Social factors, disability and depressive symptoms in adults with chronic pain

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ABSTRACT

Objectives: The primary aim of this study was to better understand the role that social factors (i.e., social support, satisfaction in participation with social roles, social isolation, and self-perceived ability to perform social roles and activities) play in pain-related interference and depressive symptoms in adults with chronic pain. Moreover, this study also examined if sex exerts a moderating role in these associations.

Methods: In this cross-sectional-study, three hundred and sixty-four adults with chronic pain participated: 133 were university students and 231 were individuals from the community. University students completed a paper-and-pencil survey and individuals from the community responded to a web-based survey. Both surveys included the same questions assessing socio-demographic, pain characteristics, pain-related interference, depressive symptoms and social factors.

Results: Only satisfaction in participation in social usual roles and selfperceived ability for participating in such social roles contributed independently, significantly and negatively to the prediction of pain interference, whereas all four social factors made independent and significant contributions to the prediction of depressive symptoms. Satisfaction with participation in usual social roles, self-perceived social ability and social support were negatively related to depressive symptoms, whereas social isolation was positively related. The results also indicated that sex moderated the associations between social factors and depressive symptoms, but not between social factors and pain interference.

Discussion: The study provides important new findings regarding the associations between social factors and physical and psychological function of individuals with chronic pain, supporting biopsychosocial models.

Keywords: chronic pain, social factors, sex, pain interference, depressive symptoms.

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INTRODUCTION

Chronic pain is a common condition, with a prevalence of about 20% of the adult European, United States and Canadian populations ^{1–3}. Moreover, individuals with chronic pain often report significant negative effects of pain on their physical and psychological function ^{4–7}. The biopsychosocial model of pain hypothesizes that pain and its impact are influenced by biological, psychological and social factors ^{8,9}.

Although research on the role of social factors in chronic pain lags behind research on biological and psychological factors, the research that does exist has identified a number of social factors associated with physical and psychological function of individuals with chronic pain ^{10,11}. Social support is the most commonly studied social factor. For example, in individuals with arthritis, findings show that the availability of more social support is associated with lower levels of disability and depressive symptoms (e.g., ^{12–16}). In addition, a recent study found that perceived social support moderated the association between pain intensity and depressive symptoms in a sample of older individuals with chronic pain ¹⁷. However, it is possible that other social factors, such as social isolation, may also play an important role in an individual's adjustment to chronic pain. In support of this possibility, a focus group study of women with chronic pelvic pain and endometriosis found that these women became more socially isolated after the onset of chronic pain, and that this isolation emerged as a key issue undermining their quality of life ¹⁸. Leung and colleagues ¹⁹ also found that social isolation was an important factor associated with the onset and evolution of chronic pain in elderly individuals.

Other social factors that might be related to the adjustment to chronic pain include satisfaction with social roles, such as with one's work and family role function. For example, it has been reported that a poor job satisfaction is associated with a higher prevalence of chronic pain ²⁰, and was a risk factor for back pain ²¹. In addition, job satisfaction has also been found to be a motivator for staying at work among workers with chronic musculoskeletal pain ²². Moreover, satisfaction with one's family role function has been identified as a relevant factor that can influence adjustment to chronic pain in adults. For example, an epidemiological study reported that 33% of patients with fibromyalgia reported no satisfaction with family function ²³. In addition, another study found that satisfaction with social roles mediated the relationship between pain intensity and depressive symptoms in a sample of individuals with chronic pain ²⁴.

Although the available studies, briefly reviewed above, support the conclusion that social factors such as perceived social support, social isolation, and satisfaction with social roles are associated with adjustment to chronic pain, to our knowledge, no study to date has yet evaluated the role of perceived ability to perform social roles and activities in the adjustment to chronic pain. On the surface, perceived ability to participate in social role function might be viewed as similar to the construct of satisfaction with social roles. However, one's perceived ability to do something (i.e., self-efficacy) is distinct from the amount of satisfaction one has with that activity; it is possible to believe one can engage in activities that do not produce satisfaction, and it is also possible to experience satisfaction when one engages in activities that one also finds very difficult. Moreover, one's perceived ability to engage in social roles has the

potential to be important, such social role self-efficacy beliefs might have an effect on social function over and above other social factors, including satisfaction with social roles ²⁵.

