondary or superior level of education (67.48%); were divorced, separated, or widowed (65.85%); were right-handed (96.75%); and previously treated for the right shoulder (63.41%). In 66.67% of the cases, shoulder pain coincided with their dominant arm. The SRQ total score was 49.47 ± 18.64, and the quickDASH, SF-12 PCS, and MCS scores were 50.52 ± 23.40, 41.50 ± 25.67, and 58.48 ± 27.47, respectively. Finally, a 17.9% of the participants reported to have anxiety according to the HADS score, and a 20.3% depression.

As for the internal consistency analysis, our results showed a Cronbach's α of 0.961 for the Spanish SRQ total score, which indicates a good internal consistency for research purposes. Table II shows that when 1 item was deleted Cronbach's α values varied from 0.958 to 0.963, and from 0.697 to 0.797 when 1 domain was deleted. The item to total score correlation analysis (Table II) showed r values that could be considered as strong (all *P* < .001), ranging from 0.528 (item 14) to 0.913 (item 15). Our results also showed that the domain to total correlations analysis showed also strong correlations with r values (all *P* < .001) that ranged from 0.838 (work domain) to 0.962 (pain domain).

Table II
Internal consistency, test-retest reliability, and factor analysis of the Spanish SRQ.

SRQ items	Internal consistency		Test-retest reliability			Factor analysis		
	Item-total correlation (r)	Cronbach's α if item deleted	ICC	95% CI	P value			
Item 1	0.839[*]	0.961	0.996	0.992-0.998	<.001	Global assessment	0.683	
Item 2	0.812[*]	0.959	0.908	0.818-0.954	<.001	Pain	0.532	
Item 3	0.816[*]	0.960	0.956	0.911-0.979	<.001		0.701	
Item 4	0.837[*]	0.959	1.000		<.001		0.656	
Item 5	0.913[*]	0.958	0.969	0.936-0.985	<.001		0.704	
Item 6	0.829[*]	0.959	0.933	0.867-0.967	<.001	Daily activities	0.654	
Item 7	0.818[*]	0.959	0.964	0.927-0.982	<.001		0.767	
Item 8	0.822[*]	0.959	0.943	0.886-0.972	<.001		0.701	
Item 9	0.771[*]	0.959	1.000		<.001		0.772	
Item 10	0.800[*]	0.959	0.945	0.889-0.973	<.001		0.751	
Item 11	0.846[*]	0.958	0.988	0.975-0.994	<.001		0.683	
Item 12	0.839[*]	0.959	0.984	0.968-0.992	<.001	Sports/recreation	0.781	
Item 13	0.771[*]	0.959	0.899	0.802-0.950	<.001		0.661	
Item 14	0.528[*]	0.963	0.944	0.889-0.973	<.001		0.627	
Item 16	0.806[*]	0.958	1.000		<.001	Work		0.859
Item 17	0.814[*]	0.958	1.000		<.001			0.893
Item 18	0.673[*]	0.961	0.993	0.986-0.997	<.001			0.783
Item 19	0.808[*]	0.958	1.000		<.001			0.863
Item 20	0.674[*]	0.961	1.000		<.001			

CI, Confidence Interval; *ICC*, Intraclass Correlation Coefficient; *r*, Pearson's correlation coefficient; *SRQ*, Shoulder Rating Questionnaire.
[*]P <.001.

Table III
Concurrent and convergent validity of the SRQ total score and domains.

SRQ domains and total score	Concurrent validity		Convergent validity (n = 174)					
	QuickDASH		SF-12 PCS		SF-12 MCS			
	r	P value	r	P value	r	P value		
Global assessment	−0.782	<.001	0.715	<.001	0.478	<.001		
Pain	−0.846	<.001	0.743	<.001	0.375	<.001		
Daily activities	−0.867	<.001	0.794	<.001	0.465	<.001		
Sports/recreation	−0.746	<.001	0.655	<.001	0.368	<.001		
Work	−0.829	<.001	0.824	<.001	0.463	<.001		
Total score	−0.913	<.001	0.828	<.001	0.464	<.001		

DASH, Disabilities of the Arm, Shoulder, and Hand; *MCS*, Mental Component Summary; *PCS*, Physical Component Summary; *r*, Pearson's correlation coefficient; *SF-12*, 12-Item Short Form Health Survey; *SRQ*, Shoulder Rating Questionnaire.

