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Quality of Life Research
An International Journal of Quality of Life Aspects of Treatment, Care and Rehabilitation - Official Journal of the International Society of Quality of Life Research

ISSN 0962-9343

Qual Life Res
DOI 10.1007/s11136-014-0852-z

Springer

Qual Life Res
DOI 10.1007/s11136-014-0852-z

A confirmatory factor analysis of the Resilience Scale adapted to chronic pain (RS-18): new empirical evidence of the protective role of resilience on pain adjustment

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Accepted: 3 November 2014

Abstract
Purpose Recent attention has focused on resilience as an important process in the experience and management of chronic pain. In this context, resilience is considered as a psychological factor that promotes adaptive responses to pain and pain-related life adversities. Current research suggests that it is a relevant variable in the prediction of pain adjustment among chronic pain patients. Recently, it was adapted the Resilience Scale to patients suffering chronic musculoskeletal pain (RS-18). The aims of this study were to confirm the internal structure of the RS-18 and to present new empirical evidence regarding its validity.
Methods A sample of 592 patients with chronic musculoskeletal back pain completed a battery of instruments to assess resilience, anxiety sensitivity, catastrophizing, fear-avoidance beliefs, hypervigilance, pain acceptance, and pain adjustment variables (pain intensity, emotional distress, functional impairment, and daily functioning).
Results Confirmatory factor analysis supported the validity of the RS-18 and a single-factor solution. A series of moderated multiple regression analysis showed that resilience is a relevant psychological variable that not only independently predicts better pain adjustment, but also moderates the relationships between several psychological pain-related variables and pain adjustment variables.
Conclusions These findings give empirical support to the consideration of resilience as a protective variable in chronic pain adjustment and highlight the consideration that improving resilient behaviour could be an important target for the treatment of pain patients.

Keywords Resilience Scale · Chronic pain adjustment · Internal structure · Validity

Abbreviations

AIC	Akaike information criterion
ASI	Anxiety Sensitivity Index
BCC	Browne–Cudeck criterion
CFI	Comparative fit index
CPAQ	Chronic Pain Acceptance Questionnaire
FABQ	Fear-Avoidance Beliefs Questionnaire
HADS	Hospital Anxiety and Depression Scale
IFI	Impairment and Functioning Inventory
NNFI	Non-normed fit index
PCS	Pain Catastrophizing Scale
PVAQ	Pain Vigilance and Awareness Questionnaire
RMSEA	Root mean square error of approximation
RS	Resilience Scale
TLI	Tucker–Lewis index

Introduction

There has been growing interest in the construct of resilience. While hard to define, it has been suggested that resilience implies experiencing adversity (illness) and

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Published online: 07 November 2014

adapting in order to bounce back and thrive, sometimes in changed ways [1]. In a broad sense, resilient people are more likely to be able to see the positive aspects and potential benefits of an adverse situation.

Recent attention has focused on resilience as an important process in the experience and management of chronic pain. In this context, resilience refers to a set of adaptive responses to pain and pain-related life adversities involving three primary components: recovery, sustainability, and growth [2]. Of these, recovery is considered to be the key characteristic of resilient functioning and has been the most widely studied [3]. In line with this, it has been found that learning to manage pain gives the patient a sense of empowerment [4]. This process involves accepting pain, which is considered to be a positive characteristic in resilient patients [5, 6].

Resilience indicators can be categorized into stable resources and modifiable positive states that vary over time [2, 5]. Modifiable resources are considered to be affected by stable resources, the experience of current pain, and other contextual stressors. Stable resources are factors that directly and indirectly influence resilient outcomes by affecting the likelihood of the availability of resilience resources when needed [2]. Thus, valid and reliable measures are needed to assess stable and modifiable resilience indicators.

Several instruments have been developed to assess resilience as a stable factor in the general population [7–9]. However, to our knowledge, the only instrument to have been adapted to chronic pain populations [10] is the Resilience Scale (RS-25) [9]. This instrument was designed to measure the degree of individual resilience considered as a personality characteristic that promotes adaptation. In a sample of chronic musculoskeletal pain patients ($N = 300$), the results of applying the adapted RS (RS-18) did not support the original two-factor structure [10], indicating that RS-18 was a single-factor 18-items instrument that included aspects of both original factors: personal competence (10 items of RS-25) and acceptance of self and life (8 items of RS-25). The RS-18 showed high internal consistency, stability, and adequate construct validity [10]. This article presents new empirical evidence on the validity of the RS-18 in a large sample of chronic musculoskeletal back pain patients.