There are some studies showing that women with chronic pain report higher levels of social support than men ^{26,27}, but the findings are not entirely consistent. For example, a number of studies have reported higher levels of depression and disability in women compared to men with chronic pain ^{28–30}, whereas other studies have not found such differences according to sex ^{31,32}. Thus, on the basis of the available findings, it is not yet possible to conclude whether sex moderates the association between social factors and patient function in individuals with chronic pain. In fact, to our knowledge, no study has tested sex as a potential moderator of the associations between social factors and patient function.

Given these considerations, the primary aim of this study was better understand the role that social factors (specifically, social support, satisfaction in participation with social roles, social isolation, and self-perceived ability to perform social roles and activities) play in pain-related disability and depressive symptoms in adults with chronic pain. A secondary aim was to test the moderating role that sex might be playing in these associations. Based on the findings from previous research, we hypothesized that social support, satisfaction in participation in social usual roles, and self-efficacy for participating in such social roles would all evidence negative and independent associations with the criterion variables of perceived pain-related disability and pain intensity, whereas social isolation would show significant positive unique associations with the criterion variables. We did not have any *a priori* hypothesis

regarding the secondary aim due to lack of previous research testing sex as a moderator of the associations between social factors and psychosocial function.

METHODS

Participants

A convenience sample of 364 individuals with chronic pain participated in this study. The inclusion criteria were (1) being able to speak, read, and write Spanish, (2) being at least 18 years old, and (3) having chronic pain (i.e., reporting a persistent pain problem for the last 3 months or longer, and having pain on at least half of the days in the past 6 months ³³. In order to ensure an adequate sample size for testing the study hypotheses, two samples of individuals with chronic pain were recruited; one was a sample of university students (N=133) who responded to a paper-and-pencil survey and the other was a sample of individuals from the community (N=231) who responded to a web-based survey (see below). Eighty-nine percent of the total sample were women and had a mean age of 36.31 years (SD = 14.05). A plurality of the sample (35%) had graduated from high school. About a quarter of the sample a university degree. See Table 1 for more details regarding the demographics of the study participants.

[Insert Table 1 about here]

Procedure

In order to obtain data for the current analyses, we collected data from two groups. The first group were students of the Universitat Rovira i Virgili who provided informed consent to participate in the study, and who then completed a paper-and-pencil survey. Data from two of the participants from this sample

were not used, because they did not answer most of the survey items. From an initial group of 441 university students who completed the survey and were screened for study inclusion, we identified 133 (30%) who met criteria for having chronic pain. The second group of participants was recruited from the community by contacting them through social networks; specifically, by contacting chronic pain patient associations, support groups, and network discussion groups, and inviting the members of these organizations to participate. Some of the participants in this second sample also learned of the study by word of mouth. Four hundred and twelve individuals from the community gave their informed consent by checking the box of study participation agreement and provided at least some data via an online survey. However, only 249 (60%) of these responded to most of the questions on the survey. Of these, 231 (93%) met the study eligibility criteria for having chronic pain, and were included in the analyses.

The first page of both surveys included information about the study purposes and procedures, as well as a place for participants to indicate that they consented to participate. They were then invited to respond to questions divided into three sections which asked for information about: (1) sociodemographics; (2) pain-related information; and (3) other domains, all described below. The questionnaires administered to the two samples were otherwise identical. The online survey was designed to be completed using the Lime Survey software (<u>https://www.limesurvey.org/</u>), with the data being saved on a secure server that is the property of the Chair in Pediatric Pain, Universitat Rovira i Virgili. We provided a contact email address and a telephone number to participants in case they needed any help in completing the surveys. If a

participant sent a message, we would then have known the name of one of the study participants. However, we had no way to link that participant to his or her data, because no identifying information (including the participant names or email addresses) were collected as a part of the survey. Regarding the procedures for the paper-pencil survey, university teachers known to the investigators were contacted and asked about their willingness to have the survey be administered to their students during a class period. The study survey was then administered to students during the designated period. A member of the research team was available during administration to answer any questions that participants might have about the survey questions.

