Control beliefs, coping and emotions: Exploring relationships to explain fibromyalgia health outcomes[1]

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ABSTRACT. In order to explain relevant health status dimensions in fibromyalgia syndrome (FMS), this *ex post facto* study explores relationships between control beliefs, illness-focused coping and emotions. The study additionally sought to clarify the role of coping and emotions as potential mediators in the relationship between control beliefs and perceived health outcomes. Structural equation modelling was employed. A total of 315 FMS patients of various primary care and rheumatology centres participated in the study, and completed measures of health status, control beliefs, coping, anxiety and depression. Analyses revealed that control belief constructs that contain the competence element (self-efficacy and perceived health competence) have a direct effect on all health status areas examined. The findings also suggested the mediating role of emotions between competence beliefs and both physical and psychosocial impact, while illness-coping behaviour significantly mediates the relationship between self-efficacy and physical impact. Control beliefs and emotions are central elements in explaining the overall impact of FMS. Therapeutic efforts should emphasize increasing competence beliefs in order to produce meaningful improvement in FMS emotional

distress and health outcomes. These findings contribute to understand further how relevant psychosocial factors may influence adaptation by FMS patients.

KEYWORDS. Fibromyalgia. Health Status. Cognitions. Coping. *Ex post facto* study.

RESUMEN. Con el objetivo de explicar el estado de salud en el síndrome fibromiálgico (SFM) se exploran las relaciones entre cogniciones, afrontamiento centrado en la enfermedad y emociones. Asimismo, en este estudio *ex post facto,* se investiga el papel mediador del afrontamiento y las emociones entre las creencias de control (CC) y los resultados de salud. Se utilizó un modelo de ecuaciones estructurales. Participaron 315 pacientes con SFM de atención primaria y reumatología, que completaron medidas del estado de salud, creencias de control, afrontamiento, ansiedad y depresión. Los resultados mostraron que las CC que contienen el elemento de competencia (autoeficacia y competencia percibida en salud) tienen un efecto directo sobre todas las áreas del estado de salud; además, apoyaron el papel mediador de las emociones entre las creencias de competencia y el impacto físico y psicosocial, mientras que el afrontamiento únicamente medió la relación entre la autoeficacia y el impacto físico. Las CC y las emociones son elementos centrales en la explicación del impacto del SFM. Los esfuerzos terapéuticos deberían incrementar las creencias de competencia para mejorar significativamente los resultados de salud y el distrés emocional de la SFM. Estos hallazgos contribuyen al entendimiento sobre cómo los factores psicosociales influyen en la adaptación de pacientes con SFM.

PALABRAS CLAVE: Fibromialgia. Estado de Salud. Cogniciones. Afrontamiento. Estudio *ex post facto.*

Improving perceived health status is one of the main targets of treatment in fibromyalgia syndrome (FMS) as in other chronic conditions. During the past decade, numerous studies have identified patients´ perceptions of control and coping as significant predictors of health outcomes in chronic pain samples in general and in FMS in particular (Arnstein, Caudill, Lynn, Norris, and Beasley, 1999; Besteiro, Lemos, Muñiz, Costas, and Weruaga, 2008; Buckelew *et al.*, 1994; Oliver and Cronan, 2005). Several theoretical models have been proposed to explain these predictive relationships, such as the Stress and Coping Model (Lazarus and Folkman, 1986), Self-Regulation Model (Leventhal, 1970) and Social Learning Model (Bandura, 1977; Rotter, 1975; Wallston, 1992). Each of these models is similar in proposing coping as a mediator between control cognitions and health status.

To date, mediational models regarding links between control cognitions, coping strategies and health status have not been explored in FMS patients, although they have been the focus of a few studies among other types of chronic pain patients (Arnstein, 2000; Arnstein *et al*., 1999; Camacho and Anarte, 2003; Ramírez-Maestre, Esteve, and López, 2008; Rudy, Kerns, and Turk, 1988; Schemelleh-Engel, Eifert, Moosbrugger, and Frank, 1997; Smith, Dobbins, and Wallston, 1991; Smith and Wallston, 1992; Soucase, Soriano, and Monsalve, 2005). In these studies two pathways have been

explored to test models and establish direction of effects between psychological constructs and health status: a) whether the relationship between illness characteristics and health outcomes is mediated by control beliefs (Arnstein, 2000; Arnstein *et al.*, 1999; Chian-Chin and Ward, 1996; Fisher and Jonson, 1998; Nicassio, Schuman, Radojevic, and Weisman, 1999; Rudy *et al.*, 1988; Smith *et al.*, 1991); and b) whether the relationship between control beliefs and health outcomes is mediated by coping efforts (Camacho and Anarte, 2003; Chian-Chin and Ward, 1996; Ramírez-Maestre *et al.*, 2008; Soucase *et al.*, 2005). The role of emotions in these models has also been considered, in some studies as a health outcome (*e.g.,* Arnstein, 2000; Arnstein *et al.*, 1999; Covic, Adamson, Spencer, and Howe, 2003) and in other studies as a mediator either between control beliefs and coping or between control beliefs and adaptative behaviour (Schemelleh-Engel *et al.*, 1997). However the mediational role of emotions between control beliefs or coping behaviours and other health outcomes has not been tested.

