

A CONFIRMATORY FACTOR ANALYSIS OF THE RESILIENCE SCALE ADAPTED  
TO CHRONIC PAIN (RS-18): NEW EMPIRICAL EVIDENCE OF THE PROTECTIVE  
ROLE OF THE RESILIENCE ON PAIN ADJUSTMENT

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## ABSTRACT

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 present new empirical evidence regarding its validity. 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). 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 predict better pain adjustment, but also moderates the relationships between several psychological pain-related variables and pain adjustment variables. 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.

## **1. Introduction**

There is a growing interest in the construct of resilience. While hard to define, it has been suggested that resilience implies experiencing adversity (illness) and adapting in order to bounce back and thrive, sometimes in changed ways [37]. 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 is referred to as a set of adaptive responses to pain and pain-related life adversities involving three primary components: recovery, sustainability, and growth [38]. Of these, recovery has been considered as the most relevant characteristic or resilient functioning as well as the most widely studied [20]. In line with this, it has been found that learning to manage the pain gave the patient a sense of empowerment [10]. This implies accepting the pain, which has been considered as a positive characteristic in resilient patients [29,30].

Resilience indicators can be categorized into stable resources and modifiable positive states that vary over time [29,38]. Modifiable resources are considered to be affected by stable resources. Further, the modifiable resources are subject to the experience of current pain as well as other contextual stressors. Thereby, stable resilience resources are considered as directly and indirectly influential factors of resilient outcomes by affecting the likelihood of the availability of resilience resources when needed [38]. Taking this into account, valid and reliable measures are needed to assess both stable and modifiable resilience indicators.

In relation to the assessment of resilience as a stable factor, there are several instruments developed in general population [4,7,36]. However, to our knowledge there is only one instrument adapted to chronic pain populations [26]. The adapted instrument

was the Resilience Scale (RS, [36]), designed to identify the degree of individual resilience considered as a personality characteristic that promotes adaptation. The results of the adaptation of the RS in a sample of chronic musculoskeletal pain patients (N = 300) did not support the original two-factor structure [26], suggesting that this resilience scale is a one-dimensional 18-items instrument that includes aspects of both original factors: personal competence and acceptance of self and life. The RS-18 showed high internal consistency, stability, and adequate construct validity [26]. Therefore, the purpose of this work was to present new empirical evidence of the RS-18 regarding its validity in a large sample of chronic musculoskeletal back pain patients.

Specifically, the main aims were to examine the internal structure of the RS-18, to assess its criterion validity by analyzing 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).

## **2. Methods**

### *2.1. 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 3 or more points on the 10-point Composite Pain Intensity Score [14], and continuous or intermittent pain appearing for 5 or more days per week. Exclusion criteria were: presence of severe injuries requiring immediate surgery; presence of major psychiatric illness (i.e. psychosis, schizophrenia, personality disorders or a bipolar disorder, according to their

medical history); presence of other chronic diseases involving disability distinct from chronic pain; and insufficient knowledge of the Spanish language.

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 years to 60 years (Mean = 45.53, *SD* = 11.89). Regarding clinical characteristics, the main of pain duration was 4.6 years (*SD* = 4.40) and the site of pain was 68% lumbar, 64% sacral, 52% cervical, and 32% thoracic.

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. No one refused participation. Each participant completed a battery of questionnaires in the same order in an oral semi-structured interview format with a psychologist lasting 1.5 hours. 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).

## 2.2. Measures

### 2.2.1. The Resilience Scale adapted to chronic pain patients (RS-18; [26])

The RS-18 comprises 18 items in one factor scored on a 7-point scale ranging from 1 (*Disagree*) to 7 (*Agree*) showing good internal consistency (alpha coefficient = .92), stability ( $r = 0.9$ ;  $p < 0.001$ ), and construct validity, with significant correlations of RS-

18 and several pain-related variables (catastrophizing, pain-acceptance, active coping, passive coping, and pain-related anxiety), and RS-18 and pain adjustment variables (pain intensity, disability, functional impairment, daily functioning, anxiety, and depression).