Measures

Socio-demographic variables

All participants were asked to provide information about their age, sex and education level.

Pain characteristics

Participants were asked to provide information about their most common/frequent pain problem during the previous three months; specifically about its location, duration, frequency, and intensity. Pain location was assessed using the pain site checklist based on the site classification recommended by International Association of Pain ³⁴. Information about pain duration was provided using a 6-point Likert scale (1 = "Less than a month," 2 = "From 1 to 3 months," 3 = "From 3 to 6 months," 4 = "From 6 months to a 1 year," 5 = "From 1 year to 5 years," 6 = "More than 5 years"). Pain frequency was assessed using a 3-point Likert scale (1 = "Less than 5 years"). Pain frequency in the last 6 months," 2 = "Half of the days in the last 6 months," 3 = "Less than

half of the days in the last 6 months"). Finally, the participants were asked to rate their average pain intensity in the last seven days for their most frequent pain problem using a 0-10 Numerical Rating Scale (NRS-11) where 0 = "No pain" and 10 = "Very much pain." The NRS-11 has been shown to provide reliable and valid scores when used with adults ^{35–37}.

Pain interference

The 7-item Brief Pain Inventory (BPI) ³⁸ was used to assess pain interference. With this scale, respondents are asked to rate the extent to which during the last week pain has interfered with seven activities of daily living (i.e., general activity, mood, walking ability, normal work, relations with other people, sleep and enjoyment of life) on a 0-10 numerical scale where 0 = "Does not interfere" and 10 = "Completely interferes." The BPI Pain Interference score can range from 0 to 70. This measure has been shown to have good psychometric properties when used in patients with chronic pain ^{39–41}. The Spanish form of the BPI Pain Interference scale has also been shown to provide reliable and valid scores ⁴². Its internal consistency was excellent (Cronbach's alpha = 0.93) in the current sample.

Depressive symptoms

To assess depressive symptoms, we used the Depression subscale of the Hospital Anxiety and Depression Scale (HADS)⁴³, which includes seven items that assess depressive symptoms during the previous week. Participants respond to each items on a 4-point Likert scale, and the total score can range from 0 to 21; higher scores indicate a higher level and frequency of depressive symptoms. The HADS has shown to provide a valid and reliable scores of depressive symptoms ⁴⁴. We used a Spanish version of the HADS whose scores have shown good reliability and validity in patients with cancer (e.g. ^{45–48} and fibromyalgia ⁴⁹. In our study, the total HADS Depression subscale showed good internal consistency, with a Cronbach's alpha of 0.87.

Social factors

Social factors were assessed using items from the Patient-Reported Outcomes Measurement Information System (PROMIS) Social Health Profile ⁵⁰. Specifically, we used the short forms assessing seven social domains: instrumental social support, emotional social support, informational social support, companionship, satisfaction in participation in social roles, social isolation, and self-perceived ability to participate in social roles and activities. All short forms have 4 items and most of them use the same item responses; a 5point Likert scale indicating frequency (Never, Rarely, Sometimes, Usually, Always). However, the short forms which assess satisfaction with participation in social discretionary activities and satisfaction with participation in social roles use different item responses. With these scales, respondents are asked to indicate how much they agree with the statements about satisfaction experienced in the last 7 days using a 5-point Likert Scale (Not at all, A little bit, Somewhat, Quite a bit, Very much). Each short form score can range from 4 to 20. All of the short forms have shown good psychometric properties ^{50,51}. Spanish short forms for all domains available are at http://www.healthmeasures.net/explore-measurement-systems/promis, and showed good to excellent internal consistency properties, as shown by Cronbach's alpha (range, 0.86 to 0.95), in this sample. A global score for social support was obtained by averaging scores of 4 short forms (instrumental social social support, informational support, emotional social support and

companionship) after conducting confirmatory factor analysis that is detailed in the data analyses plan.