The specific aims of the study were as follows: to examine the internal structure of the RS-18; to assess its criterion validity by analysing its association with other psychological pain-related variables, such as anxiety sensitivity, catastrophizing, fear-avoidance beliefs, hypervigilance, and pain acceptance; and to investigate its relative capacity to affect patient adjustment (namely, pain intensity, emotional distress, functional impairment, and daily functioning).

Materials and methods

Participants and procedure

A total of 592 patients with chronic musculoskeletal back pain were assessed. They had been referred by physicians and physiotherapists from several Primary Care Health Centres in Málaga (Spain). The inclusion criteria for the study were: back pain of benign origin of least 3 months duration; pain intensity of three or more points on the 10-point Composite Pain Intensity Score [11]; and continuous or intermittent pain appearing for five or more days per week. Exclusion criteria were: the presence of severe injuries requiring immediate surgery; the presence of major psychiatric illness (i.e. psychosis, schizophrenia, personality disorders, or a bipolar disorder, according to their medical history); the presence of other chronic diseases involving disability other than chronic pain; and insufficient knowledge of the Spanish language.

Prior to data collection, the researchers held a meeting with the participating doctors in which the eligibility criteria were explained and the procedures were decided on. At the end of their medical visit, each patient who fulfilled the eligibility criteria was informed by their doctor of the study aims, and their participation was requested. Over 30 % of patients refused to participate in the study. The participants who accepted were contacted by telephone to make an appointment. None of these contactees refused participation. Each participant completed a battery of questionnaires in the same order in an oral semi-structured interview format lasting 1.5 h that was administered by a psychologist. All patients were interviewed at their clinic while waiting to be seen by their physicians. Informed consent was obtained prior to data collection. Patients were aware that the information collected was confidential. The research project, of which this study is a part, was approved by the Ethics Committee of both the Sanitary District at Málaga and the Costa del Sol Health District (Spain).

Measures

The Resilience Scale adapted to chronic pain patients [10]

The RS-18 comprises a single 18-items factor scored on a 7-point scale ranging from 1 (*Disagree*) to 7 (*Agree*). It has good internal consistency (alpha coefficient = 0.92), stability ($r = 0.9$; $p < 0.001$), and construct validity. Significant correlations have been found between the RS-18 and several pain-related variables (catastrophizing, pain acceptance, active coping, passive coping, and pain-related anxiety) and between the RS-18 and pain adjustment variables (pain intensity, disability, functional impairment, daily functioning, anxiety, and depression) [10].

Anxiety Sensitivity Index [12]

The ASI is a self-report measure of anxiety sensitivity. It comprises 16 items using a 5-point Likert-type format ranging from 0 (*Very little*) to 4 (*Very much*). The ASI has high levels of internal consistency, good test–retest reliability, and excellent convergent validity. The Spanish version of the ASI is fully equivalent to the original and provides cross-cultural evidence for construct validity and concurrent validity, as well as high internal consistency ($\alpha = 0.95$) [13].

Pain Catastrophizing Scale [14]

The PCS comprises 13 items on a 5-point scale, ranging from 0 (*Not at all*) to 4 (*All the time*). The PCS was developed to assess three components of catastrophizing: rumination, magnification, and helplessness. It has excellent psychometric properties and has been widely used in research. The Spanish version [15] used in this study has good psychometric properties and high internal consistency ($\alpha = 0.94$). The PCS total score was used in this study.

Fear-Avoidance Beliefs Questionnaire [16]

The FABQ is a 16-item self-report questionnaire focusing on patients' beliefs about how physical activity and work affect low back pain. Each item is answered on a 7-point Likert scale (from *Strongly agree* to *Strongly disagree*). The factors have good internal consistency. The Spanish version [17] has high internal consistency ($\alpha = 0.93$) and validity.

Pain Vigilance and Awareness Questionnaire [18]

The PVAQ was developed as a broad measure of attention and hypervigilance to pain. It consists of 16 items divided into two subscales (attention to pain and attention to changes in pain); the respondents are asked to indicate how frequently each item is a true description of their behaviour on a 6-point scale ranging from 0 (*Never*) to 5 (*Always*). It has good internal consistency and adequate test–retest reliability. The Spanish version [19] is a reliable ($\alpha = 0.89$) and valid measure. The PVAQ total score was used in this study.