Table IV
Discriminant validity of the total score of the Portuguese SRQ regarding the presence of anxiety and depression (n = 135).

	SRQ total score			AUC	SE	95% CI	P value
	Mean	SD	P value				
Depression							
No (n = 98)	52.43	18.20	<.001	0.749	0.066	0.620-0.878	<.001
Yes (n = 25)	37.87	15.82					
Anxiety							
No (n = 101)	51.95	18.15	.001	0.757	0.060	0.640-0.873	<.001
Yes (n = 22)	38.08	16.83					

AUC, Area under the receiver operating characteristic curve; *CI*, Confidence Interval; *SD*, Standard Deviation; *SE*, Standard error; *SRQ*, Shoulder Rating Questionnaire.

Regarding reliability, the test-retest analysis (Table II) indicated excellent correlations for all the SRQ items except for item 13, which was substantial, but in the limit of the excellent range (ICC = 0.899). The Spanish SRQ total score (ICC = 0.990) and domains also showed excellent values, ranging from global assessment (ICC = 0.980) to work (ICC = 0.999), with the exception of the domain sports/recreation (substantial, ICC = 0.855). No floor and ceiling effects were observed neither for the Spanish SRQ total score nor for all the domains apart from the work domain, where a floor effect was found (19.51% of the participants reported the minimum score).

With regards to the construct validity, the factor analysis (Table II) exhibited a 2-factor structure. The first and most important factor included the items related to the original first 4 SRQ domains (global assessment, pain, daily activities, and sports/recreation), and the rest of the Spanish SRQ items loaded in the other factor, which coincide with the original SRQ domain work. The total variance explained by our model was 69.41%, and the adequacy for the data was assessed with a KMO = 0.933 (P < .001). Therefore, the sample can be deemed as adequate for the purposes of this analysis.

Table III shows the concurrent validity of the SRQ total score and domains with the quickDASH total score. Our findings showed statistically significant negative correlations (all P < .001), which means that greater shoulder symptoms (and worse function) are correlated with greater shoulder disability. Likewise, significant strong positive correlations were observed when comparing the SRQ total score and domains with both SF-12 MCS and PCS (all P < .001), which determines a good convergent validity.