#### 2.2.2. Anxiety Sensitivity Index (ASI; [25])

The ASI is a self-report measure of AS. 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 ( $\alpha = .95$ ) [27].

#### 2.2.3. Pain Catastrophizing Scale (PCS; [32])

The PCS is composed of 13 items on a 5-point scale, ranging from 0 (*Not at all*) to 4 (*All the time*). The PCS was developed to assess 3 components of catastrophizing: rumination, magnification, and helplessness. It has excellent psychometric properties and has been widely used in research. The Spanish version [21] used in this study has good psychometric properties and a high internal consistency ( $\alpha = .94$ ). The PCS total score was used in this study.

#### 2.2.4. Fear-Avoidance Beliefs Questionnaire (FABQ; [34]).

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 [16] has high internal consistency ( $\alpha = .93$ ) and validity.

#### 2.2.5. Pain Vigilance and Awareness Questionnaire (PVAQ; [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 [9] is a reliable ( $\alpha = .89$ ) and valid measure. The PVAQ total score was used in this study.

#### 2.2.6. Chronic Pain Acceptance Questionnaire (CPAQ; [19])

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 (CPAQ-SV; [3]) has suitable internal consistency ( $\alpha = .80$ ) and construct validity.

#### 2.2.7. Composed Pain Intensity Index

Jensen et al. [14] 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 subject by calculating the average of the mildest, average, worst, and current pain.

#### 2.2.8. Hospital Anxiety and Depression Scale (HADS; [39])

The HADS comprises two 7-item scales designed to rate depression (HADS-D) and anxiety (HADS-A), respectively. The scores from both scales can be added to produce a total score of emotional distress (HADS-T). Ratings may range from 1 (*Almost always*) to 4 (*Almost never*). The Spanish version used in this study [22] has suitable reliability ( $\alpha = .85$  for HADS-T).

### 2.2.9. The Impairment and Functioning Inventory (IFI [24])

The IFI [24] is composed of 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 ( $\alpha = .84$  for functional status, and  $\alpha = .85$  for functional impairment). Factor analytic techniques support its hypothesized internal structure [24].

### 2.3. *Data Analysis*

All analyses were performed using the Statistical Package for the Social Sciences (SPSS, Windows version 21.0, SPSS Inc, Chicago, IL) and AMOS Graphics (version 21.0; Small Waters Corp., Chicago, IL) software. Univariate and multivariate distributions were examined. All the variables were normally distributed. Univariate and multivariate outliers were not detected. The multivariate distribution was found to be normal, with a Mardia's coefficient of multivariate kurtosis of .37. There was no evidence of significant univariate skewness or kurtosis across any of the variables.

As a first step of the analyses, the internal structure of the RS-18 was analyzed. In line with this, both one-factor solution model and two-factor solution model were examined for the purpose of assessing which one show the best fit. A confirmatory factor analysis was performed via Structural Equation Modelling (SEM) for each model. Analyses were performed using the Maximum Likelihood and the robust estimation method. In addition to the  $\chi^2$  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), and Tucker-Lewis index (TLI), Akaike information criterion (AIC), and Browne-Cudeck criterion (BCC). The RMSEA reflects the magnitude of difference between the fitted and actual

covariance matrices with a parsimony correction for the number of parameters. Values of RMSEA closer to zero suggest a better fit, values less than .08 are indicative of an adequate fit and values less than .06 indicate a good fit [13]. The CFI and NNFI both measure the proportional improvement in fit by comparing a hypothesized model to the null model as a baseline model. The CFI and NNFI range from 0 (absolute lack of fit) to 1 (perfect fit), and fit is considered to be good when the values are more than .90 [15]. The TLI assesses the relative improvement per degree of freedom of the target model over the null model. Similar to the CFI and NNFI, values of TLI more than .90 indicate reasonable model fit [12]. 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 [15]. The AIC is generally used to select among non-nested competing models estimated with the same data. The BCC operates in the same manner as the AIC but imposes greater penalties [5]. The model with the smallest AIC and BCC is considered to have the best fit. To explore the internal consistency of the RS-18, Cronbach's alpha and the corrected item-factor correlations were calculated.