Data analyses plan

We first computed percentages, means, and standard deviations of sociodemographic and pain-related variables to describe the study sample. We also performed Pearson correlation coefficients between the study variables to describe their zero order associations. As four of the social factors (companionship, emotional support, informational support and instrumental support) were highly correlated each other, we thought that they might represent different components of a higher order factor of "social support." We therefore evaluated this possibility using a Confirmatory Factor Analysis (CFA). Maximum Likelihood Robust (MLR) was used as the factor extraction method and the following indices were computed: Chi-square, Comparative Fit Index (CFI), and Standardized Root Mean Residual (SRMR) to help evaluate the goodness of fit of the model. CFI values should range from 0.95 to 1.00 to indicate a good model of fit, and between 0.90 and 0.95 to show an acceptable level of fit; SRMR should be kept below 0.10⁵². We also considered computing RMSEA, as this is commonly used to evaluate the fit of CFAs. However, the RMSEA in this case was not appropriate ⁵³, since it is not reliable enough when the CFA model shows small degrees of freedom as in this study. This could be due to the fact that there are just 4 components and the sample size is not considered to be very large. If the expected model was confirmed, we would use a unique factor of social support for subsequent analyses. Next, we evaluated the suitability of the data for the planned regression analyses by examining skewness and kurtosis, homoscedasticity and multicollinearity. To

test the study hypothesis, that the social factors would make independent contributions to the prediction of the study criterion variables, we conducted two hierarchical regression analyses, one for each criterion (i.e., perceived painrelated interference and depressive symptoms). In step 1, we entered pain intensity, sex (men vs. women) and data source (i.e., university vs. community sample) to control for their potential confounding effects on the predictor and criterion variables. We then entered the 4 social factor predictors (i.e. X,Y,Z) in step 2. Finally, in step 3, we entered interaction terms (i.e. Sex*X, Sex*Y, Sex*Z, Source*X, Source*Y) representing the moderating effects of sex and data source on the association between each social factor and the criterion variable. All continuous predictor variables that were going to be examined in interaction terms were 0 centered to avoid collinearity problems than could have an effect on the regression results. If any interaction term emerged as significant, we planned to interpret the interaction using the visualization strategy recommended by Hayes and Rockwood ⁵⁴. To implement this strategy, it is necessary to compute regression lines representing the associations between the criterion measure and the social factors separately for men and women. To compute the data needed to create the regression lines, we used the custom dialogs for SPSS (process.spd) developed by Andrew F. Hayes. The rest of the analyses were conducted using SPSS 25.

Given the large number of planned analyses, we determined that there was a need to control for possible alpha inflation in order to control for Type I errors (i.e., concluding that there were statisticially significant effects when in fact there are none in the population). At the same same, a very conservative approach such as a Bonferroni correction (which would have resulted in an

alpha level of .003) would have substantially increased the risk of Type II errors (i.e., concluding that there were no significant effects when in fact they do exist in the population). We therefore balanced the need to control for both types of errors by adopting a more conservative p value of 0.01 for determining that a particular finding was statistically significant.

Before performing the regression analyses, we estimated the sample size needed to obtain a medium effect size (f^2 =.15) with 15 predictors and a probability of error of 0.01 using G*power ^{55,56}. The minimum number of participants required to conduct the aforementioned analysis was 316.

RESULTS

Descriptives of the study variables and correlations

Means and standard deviations of the criterion variables, pain interference (BPI) and depressive symptoms (HADS), were 6.12 (2.60) and 7.46 (4.82), respectively. The predictors had the following means and standard deviations: pain intensity = 6.89 (2.01), satisfaction with participation in social roles or activities = 41.24 (8.68), ability to participate in social roles and activities = 41.67 (6.88), companionship = 48.58 (9.10), emotional support = 50.96 (9.81), informational support = 51.50 (9.93), instrumental support = 50.78 (8.45), and isolation = 53.23 (8.68).