Finally, as for the discriminant validity, the SRQ total score was compared to the HADS anxiety and depression scores. Table IV indicates that significantly higher SRQ total scores were observed in those participants with probable cases of anxiety (P = .001) and depression (P < .001). The ROC curve analysis indicated a significant ability of the SRQ total score to discriminate between participants with and without symptoms related to probable presence of anxiety and depression (Fig. 2). Our results showed a statistically
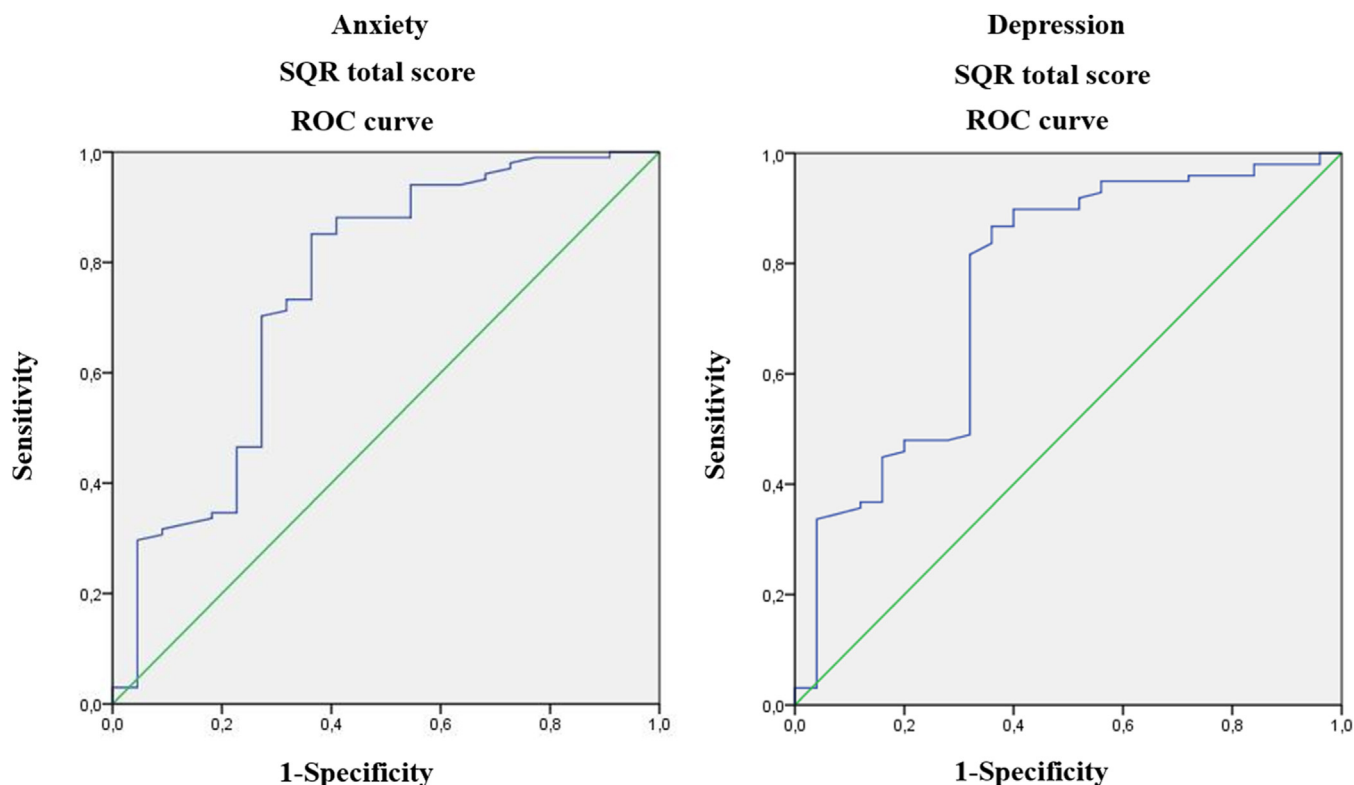
Anxiety
SQR total score
ROC curve

Depression
SQR total score
ROC curve

Figure 2 The ROC curve of the SRQ total score for discriminating among women with and without depression and anxiety. *SRQ*, the Shoulder Rating Questionnaire; *ROC*, receiver operating characteristic.

significant AUC (Table IV), with a SRQ total score cut-off point of 34.17 to detect both anxiety (85.15% sensitivity and 63.64% specificity) and depression (86.53% sensitivity and 64.00% specificity).

Discussion

The aim of the present study was to carry out the cross-cultural adaptation of the Spanish version of the SRQ, as well as to evaluate the validation and the psychometric properties of this questionnaire in Spanish patients with chronic nonsurgical shoulder pain. The findings of this study determined that the Spanish SRQ is a valid and reliable questionnaire to assess shoulder symptoms and function[24] among this type of patients, with satisfactory psychometric properties and it is able to discriminate between patients with or without depression and anxiety.

Concerning the internal consistency analysis, the original development and validation of the SRQ reported a Cronbach's α coefficient of 0.86 for the overall final questionnaire, and ranged from 0.71 (pain) to 0.90 (daily activities).[24] Our analysis revealed a higher internal consistency for the SRQ total score (Cronbach's α of 0.96), and the Cronbach's α values for the domains ranged from 0.697 (pain) to 0.797 (sports/recreation). Our findings regarding the SRQ total score were higher than those revealed by Cheimonidou et al[8] in the Greek validation (0.8), de Siqueira et a[37] in the Brazilian adaptation (0.89), or by Pereira et al[30] in the Philippine translation (0.914).