The second step was to assess its criterion validity. To accomplish this, a series of moderated multiple regression analysis were performed, in order to test the effects of the interactions of RS-18 and psychological pain-related variables theoretically related to resilience such as anxiety sensitivity, catastrophizing, fear-avoidance beliefs, and pain acceptance across pain adjustment variables (pain intensity, emotional distress, functional impairment, and daily functioning). A series of standardized product variables were then created to represent the interactions between RS-18 and pain intensity. Interaction effects were only analyzed in those cases in which the predictors significantly predicted the outcome variables considered in the analyses. Further, partial correlations, controlling for diagnosis and pain duration, between the RS-18 and the

aforementioned variables were examined before the moderated multiple regression analyses were carried out.

### **3. Results**

#### *3.1. Factorial structure, internal consistency, and corrected item-factor correlations*

Using the whole sample, confirmatory factor analysis was performed to examine the validity of the two-factor structure [36]. A one-factor model in which all the items were specified to a single factor was also estimated [26]. 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 tested models.

-Insert Table 1 here, please-

The RS-18 consists of 18 items with one-factor structure which, showed good internal consistency ( $\alpha = .93$ ). Descriptive statistics (means, standard deviations, and corrected inter-total correlations) as well as the factor loadings of the RS-18 items are presented in Table 2. As shown, the corrected item-factor correlations were appropriate and the factor loadings were all significant ( $p < .05$ ).

-Insert Table 2 here, please-

#### *3.2. Validity evidences of RS-18*

The relationship of the RS-18 to both 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) were calculated by examining partial correlations, controlling for diagnosis and pain duration. All the associations were significant. A small effect size [6] 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. Large effect sizes were found between the RS-18 and pain-acceptance (see Table 3).

-Insert Table 3 here, please-

Then, the effects of the interactions of resilience as measured by the RS-18 and the psychological pain-related variables across pain adjustment variables were tested. Results indicate that although anxiety sensitivity, catastrophizing, fear-avoidance beliefs, hypervigilance, and pain acceptance significantly predicted pain intensity, resilience did not add an incremental variance to these associations. Regarding emotional distress, resilience, anxiety sensitivity, catastrophizing, and fear-avoidance beliefs made a significant independent contribution, although no interaction effects were found. The interaction between resilience and pain acceptance added a significant incremental variance to emotional distress, with an increment of 1.9% ( $B = -.004$ ,  $p < .001$ ). On the other hand, anxiety sensitivity, catastrophizing, hypervigilance, and pain acceptance significantly predicted functional impairment. Although resilience not added an incremental variance to these associations, it made also a cumulative and independent contribution. The interaction between resilience and anxiety sensitivity, as well as resilience and pain acceptance added a significant incremental variance to daily functioning of 1.2% ( $B = .007$ ,  $p < .05$ ) and 1.3% ( $B = -.004$ ,  $p < .05$ ), 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).

-Insert Table 4 here, please-

### **3. 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, experiential avoidance, pain acceptance and fear-avoidance), and to investigate its relative capacity to affect patient adjustment. The factorial structure of the Resilience Scale adapted to chronic pain patients (RS-18[26]) 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 [1,26,35]. Accordingly to the data, the RS-18 is a one-dimensional instrument that includes aspects of both original factors: personal competence and acceptance of self and life. Since the original RS was developed with the aim of identifying the degree of resilience considered as a personality characteristic that promotes adaptation [36], the RS-18 represents a valid and reliable instrument to assess resilience behaviour in chronic pain patients. Like in a previous study [26], the RS-18 showed high internal consistency (Cronbach's  $\alpha = .93$ ) 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 [26]. Taking as a whole, the findings point to the notion that resilience could be considered as a stable resource for effective coping and adaptation in the face of major life stress as represents a chronic pain condition. That is to say, resilience represents the ability of patients facing a disabling physical illness to maintain relatively stable levels of psychological, emotional and social functioning [26].