The zero order associations between criterion and predictor variables are presented in Table 2. We found negative moderate and statistically significant associations between pain interference and most of the social factors (*r*s range, -.0.24 to -0.57, *p*s < 0.001). Just one social factor, isolation, showed a moderate statistically significant, and positive association with pain interference (*r* = 0.34, *p* < 0.001). Similar results were found for the other criterion variable: depressive

symptom severity. Negative moderate statistically significant correlations emerged between most social factors and depressive symptom severity (*r*s range, -.0.39 to -0.64, *p*s < 0.001), and a positive association was found between social isolation and this criterion variable (r = 0.54, p < 0.001).

[Insert Table 2 about here]

Streamlining the measures of social support

After conducting a CFA with the 4 social factors which were strongly associated with each other (*r*s range: 0.55 to 0.85), we found support for a single higher order factor representing "social support." The goodness of fit indexes for the model (of the 4 factors as smaller elements of the same social support factor) were: (1) $\chi^2(df) = 6.99$ (2), p = 0.03; (2) CFI = 0.99; (3) SRMR = 0.02. Because all these fit indexes showed a good fit of the model and no modification indices were indicated for this model, we decided to accept it and compute a total score for the "social support" factor by averaging the scores of the 4 factors. The mean and standard deviation of the social support factor were 50.40 (8.17); these scores were negatively and significantly correlated with pain interference (*r* = -.29, *p* < .001) and depressive symptom severity (*r* = -.54, *p* < .001).

Assumptions testing

All variables met the assumption of normality (showing skew or kurtosis values of variables below 2) and homoscedasticity. Regarding multicollinearity, VIF was below 10 for the all predictors; range = 1.51 - 1.88 when pain interference was the criteria variable and range = 1.10 - 1.95 when the criteria was depression symptoms.

Effects of social factors as predictors of pain interference

The results of the regression analyses predicting pain interference are presented in Table 3. Pain intensity, sex and data source as control variables explained 54% of variance ($F_{(3,344)} = 133.40$, p < .001); specifically, pain intensity ($\beta = .44$, *p* < .001) and data source made a significant contribution ($\beta = .40$, *p* < .001), whereas sex did not ($\beta = .01$, *p* > .01). In addition, social factors explained 8% of variance (*p* < .001) when controlling for pain intensity, sex and data source effects. However, only satisfaction with participation in usual social roles ($\beta = .16$, *p* < .01) and social self-perceived ability ($\beta = .19$, *p* < .01) made significant independent contributions to the prediction of pain interference. None of the interaction effects involving sex were statistically significant.

[Insert Table 3 about here]

Effects of social factors as predictors of depressive symptoms

The results of regression analyses predicting depressive symptoms are presented in Table 4. Pain intensity, sex, and data source as control variables contributed to the prediction of depressive symptoms explaining 32% of the variance ($F_{(3,321)} = 50.77$, p < .001). Specifically, pain intensity ($\beta = .30$, p < .001), and data source ($\beta = .36$, p < .001) made significant and independent contributions to the prediction of depressive symptoms. Social factors explained an additional 24% of the variance (p < .001) after controlling for pain intensity, sex, and data source effects. Satisfaction with participation in usual social roles ($\beta = ..15$, p < .01), self-perceived social ability ($\beta = ..20$, p < .001), and social support ($\beta = ..20$, p < .001) and social isolation ($\beta = .18$, p < .001) all made significant and independent contributions to the predictions to the predictions to the predictions to the precisive symptoms.

[Insert Table 4 about here]

Interactions involving sex or data source explained an additional 3% of the total variance ($F_{(8,309)} = 3.17$, p < .01). One interaction, Sex x Social Roles (β = -.29, p < .01) emerged as statistically significant at .01 significance level. As planned, in order to understand this interaction effect, we computed the regression lines separately for women and men (see Figure 1). Regarding the Sex x Social Roles effect, men evidenced the highest level of depressive symptoms when satisfaction with usual social roles was low. Conversely, women showed a similar level of depressive symptoms independently of their level of satisfaction with their social roles.