To assess test-retest reliability, the Spanish SRQ was completed 5-7 days after the first time by a randomly selected subsample. This time interval is similar than that used in previous validations.[43,46] Choi et al[9] indicated that the test-retest reliability of the total score and domains of the Korean version of the SRQ was good to almost perfect, with ICC values that ranged from 0.84 to 0.95. Our results are in agreement with that, and indicated that the Spanish

SRQ total score and all the domains showed excellent reliability (ICC > 0.90), except for the sports/recreation domain, which was substantial (ICC = 0.855). These values are higher and thus better than those described in the adaptations of the SRQ into the Dutch[43] and Turkish versions. As for the range of measurement, our analysis determined that any ceiling or floor effects were observed for the SRQ total score, which is in accordance with the data published by Yaşar et al,[46] and only a small floor effect (19.51% of the participants reported the minimum score) was observed in the work domain. This can be explained by the percentage of patients who were workers (65.85%).

The exploratory factor analysis by principal components of the Spanish SRQ yielded a 2-factor structure that separates the workplace from the rest. In this way, one factor corresponds with the original domains that refer to the global assessment, pain, daily activities, and sports/recreation areas, while the second one coincides with the SRQ original domain "work".[24] The total explained variance (69.41%) and the KMO value (0.933, which is larger than the minimum recommended value of 0.30)[40] can be deemed as adequate for the analysis. To determine the concurrent validity of the Spanish SRQ, the quickDASH total score is used. This is a widely used and validated questionnaire to assess upper extremity-related deficits and symptoms in daily life.[17,36] Our findings showed significant correlations between the Spanish SRQ total score and domains, and the quickDASH total score, and these correlations were considered as strong. Our results are in agreement with those described by Çiftçi et al[10] who found significant correlations between the Turkish version of the SRQ and the DASH Questionnaire in patients with shoulder pain with and without working.

As for the convergent validity, we used the SF-12 physical and mental components. This scale has been used in the validation of several questionnaires related to shoulder and upper limb.[2,42] Our findings indicated that the Spanish version of the SRQ domains and

total score had significant and greater correlations with the PCS of the SF-12, and significant but moderate correlations were obtained with the MCS of the SF-12. The results of this study are consistent with that of Vermeulen et al,[43] who described that the total score of the Dutch SRQ had a significant and strong (r = 0.62) correlation (r = 0.62) with the PCS of the 36-item short form health survey, and a medium correlation (r = 0.34) with the MCS of the 36-item short form health survey.

An increase in the burden of anxiety and depression symptoms has been associated with worse shoulder functionality and increased symptomatology.[4,5] In the present study, we attempted to determine the ability of the Spanish SRQ to discriminate between patients with and without anxiety and depression, assessed by the HADS. Our results showed that patients with probable cases of anxiety and depression had significantly lower scores in the Spanish SRQ total score, and a cut-off point of 34.17 was able to detect the probable presence of depression (86.53% sensitivity and 64.00% specificity) and anxiety (85.15% sensitivity and 63.64% specificity).

This study has some limitations that need to be considered. The study was carried on patients from a specific geographical area. The test-retest reliability was performed on only 31 of the 123 patients. In addition, 67.48% reported to having secondary or higher studies; thus, any generalization of results should be limited to individuals with similar characteristics to our sample population. On the other hand, the questionnaire has been validated in Spanish people, and our findings should not be applied to other Spanish-speaking population.

Furthermore, the study was performed with patients suffering from chronic shoulder pain. Hence, the findings cannot be generalized to all patients with shoulder pain. Future studies should be conducted including patients with acute and subacute shoulder pain, patients undergoing surgery for shoulder disorders, with all the participants in the test-retest reliability analysis, and from different geographical regions with a heterogeneous educational level.

Conclusion

The findings of the present study confirm that the Spanish cross-cultural adaptation of the SRQ has appropriate internal consistency and test-retest reliability, as well as an adequate construct validity, and good concurrent and convergent validity in Spanish patients with chronic nonsurgical shoulder pain. Moreover, the Spanish SRQ has been shown to be able to discriminate between the probable presence of anxiety and depression in these patients.

Disclaimers:

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