A COMPREHENSIVE MODEL OF ADJUSTMENT TO PAIN IN THE CO-OCCURRENCE OF PTSD AND CHRONIC MUSCULOSKELETAL PAIN: VULNERABILITY AND PROTECTIVE PATHWAYS

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INTRODUCTION

There are a significant comorbidity between PTSD and chronic pain. Thus, studies clarifying the vulnerability and protective variables and mechanisms associated with PTSD and chronic pain are needed. The aim of this study was to examine the association between trauma, resilience, PTSD symptoms, and the variables included in the fear-avoidance models (anxiety sensitivity, catastrophizing, fear-avoidance beliefs, fear of pain, pain hypervigilance) as well as pain acceptance and experiential avoidance in explaining adjustment to chronic pain (pain intensity, pain-related disability and emotional distress).

METHOD

Participants and Setting

The final sample included 229 patients with chronic back pain, who had been exposed to a traumatic event before the onset of pain. Of these, 119 had a score below 10 points on the Davison Trauma Scale (DTS; Davidson, 1996); the remaining 110 patients obtained a score higher than 40 points on the DTS, which indicates the presence of PTSD symptoms and a high probability of a PTSD disorder. They had been referred by physicians and physiotherapists from several Primary Care Health Centres in Málaga (Spain). The majority of them were female (71.2%) and were married (66.8%). 36.7% had completed secondary education, and were employed (48.3%). Their ages ranged from 18 years to 60 years (Mean = 45.53, SD = 11.89). All of them had back pain in the following regions: lumbar, sacral and coccygeal (88.6%); cervical (10.5%); and thoracic (0.9%).

Patients were referred by their physicians. The selected participants were contacted by telephone and invited to participate in the study. The participants who accepted completed a battery of questionnaires in the same order in an oral semi-structured interview format 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.

Measures

Table 1 shows both the variables and instruments used during data collection.

Table 1. Variables and instruments

VARIABLE	INSTRUMENTS
TRAUMATIC EVENTS	STRESSFUL LIFE EVENT SCREENING QUESTIONNAIRE REVISED (SLESQ-R; Goodman et al., 1998)
PTSD SYMPTOMS	DAVIDSON TRAUMA STRESS (DTS; Davidson et al., 2002)
ANXIETY SENSITIVITY	ANXIETY SENSITIVITY INDEX (ASI; Reiss, Peterson, Gursky and McNally, 1986)
EXPERIENCIAL AVOIDANCE	ACCEPTANCE AND ACTION QUESTIONNAIRE (AAQ; Hayes et al., 2004)
CATASTROPHIZING	PAIN CATRASTROPHIZING SCALE (PCS; Sullivan, Bishop and Pivik, 1995)
FEAR-AVOIDANCE BELIEFS	FEAR-AVOIDANCE BELIEFS QUESTIONNAIRE (FABQ; Waddel, Newton, Henderson, Somerville and Main, 1993)
PAIN ANXIETY	PAIN ANXITY SYMPTOMS SCALE (short form) (PASS-20; McCracken and Dhingra, 2002)
HYPERVIGILANCE	PAIN VIGILANCE AND AWARENESS QUESTIONNAIRE (PVAQ; McCracken, 1997)
RESILIENCE	RESILIENCE SCALE ADAPTED TO CHRONIC PAIN (RS18; Ruiz-Párraga, López-Martínez and Gómez-Pérez, 2012; Ruiz-Párraga et al., in press)
PAIN ACCEPTANCE	CHRONIC PAIN ACCEPTANCE QUESTIONNAIRE (CPAQ; Bendayán, Esteve and Blanca, 2012)
DOLOR	NUMERICAL SCALE OF COMPOSED INDEX OF PAIN (Jensen et al., 1999)
DISABILITY	ROLAND-MORRIS DISABILITY QUESTIONNAIRE (RMDQ; Roland and Morris, 1983)
EMOTIONAL DISTRESS	THE HOSPITAL ANXIETY AND DEPRESSION SCALE (HADS; Zigmond and Snaith, 1983; Quintana et al., 2003)

RESULTS

Measurement Model

All the variables of the model were continuous and normally distributed. No univariate or multivariate outliers were found. Structural Equation Modelling (SEM), with maximum likelihood estimation, was used. The analysis was performed according to a 2-stage process. First, separate confirmatory factor analysis models were used to verify that the measurement scales employed in the model were valid operationalizations of the latent constructs. The factor structure of each of the latent variables was verified, and then the hypothesized model was estimated. Table 2 shows the correlation coefficients between the model variables. On the basis of the proposed comprehensive model, a model with 5 manifest and 2 latent variables was developed.