Chronic Pain Acceptance Questionnaire [20]

The CPAQ is a 20-item scale assessing acceptance of pain. The items are rated on a scale from 0 (*Never true*) to 6 (*Always true*). It has good internal consistency and concurrent validity. Like the original questionnaire, the Spanish version [21] has suitable internal consistency ($\alpha = 0.80$) and construct validity.

Composite Pain Intensity Index

Jensen et al. [11] showed that composites of the 0–10 ratings are highly reliable measures of pain intensity in chronic pain patients. Hence, the patients were asked to rate their mildest, average, and worst pain during the past 2 weeks, as well as their current pain, on a scale ranging from 0 (*Not at all*) to 10 (*Extremely painful*). A composite pain intensity score was calculated for each participant by calculating the average of the mildest, average, worst, and current pain.

Hospital Anxiety and Depression Scale [22]

The HADS comprises two 7-item scales designed to rate depression and anxiety, respectively. The scores from both scales can be added to produce a total score of emotional distress. Ratings range from 1 (*Almost always*) to 4 (*Almost never*). The Spanish version used in this study [23] has suitable reliability ($\alpha = 0.85$ for emotional distress).

The Impairment and Functioning Inventory [24]

The IFI [24] comprises 30 items referring to activities related to one of the following areas: household, autonomous behaviour, leisure, and social relationships. The instrument provides an index of functioning and an index of impairment. The subscales and the global scales of this questionnaire show suitable reliability ($\alpha = 0.84$ for functional status; $\alpha = 0.85$ for functional impairment). Factor analytic techniques support its hypothesized internal structure [24].

Data analysis

All analyses were performed using the Statistical Package for the Social Sciences (SPSS, Windows version 21.0, SPSS Inc., Chicago, IL, USA) and AMOS Graphics (version 21.0; Small Waters Corp., Chicago, IL, USA) software.

As a preliminary step, the internal structure of the RS-18 was analysed. The one-factor solution model and two-factor solution model were assessed to identify which one had the best fit. A confirmatory factor analysis was performed via structural equation modelling for each model. Analyses were performed using maximum likelihood estimation and the robust estimation method. In addition to the χ^2 goodness-of-fit test, six goodness-of-fit statistics were computed for each model: root mean square error of approximation (RMSEA), comparative fit index (CFI), non-normed fit index (NNFI), Tucker–Lewis index (TLI), Akaike information criterion (AIC), and Browne–Cudeck criterion (BCC). The RMSEA indicates the magnitude of

difference between the fitted and actual covariance matrices with a parsimony correction for the number of parameters. RMSEA values close to zero indicate a very good fit, values less than 0.06 indicate a good fit, and values less than 0.08 indicate an acceptable fit [25]. The CFI and NNFI both measure the proportional improvement in fit by comparing a hypothesized model to a null model as a baseline model. The CFI and NNFI range from 0 (absolute lack of fit) to 1 (perfect fit); values greater than 0.90 indicate a good fit [26]. The TLI assesses the relative improvement per degree of freedom of the target model compared to the null model. Similar to the CFI and NNFI, TLI values greater than 0.90 indicate reasonable model fit [27]. Finally, the AIC assesses model fit in hypothetical replication samples of the same size and randomly drawn from the same population as the research sample [26]. The AIC is generally used to select the model with the best fit from among non-nested competing models estimated with the same data. The BCC operates in the same manner as the AIC, but imposes greater penalties [27]. The model with the smallest AIC and BCC has the best fit. The internal consistency of the RS-18 was assessed by calculating Cronbach's alpha and the corrected item-factor correlations.

The second step was to assess the criterion validity of the RS-18. Thus, a series of moderated multiple regression analysis were performed to analyse the effects of the interactions of the RS-18 and psychological pain-related variables theoretically related to resilience, such as anxiety sensitivity, catastrophizing, fear-avoidance beliefs, hypervigilance, and pain acceptance in relation to pain adjustment variables (pain intensity, emotional distress, functional impairment, and daily functioning). A series of standardized product variables were then created to represent interactions between RS-18 and pain intensity. Interaction effects were only analysed in those cases in which the predictors significantly predicted the outcome variables considered in the analyses. Furthermore, after controlling for diagnosis and pain duration, partial correlations between the RS-18 and the aforementioned variables were examined before the moderated multiple regression analyses were conducted. In line with Cohen's recommendation [28], effect sizes of 0.10, 0.30, and 0.50 (product moment *r*) were considered to be small, medium, and large, respectively.