[Insert Figure 1 here]

DISCUSSION

This study tested hypothesized associations between social factors (i.e., social support, satisfaction in participation in social roles, social isolation, and self-perceived ability to perform social roles and activities) and pain-related interference and depressive symptoms in adults with chronic pain. The study also examined the moderating role of sex in these associations. Two of the social factors (satisfaction in participation in social usual roles and self-perceived ability for participating in such social roles) made independent contributions to the prediction of pain interference, whereas all four social factors made independent and significant contributions to the prediction of depressive symptoms. The results also indicated that sex moderated the association between social factors and depressive symptoms, but not between social factors and pain interference.

The association between satisfaction with social roles and pain interference is consistent with previous studies that have found satisfaction with

social roles to be related to adjustment to chronic pain ^{20,24}. However, the significant association between self-perceived ability to participate in social roles and pain interference in our sample is a new finding, as previous research has not yet examined these associations. The findings also showed that neither social support nor social isolation were associated significantly with pain-related interference, which is inconsistent with the study hypotheses.

Although a previous study found a lack of significant association between social support and disability ¹⁵, consistent with the current findings, other studies have shown both negative ⁵⁷ and positive associations ¹³. One explanation for the inconsistency of the findings with respect to social support could be related to the different characteristics of the samples included in the studies. For example, our study and the López-Martínez and colleagues' study ¹⁵ included people with a variety of pain problems (such as headache, backache or widespread pain). On the other hand, the studies that have shown an association between disability and social support included patients with rheumatic disorders ^{13,57}. Thus, the type of pain problem may moderate the role that social support plays as a predictor of disability in individuals with chronic pain; research to evaluate this possibility is warranted, as it may provide important information regarding when (and for whom) social support interventions may be most effective for reducing pain-related disability.

The finding that all four social support factors made independent and significant contributions to the prediction of depressive symptoms underscores the importance of social factors as playing a role in depressive symptoms in individuals with chronic pain. Our findings are consistent with previous research in individuals with chronic pain ^{14–16}. For example, two studies have shown that

positive and helpful social support from friends and the family was related to lower levels of depression whereas problematic "support" (i.e., social support that is perceived as non-supportive, even though the person who provides it may have been well-intended) was associated with more severe depression ^{12,13}. Research is now needed to evaluate the potential causal role of social factors as influencing depressive symptom severity.

One significant interaction involving sex emerged in the prediction of depressive symptoms: involving satisfaction with usual social roles. Men showed the highest level of depressive symptoms when satisfaction with usual social roles was low, whereas women showed a similar level of depressive symptoms independently of their level of satisfaction with social roles. This result suggests the possibility that satisfaction with social roles may be a particularly relevant factor to take into account in men with chronic pain who also present significant depressive symptoms. Further research should replicate it.

To our knowledge, no previous researchers have evaluated sex (or gender, see limitations section) as a potential moderator of the associations between social factors and function in individuals with chronic pain. However, in line with our findings, sex has been found to moderate the associations between other psychosocial factors (for example depression and disability or pain-related anxiety and fear of movement or reinjury) in individuals with chronic pain ^{61,62}. These findings, when considered in light of the present results, suggest that more research to examine the role of sex in how social factors influence important pain-related outcomes in individuals with chronic pain is warranted.

This study has a number of limitations that should be considered when interpreting the results. First, the data are cross-sectional; it is therefore not possible to draw conclusions regarding causal associations among the study variables. Second, there were many more women than men (89% versus 11%) in the sample; thus, the interaction effects that were observed should be interpreted with caution and confirmed by replicating them in other independent and ideally more sex balanced studies. Third, the study enrolled two different kind of samples; a community sample of individuals with chronic pain who provided data online and a sample of undergraduate students with chronic pain attending a university in Catalonia, Spain. Although sample source did not have any significant influence on the findings either as a main effect or as a factor that interacted with the study predictors, it is still possible that sample source might have influenced the results in ways we were unable to detect. Future studies with additional samples of individuals with chronic pain will help determine the overall reliability of the study findings. Finally, although we assessed sex (i.e., whether subjects were men or women), we did not assess gender (i.e., how the participants view themselves with respect to their gender role). While sex can be viewed as a proxy measure of gender, the two are not the same. Because we did not assess gender, we were not able to determine the extent to which the interaction involving sex that emerged was due to gender role identification or to biological differences. Future researchers should assess both sex and gender when possible to help address this issue.