Table 2. ***Zero-order correlations between variables in the structural model*** **(N = 229)**

	1[a]	2	3	4	5	6	7	8	9	10	11	12
1. Resilience	1	.35**	-.63**	.67*	-.15*	-.56**	-.38**	-.53**	-.50**	-.37**	-.33**	-.59**
2. Anxiety sensitivity	_	1	.37**	-.40**	.24**	.50**	-.15*	.52**	.31**	.26**	.27**	.49**
3. PTSD symptoms	_	_	1	-.49**	.21**	.53**	.29**	.58**	.47**	.35**	.24**	.67**
4. Pain acceptance	_	_	_	1	-.26**	-.62**	-.41**	-.57**	-.53**	-.41**	-.46**	-.53**
5. Experiential avoidance	_	_	_	_	1	.24**	.12	.20**	.21**	.16**	.24**	.27**
6. Catastrophizing	_	_	_	_	_	1	.46**	.54**	.57**	.35**	.43**	.44**
7. Fear-avoidance beliefs	_	_	_	_	_	_	1	.30**	.44**	.30**	.33**	.27**
8. Fear of pain	_	_	_	_	_	_	_	1	.44**	.38**	.47**	.53**
9. Hypervigilance	_	_	_	_	_	_	_	_	1	.37**	.31**	.38**
10. Pain intensity	_	_	_	_	_	_	_	_	_	1	.43**	.36**
11. Pain disability	_	_	_	_	_	_	_	_	_	_	1	.25**
12. Emotional distress	_	_	_	_	_	_	_	_	_	_	_	1

*Significance level (in excepted direction) $P < 0.05$ **Significance level (in expected direction) $P < 0.01$ [a] The numbers in the top row refer to the variables listed in rows 1-12

RESULTS *(CONTINUE)*

As shown in Table 5.2, all the variables in the model were significantly correlated, with the exception of experiential avoidance and fear-avoidance beliefs ($r = 0.12$).

The goodness-of-fit statistics indicated an adequate fit of the hypothesized model to the data (RMSEA = .07; CFI = .99; NNFI = .98; TLI = .96). The x^2 test was significant (x^2 (8) = 19.25, x^2 /dl = 2.40, $p = .014$). In general, this statistic is not regarded as an ideal goodness-of-fit statistic as it is highly sensitive to sample size and the size of correlations (Kline, 2005) and tests the unrealistic null hypothesis of perfect fit (MacCallum, 2003). To reduce the sensitivity of this statistic to sample size, the index was divided by the degrees of freedom. As ratios of 3 or less indicate an acceptable fit of the model (Kline, 2005), the results provided support for the hypothesized model. All the standardized path coefficients were significant ($p < .05$) and within an acceptable range, and all the scales loaded significantly on the appropriate latent construct.

The final model as well as standardized coefficients and R^2 values are shown in Figure 1, with R^2 values shown above each endogenous variable.