Results

Preliminary analyses

The preliminary results showed that the majority of patients were female (71.2 %) and were married (66.8 %). They had completed secondary education (36.7 %) and were employed (48.3 %). Their ages ranged from 18 to 60 years (mean = 45.53, SD = 11.89). Regarding clinical characteristics, mean pain duration was 4.6 years (SD = 4.40), and the pain site was 68 % lumbar, 64 % sacral, 52 % cervical, and 32 % thoracic.

Univariate and multivariate distributions were examined. All the variables were normally distributed. Univariate and multivariate outliers were not detected. The multivariate distribution was normal, with a Mardia's coefficient of multivariate kurtosis of 0.37. There was no evidence of significant univariate skewness or kurtosis across any of the variables.

Factorial structure, internal consistency, and corrected item-factor correlations

Using the entire sample, confirmatory factor analysis was performed to examine the validity of the two-factor structure [9]. A one-factor model in which all the items were specified to a single factor was also estimated [10]. The two-factor structure failed to meet the recommended cut-off criteria. The one-factor structure had a good fit and was the most parsimonious. Table 1 shows all the goodness-of-fit indexes (GFIs) of the two models tested.

The RS-18 comprises 18 items with a one-factor structure with good internal consistency ($\alpha = 0.93$). Table 2 shows the descriptive statistics (means, SDs, and corrected inter-total correlations) and the factor loadings of the RS-18 items. As shown, the corrected item-factor correlations were appropriate, and the factor loadings were all significant ($p < 0.05$).

Validity evidences of the RS-18

The relationship of the RS-18 to pain-related variables (anxiety sensitivity, catastrophizing, fear-avoidance beliefs, hypervigilance, and pain acceptance) and pain adjustment variables (pain intensity, emotional distress, functional impairment, and daily functioning) was calculated by examining partial correlations, after controlling for diagnosis and pain duration. All the associations were significant. A small effect size was found between the RS-18 and fear-avoidance beliefs, pain intensity, and emotional distress; medium effect sizes were found between the RS-18 and anxiety sensitivity, catastrophizing, hypervigilance, functional impairment, and daily functioning; and large effect sizes were found between the RS-18 and pain acceptance (see Table 3).

The effects of the interactions between resilience (as measured by the RS-18) and the psychological pain-related variables on pain adjustment were analysed. The results indicate that although anxiety sensitivity, catastrophizing,

Table 1 Confirmatory factor analysis of the RS-18

	χ^2/df	RMSEA	CFI	NNFI	TLI	AIC	BCC
One-factor solution	1.46	0.05	0.97	0.95	0.96	342.000	353.501
Two-factor solution	4.93	0.08	0.93	0.91	0.81	729.446	732.069

Goodness-of-fit indexes ($n = 592$)

RMSEA root mean square error of approximation, *CFI* comparative fit index, *NNFI* non-normed fit index, *TLI* Tucker–Lewis index, *AIC* Akaike information criterion, *BCC* Browne–Cudeck criterion

Table 2 Means, SDs, corrected item-factor and factor loadings of the items of the RS-18 ($n = 592$)

Short items[a]	Mean	SD	Corrected item-factor correlations	Factor loading
1. Follow through with them	5.36	1.19	0.48	0.49
2. Manage one way or other	5.33	1.04	0.69	0.72
3. Keeping interested in things is important	5.74	1.01	0.71	0.73
4. I feel proud that I have accomplished things	5.50	1.21	0.67	0.73
5. Take things in stride	4.85	1.24	0.57	0.61
6. Friends with self	5.02	1.19	0.63	0.66
7. I am determined	5.12	1.36	0.65	0.69
8. Seldom wonder about point of it all	4.82	1.18	0.63	0.63
9. Take things 1 day at a time	4.63	1.30	0.48	0.40
10. I have self-discipline	5.12	1.21	0.66	0.69
11. I keep interest in things	5.41	1.15	0.69	0.72
12. Can find something to laugh about	5.53	1.18	0.69	0.74
13. I can get through difficult times because of experience	5.21	1.17	0.77	0.82
14. I can usually look at situation in number of ways	4.82	1.20	0.61	0.62
15. Life has meaning	5.73	1.10	0.61	0.70
16. I do not dwell on things	5.12	1.20	0.54	0.56
17. When in a difficult situation, can usually find way out	5.07	1.24	0.71	0.79
18. It's okay if there are people who don't like me	5.60	1.20	0.47	0.49