In the context of adaptation to chronic pain, vulnerability and resilience have been considered as related, albeit separable, factors that are at work at the same time and affect pain adjustment [30,31]. In relation to this, 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” [8]. Nevertheless, the fear-avoidance model highlights the 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 has been recently argued by Crombez et al. [8], what is missing in the fear-avoidance model is how individuals try to function despite pain. To said, within the framework of this conceptual model it remains unclear how a confrontational style leads to a better pain adjustment and what forms of confrontation might be adaptive [11]. The findings of the current study constitute a first approach in this direction.

As our data have indicated, resilience as measured by the RS-18 is a relevant psychological variable that not only is related to pain adjustment variables (i.e. pain intensity, functional impairment, and daily functioning), but 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 [17,23,26], in the present study the RS-18 was positively associated with pain acceptance and higher daily functioning levels, and negatively related to functional impairment. Worth noting, 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. Importantly, resilience moderated the relationship between pain acceptance and daily functioning; hence, high RS-18 scores increased the relationship between pain acceptance and daily functioning. It must be borne in mind that research is accumulating that it is not pain itself, but the extent to what pain interferes with daily life that provides patients the main motivation of to seek health care [8]. Furthermore, is well known that individuals who accept their chronic pain and maintain meaningful lives in spite of pain, are therefore likely to re-orientate their attention toward positive everyday activities and other rewarding aspects of life [8,30]. In line with this, resilience as measured by the RS-18 seems to be one of the factors that would predict a confrontational style that, in turn, leads to a better pain adjustment

It is also noteworthy that although related, resilience and pain acceptance are not the same. As Sturgeon and Zautra [30] have recently pointed, resilience could be defined as a construct reflecting 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, these results support those found in previous studies [23,26]. Take as a whole, the current findings also provide further evidence that resilient patients possess a greater belief that they can effectively control their pain and that they are more likely to adopt a more adaptive pain coping strategies [10,29]. In fact, Wagnild and Young [36] 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, significant associations were found between the RS-18 and those variables traditionally associated with poor adjustment to chronic pain (i.e., anxiety sensitivity, catastrophizing, fear-avoidance beliefs, and hypervigilance), after controlling for diagnosis and pain duration. These data are similar to those obtained previously by Ruiz-Párraga et al. [26]. In the framework of the fear-avoidance models [2], these variables are considered as representative of the vulnerability construct and give rise to a dysfunctional avoidant pattern exhibited by some patients. The RS-18 only moderated the relationship between anxiety sensitivity and daily functioning; thus, the relationship between anxiety sensitivity and daily functioning was weaker when the RS-18 scores were high. 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 seem to point to the idea that vulnerability variables and resilience variables are independent, and provide new evidence for the two-factor model of vulnerability and resilience processes associated with adaptation to chronic pain [28,38]. Accordingly to the data of the current study, two distinct factors appear to predict adjustment to chronic pain: a resilience factor composed of resilience and pain acceptance, and a separate vulnerability factor composed of those variables included in the fear-avoidance models [2,33]: catastrophizing, fear-avoidance beliefs, and hypervigilance.

Naturally, the current study has a number of limitations. It should be noted that the entirely chronic back pain sample we used may affect interpretability of the current findings and that these 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. Our results should be replicated in future studies using another assessment method. In addition, the possible influence of pain interventions (eg. medication, physiotherapy, activity-related instructions) was not controlled for. Finally, all findings were based on cross-sectional and correlational data. In the future, longitudinal research could provide solid evidence on the role of resilience at different stages of the development of chronic pain conditions.

Despite these limitations, our results provide clinicians and researchers with access to a valid and reliable measure of pain-related resilience for 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 seem to be useful in predicting adjustment to chronic pain. Given that improving resilient behaviour could be an important target for the treatment of pain patients, the validation of measurements that can evaluate resilience indicators is of great importance.

### **Acknowledgments**

This work was partly supported by a grant from the Andalusian County Council (Proyectos Excelencia Junta de Andalucía, P07-SEJ-3067) and a grant from the Spanish Ministry of Science and Innovation (PSI2008-01803/PSIC). Gema T. Ruiz-Párraga has received a grant from the Andalusian County Council (Junta de Andalucía, Proyectos Excelencia 2008-2012). This work has not received financial arrangements that may represent a possible conflict of interest.

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