Despite the study's limitations, the results provide new important evidence regarding the role that social factors play in pain-related interference and depressive symptoms. The findings confirm that the "social" aspects of

biopsychosocial models of chronic pain are important to both physical function and (perhaps especially) psychological function, in individuals with chronic pain. Research to evaluate the potential causal role of these factors in patient function – in particular how they might influence outcomes differently for men and women – is warranted.

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Table 1. Characteristics of the sample

Sex ^a (N, %)		
Women	325	89
Age ^b (Mean, SD)	36.31	14.05
Level of education ^b		
Primary school	11	3
Secondary school	29	8
Senior high school	128	35
Vocational education and training	96	26
University degree	93	26
Master's degree	3	1
Usual pain intensity of the most frequent pain ^a	6.80	2.01
(Mean, SD)	0.09	2.01
Duration of the most frequent pain ^a (N, %)	$\overline{\mathbf{O}}$	~
From 3 to 6 months	30	8
From 6 months to 1 year	42	12
From 1 to 5 years	123	34
More than 5 years	168	42
Location of the most frequent pain ^a (N, %)	*	
Head, face and mouth	37	10
Cervical region	55	15
Upper shoulder and upper limbs	73	20
Thoracic region	9	3
Abdominal region	17	5
Lower back, lumbar spine, sacrum and coccyx	109	30
Pelvic region	6	2
Anal, perineal, and genital region	5	1
Lower limbs	52	14

^aInformation missing in 1 case.

^bInformation missing in 4 cases.

Table 2. Pearson correlations among the study variables

Variables	Pain interference	Depressive symptoms
	(BPI)	(HADS)
Pain intensity (NRS-11)	.66***	.48***
Satisfaction with social roles	56***	56***
Ability	57***	59***
Companionship	26***	47***
Emotional support	26***	50***
Informational support	24***	49***
Instructional support	24***	39***
Social isolation	.34***	.54***

***p < .001

Step and variable	Total R ²	<i>R</i> ² change	<i>F</i> change	Sd β
Step 1: Control variables	.54	.54	133.40***	
Pain intensity				.44***
Sex				01
Data source				.40***
Step 2: Social factors	.62	.08	17.01***	
Satisfaction with social roles				16**
Ability			-77-	19***
Social support				.01
Isolation				.06
Step 3: Interactions	.63	.01	1.16	
Sex x social roles				03
Sex x ability				09
Sex x social support				02
Sex x isolation				11
Source x social roles				06
Source x ability				29
Source x social support				05
Source x isolation				.03
p < .01; *p < .001				
X				

Table 3. Results of the linear regression analyses predicting pain interference.

Step and variable	Total R ²	<i>R</i> ² change	<i>F</i> change	Sd β
Step 1: Control variables	.32	.32	50.77***	
Pain intensity				.30***
Sex				10*
Data source				.36***
Step 2: Social factors	.56	.24	43.60***	
Satisfaction with social roles				15**
Ability			~~	20***
Social support				20***
Isolation				.18***
Step 3: Interactions	.58	.03	3.17**	
Sex x social roles				32**
Sex x ability				.19
Sex x social support	$\mathcal{O}_{\mathcal{I}_{\mathcal{I}}}$			07
Sex x isolation				13
Source x social roles				20
Source x ability				40
Source x social support				.10
Source x isolation				.21
p < .01; *p < .001				

Table 4. Results of the linear regression analyses predicting depressive symptoms.

Figure 1. Regression lines representing the sex interaction effect on the association of satisfaction with social usual roles and depressive symptoms



Note: Axis-x shows the values of satisfaction with social roles after being 0-centered. Axis-y shows values of depressive symptoms.