[a] Used by permission. The original Resilience Scale™ is copyrighted internationally by Wagnild and Young [9]

Table 3 Descriptive information and partial correlations between resilience and the pain-related variables and pain adjustment variables included in the study ($n = 592$)

Measures	Mean (SD)	RS-18 score
Anxiety sensitivity	35.07 (14.07)	−0.32**
Experiential avoidance	38.77 (15.35)	−0.12*
Catastrophizing	21.97 (8.17)	−0.37**
Fear-avoidance beliefs	27.25 (17.48)	−0.10*
Hypervigilance	23.44 (7.01)	−0.29**
Pain acceptance	70.33 (13.99)	0.55**
Pain intensity	5.08 (1.58)	−0.13*
Emotional distress	35.94 (6.20)	−0.22**
Functional impairment	19.34 (6.74)	−0.43**
Daily functioning	43.27 (11.38)	0.37**

* Significant (in the expected direction) at the 0.05 significance level

** Significant (in the expected direction) at the 0.01 significance level

fear-avoidance beliefs, hypervigilance, and pain acceptance significantly predicted pain intensity, resilience did not add incremental variance to these associations. Resilience, anxiety sensitivity, catastrophizing, and fear-avoidance beliefs were independently associated with emotional distress, although no interaction effects were found. The interaction between resilience and pain acceptance added significant incremental variance (1.9 %; $\beta = -0.004$, $p < 0.001$) to emotional distress. On the other hand, anxiety sensitivity, catastrophizing, hypervigilance, and pain acceptance significantly predicted functional impairment. Although resilience did not add incremental variance to these associations, it was independently associated with functional impairment. The interaction between resilience and anxiety sensitivity and between resilience and pain acceptance added significant incremental variance to daily functioning (1.2 %; $\beta = 0.007$, $p < 0.05$, and 1.3 %;

Table 4 Moderated multiple regression analyses showing the contribution of an interaction between resilience and psychological pain-related variables to predicting pain adjustment ($n = 585$)

Predictor variables	Pain intensity			Emotional distress			Functional impairment			Daily functioning		
	β	ΔR^2	R^2	β	ΔR^2	R^2	β	ΔR^2	R^2	β	ΔR^2	R^2
Anxiety sensitivity	0.05	0.02*		0.10*	0.10**		0.31**	0.28**		−0.02	0.07**	
Resilience	−0.11*			−0.27**			−0.34**		0.28	0.27**		
Interaction	0.03	0.01	0.02	−0.03	0.01	0.10	−0.03	0.01		0.10*	0.08	0.08*
Catastrophizing	0.06	0.04*		0.16**	0.05**		0.31**	0.27**		−0.18	0.11**	
Resilience	−0.18*			−0.14*			−0.32**			0.24**		
Interaction	0.01	0.01	0.04	−0.03	0.01	0.05	0.03	0.01	0.27	−0.03	0.01	0.11
Fear-avoidance beliefs	0.11*	0.07**		0.13*	0.05**		0.07	0.19**		−0.24**	0.13**	
Resilience	−0.23**			−0.18**			−0.43**		0.19	0.25**		
Interaction	0.01	0.01	0.07	0.01	0.02	0.05	−0.02	0.01		−0.07	0.02	0.13
Hypervigilance	0.07	0.04**		0.01	0.03**		0.19**	0.22**		−0.19**	0.11**	
Resilience	−0.18**			−0.19**			−0.38**			0.21**		
Interaction		0.01	0.04	−0.10*	0.09	0.04*	−0.01		0.22	−0.05	0.02	0.11
Pain acceptance	−0.33**	0.09**		−0.11*	0.07**		−0.23**	0.28**		0.07*	0.16**	
Resilience	−0.06			−0.19**			−0.37**			0.35**		
Interaction	−0.07	0.05	0.10	−0.14**	0.09	0.08**	0.02	0.02	0.29	−0.10*	0.09	0.17*

* Significant (in the expected direction) at the 0.05 significance level

** Significant (in the expected direction) at the 0.01 significance level

$\beta = -0.004$, $p < 0.05$, respectively). Resilience, catastrophizing, fear-avoidance beliefs, and hypervigilance made a significant independent contribution to daily functioning although no interaction effects were found (see Table 4).