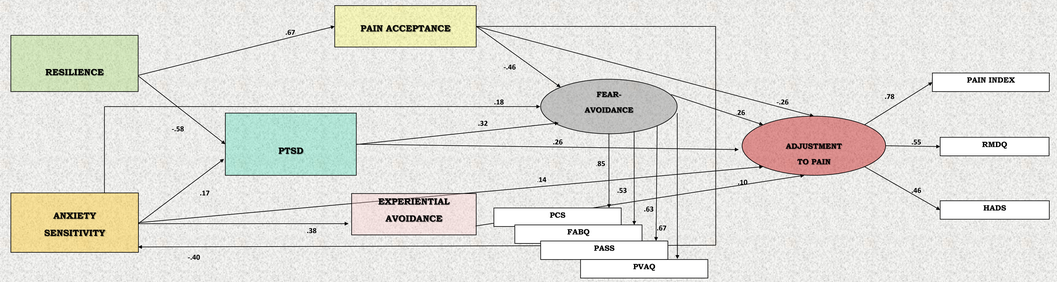

Figure 1. Structural equation model. Standardized path coefficients are presented.
PCS indicates Pain Catastrophizing Scale; FABQ, Fear-Avoidance Beliefs Questionnaire; PASS, Pain Anxiety Symptoms Scale; PVAQ, Pain Vigilance and Awareness Questionnaire. PAIN INDEX, numerical rating scale of composed index of pain; RMDQ, Roland Morris Disability Questionnaire; HADS, Hospital Anxiety and Depression Scale.

As hypothesized, resilience yielded 2 statistically significant path coefficients. One was to PTSD symptoms, with patients characterized by higher levels of resilience reporting lower levels of PTSD symptoms. The second path was to pain acceptance, indicating that higher levels of resilience were associated with higher levels of pain acceptance. Furthermore, resilience had indirect effects on F-A and adjustment to pain, due to the mediating role of PTSD and pain acceptance.

PTSD symptoms yielded 2 statistically significant path coefficients. One was to F-A, indicating that higher levels of PTSD symptoms were associated with higher levels of F-A (catastrophizing, fear avoidance beliefs, fear-related pain and pain hypervigilance). The second path was to adjustment to pain, with patients characterized by higher levels of PTSD symptoms reporting less adjustment to pain, and therefore higher levels of pain, disability and emotional distress.

AS yielded 4 path coefficients to PTSD, EA, F-A, and adjustment to pain, indicating that higher levels of AS increased the levels of PTSD, EA and F-A, whereas they decreased adjustment to pain, with higher scores on pain, disability and emotional distress.

EA yielded 1 significant path coefficient to adjustment to pain, indicating that higher levels of EA decreased adjustment to pain, and increased levels of pain, disability and emotional distress.

F-A yielded 1 direct effect to adjustment to pain, with higher scores of F-A indicating decreased adjustment, and thus more pain, disability and distress.

Finally, pain acceptance yielded 3 significant path coefficients. One was to adjustment to pain, with patients with higher levels of pain acceptance reporting lower levels of adjustment to chronic pain (higher levels of pain, disability and emotional distress). The other 2 paths were to AS and F-A, indicating that higher levels of pain acceptance were associated with lower levels of AS and F-A.

As has been shown, adjustment to pain (pain, disability and emotional distress) directly depends on the levels of AS, PTSD, FA, EA and pain acceptance.

CONCLUSIONS

Taken as a whole, the results of this study demonstrate the role of a vulnerability pathway and a protective pathway in the development of psychological and pain symptoms after a traumatic event. Furthermore, the SEM analysis shows that the two pathways are interconnected. Regarding the vulnerability pathway, the findings support the postulates underlying the shared and mutual maintenance models of PTSD and chronic pain (Asmundson et al., 2002; Asmundson and Hadjistavropolous, 2006; Liedl and Knaevelsrud, 2008; McLean et al., 2005; Otis, Keane and Kerns, 2003; Sharp and Harvey, 2001). In relation to the protective pathway, the findings show that the ability to adapt to pain plays an important role in adjustment to chronic pain. Thus, this study provides empirical support for the potential role of PTSD symptoms in fear-avoidance models of chronic pain, and may provide support for the diathesis-stress model of pain. It is the first comprehensive model of adjustment to pain to consider vulnerability and protective adaptation mechanisms in patients who have undergone a traumatic event. The study highlights the importance of a comprehensive framework of reference to understand the comorbidity of PTSD and chronic musculoskeletal pain, and the need to provide well-designed treatment programs for the simultaneous treatment of these conditions.

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Poster presented at the 9th *Congress of the European Pain Federation EFIC*, September, 2015, Vienna (Austria)