Discussion

The purpose of this study was to present new empirical evidence of the RS-18 regarding its validity in a large sample of chronic musculoskeletal back pain patients; more specifically: to examine the internal structure of the RS-18, to assess its criterion validity by examining its association with other psychological pain-related variables (anxiety sensitivity, catastrophizing, fear-avoidance beliefs, hypervigilance, and pain acceptance), and to investigate its relative capacity to affect patient adjustment. The factorial structure of the Resilience Scale adapted to chronic pain patients [10] was replicated and showed excellent reliability as well as construct validity.

Confirmatory factor analysis of the RS-18 supported the validity of this version with a single-factor solution. These results are consistent with previous research [10, 29]. Accordingly to the data, the RS-18 is a one-dimension instrument that includes aspects of both original factors of the RS-25: personal competence (10 items) and acceptance of self and life (8 items). In fact, Wagnild and Young [9] recommended additional research directed to analyse the underlying dimensions of the RS, since their results supported a unidimensional measure, although they chose a two-factor solution based on the criterion of factors with eigenvalues greater than one. Since the original RS was developed with the aim of identifying the degree of resilience considered as a personality characteristic that promotes adaptation [9], the RS-18 represents a valid and reliable instrument to assess resilience behaviour in chronic pain patients. Like in a previous study [10], the RS-18 showed high internal consistency (Cronbach's $\alpha = 0.93$) as well as appropriate corrected item-factor correlations. In addition, the data of the current study showed that RS-18 is associated with conceptually related measures of adaptation to pain, after controlling for diagnosis and pain duration. These results are also in line with those found previously [10]. Overall, the findings suggest that resilience is a stable resource for effective coping and adaptation in the face of major life stress such as a chronic pain condition. In line with the authors of the original RS [9], the items of the personal competence factor suggested self-reliance, independence, determination, invincibility, mastery, resourcefulness, and perseverance. The items of the acceptance of self and life factor represented adaptability, flexibility, a sense of peace in spite of adversity, and balanced perspective of life. On the whole, both factors reflect a personal characteristic that promotes adaptation in a stressful context, as represented by experiencing chronic pain. That is, resilience represents the ability of patients facing a disabling physical illness to maintain relatively stable levels of psychological, emotional, and social functioning [10].

In the context of adaptation to chronic pain, vulnerability and resilience have been considered to be related, although separate, factors that function simultaneously and affect pain adjustment [6, 30]. In relation to this idea, the fear-avoidance model of chronic back pain represents the most influential conceptualization about those factors that could explain why patients became pain "avoiders" or pain "confronters" [31]. Nevertheless, the fear-avoidance model places emphasis on a dysfunctional pattern in which catastrophizing, fear-avoidance beliefs, pain-related anxiety, and hypervigilance represent the vulnerability construct. Therefore, this pattern is a risk factor for the development of chronic pain through diminished daily functional activity and increased perceived disability, which is negatively associated with quality of life. Nonetheless, as recently argued by Crombez et al. [31], fear-avoidance model fails to explain how individuals try to function despite pain. That is, within the framework of this conceptual model, it remains unclear how a confrontational style leads to better pain adjustment and what forms of confrontation might be adaptive [32]. The findings of the current study constitute a first approach to these issues.

The results of measuring resilience using the RS-18 show that resilience is a relevant psychological variable that is not only related to pain adjustment variables (i.e. pain intensity, functional impairment, and daily functioning), but also with conceptually related measures of adaptation to pain. Furthermore, the results showed that the RS-18 also moderates the relationships between some of these variables and the psychological vulnerability variables considered in the fear-avoidance models (i.e. anxiety sensitivity, catastrophizing, fear-avoidance beliefs, and hypervigilance), and between these pain adjustment variables and pain acceptance, considered as representative of a confrontational pattern. Overall, these results bring new empirical evidence to the validity of the RS-18.

In line with previous research [10, 33, 34], in the present study, the RS-18 was positively associated with pain acceptance and higher daily functioning levels, and negatively related to functional impairment. It is worth noting that large effect sizes were found between the RS-18 and pain acceptance. Moreover, resilience moderated the relationship between pain acceptance and emotional distress, suggesting that this negative relationship was stronger when the RS-18 scores were high. Pain acceptance has been demonstrated to be positively associated with better mood [20]. Emotional distress (indicated by depression and anxiety scores on the HADS) could be considered as reflecting worse adaptation to a pain condition. Therefore, the results of this study suggest that chronic pain patients with higher scores on resilience would better accept pain and in turn would be less depressed and anxious. It is noteworthy that resilience moderated the relationship between pain acceptance and daily functioning; hence, high RS-18 scores indicated increased pain acceptance and improved daily functioning.

It should be noted that there is increasing evidence that patients seek health care due to the degree to which pain interferes with daily life rather than to pain itself [31]. Furthermore, it is recognised that individuals who accept their chronic pain and maintain meaningful lives despite the pain are more likely to re-orientate their attention toward positive everyday activities and other rewarding aspects of life [6, 31]. In line with this, as measured by the RS-18, resilience seems to be one of the factors that would predict a confrontational style that, in turn, would lead to better pain adjustment.

It is also worth recalling that, despite being related, resilience and pain acceptance are not the same. As Sturgeon and Zautra [6] recently suggested, resilience could be defined as a construct that reflects overall individual well-being despite the presence of a significant stressor, whereas acceptance refers to a processes represented by adaptive cognitive and behavioural efforts. On the other hand, our results support those obtained in previous studies [10, 34]. In fact, Wagnild and Young [9] described resilience as the "ability to identify what is stressful, appraise realistically one's capacity for action, and problem solve effectively" (p. 167).

On the other hand, after controlling for diagnosis and pain duration, significant associations were found between the RS-18 and the variables traditionally associated with poor adjustment to chronic pain (i.e. anxiety sensitivity, catastrophizing, fear-avoidance beliefs, and hypervigilance). These results are similar to those previously obtained by Ruiz-Párraga et al. [10]. In the framework of fear-avoidance models [35], these variables are considered to represent the vulnerability construct and lead to the dysfunctional avoidant pattern exhibited by some patients. The RS-18 only moderated the relationship between anxiety sensitivity and daily functioning; thus, high RS-18 scores indicated a weak relationship between anxiety sensitivity and daily functioning. Nevertheless, no interaction effects were found between the RS-18 and catastrophizing, fear-avoidance beliefs, and hypervigilance in the prediction of pain intensity, emotional distress, functional impairment, and daily functioning. These results suggest that vulnerability variables and resilience variables are independent; the results also provide new evidence on the validity of the two-factor model of vulnerability and resilience processes associated with adaptation to chronic pain [2, 36]. According to the results of the current study, two distinct factors appear to predict adjustment to chronic pain: a resilience factor comprising resilience and pain acceptance; and a vulnerability factor comprising the variables included in the fear-avoidance models [35, 37]:

catastrophizing, fear-avoidance beliefs, and hypervigilance.

Naturally, the current study has a number of limitations. The fact that the sample consisted of chronic back patients alone may affect the interpretation and generalizability of the results. In addition, the results may have been different if the study had included participants with other chronic pain diagnoses. A second limitation is that self-report instruments alone were employed to assess the variables examined. These results should be replicated in future studies using another assessment method. In addition, the possible influence of pain interventions (e.g. medication, physiotherapy, activity-related instructions) was not controlled for. Finally, all the findings were based on cross-sectional and correlational data. In the future, longitudinal research could provide solid evidence of the protective role of resilience at different stages of the development of chronic pain conditions.

Despite these limitations, the RS-18 provides clinicians and researchers with a valid and reliable measure of pain-related resilience among pain patients. In addition, this study supports the RS-18 as a valid and reliable instrument for clinical practice and research. This scale has the advantage of excluding items closely related to functional disability and impairment. Furthermore, the RS-18 scores appear to be of use in predicting adjustment to chronic pain. Given that improving resilient behaviour could be an important target in the treatment of pain patients, it is of great importance to validate measures that can evaluate resilience indicators.

Acknowledgments This work was partly supported by a grant from the Spanish Ministry of Economy and Competitiveness (PSI2013-42512-P).

Conflict of interest This work has not received financial arrangements that may represent a possible conflict of interest.

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