Results of these studies in non-FMS samples have generally suggested direct effect of control beliefs on health outcomes rather than indirect effects through coping efforts as a mediator (Camacho and Anarte, 2003). These studies also found that control beliefs affect depression as an outcome (Arnstein *et al.*, 1999; Arnstein, 2000; Smith *et al.*, 1991). When emotions were considered as an antecedent they did not affect coping (Camacho and Anarte, 2003) or adaptative behaviours (Schemelleh-Engel *et al.*, 1997).

Examining relationships between control beliefs, coping, emotions and health status in FMS patients specifically may be warranted. This could shed new light on the adaptation to this condition. A wide variety of reasons makes it crucial to study this syndrome particularly. FMS is a complex, chronic condition characterized by widespread pain, fatigue and a variety of other symptoms with unknown aetiology (Wolfe *et al.*, 1990). Nowadays it is one of the most prevalent chronic pain disorders among rheumatic illnesses (Carmona, Ballina, Gabriel, and Laffon, 2001) and is associated with greater impairment of health status (physical and psychosocial impact) than other chronic pain conditions (Bergman, 2005). FMS patients also are high users of healthcare resources (Carmona *et al.,* 2001) and to date no adequate treatment or rehabilitation have proved to be effective (Pastor *et al.*, 2003).

The aim of this study was to test relationships between relevant cognitive constructs, coping and emotions and health status outcomes in FMS patients using structural equation modelling (SEM). The study tested: a) whether coping efforts mediate the relationship between control beliefs and health status outcomes as proposed in the theoretical models above, or b) whether control beliefs have a direct effect on health status, based on results of studies described previously in heterogeneous chronic pain samples. Considering that FMS is a chronic pain problem, the direct effect on health status was expected.

Given the strong interface of emotions with cognition (Leventhal and Scherer, 1987; Schemelleh-Engel *et al.*,1997) and relationships between emotions, pain intensity and disability found in FMS correlation studies (Kurtze, Gunderson, and Svebak, 1998), in this study we hypothesized that emotions mediated the relationships between control beliefs on health status. As models tested in heterogeneous chronic pain samples showed that emotions did not affect coping, in accordance with results found in FMS

predictive studies where depression did not affect illness coping behaviour (Buckelew *et al,* 1994), we decided to allocate emotions as a mediator between illness coping behaviour and health outcomes. The hypothesized paths between control cognitions, coping, emotions and health status dimensions are depicted in Figure 1. In the figure, arrows between each variable of control beliefs, emotional status and health status are omitted but intercorrelations were assumed.

FIGURE 1. Paths explaining health status in fibromyalgia syndrome.
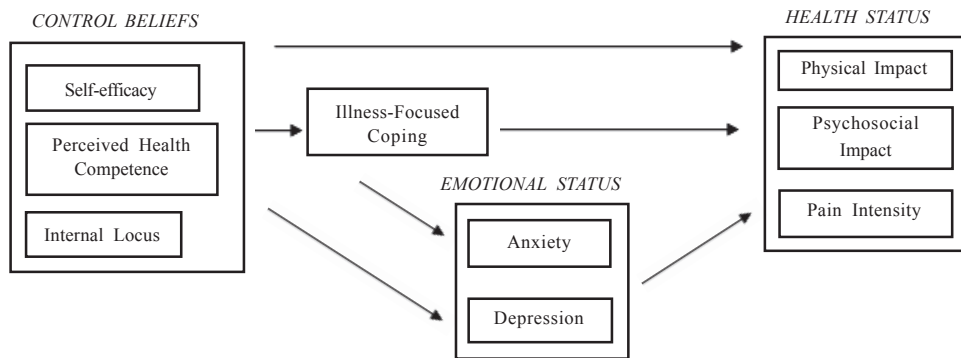
Notes. In order to simplify the path diagram, the effects between each variable are represented with one arrow.

As shown in Figure 1, the health status construct in this study incorporated three relevant dimensions for FM samples: pain intensity, physical status and psychosocial status (separate from emotional status). The control cognitions construct incorporated three types of control cognitions derived from different social learning theories applied to chronic illness. Following recommendations in the literature, two elements of control perception were considered (Skinner, 1996): beliefs about contingency and beliefs about personal competence. To reflect the contingent element (belief about the relationship between behaviour and consequences) we included internal locus of control (Wallston, 1992). To reflect the competence element (beliefs in one's own ability to perform a specific behaviour) we included self-efficacy (Bandura, 1977). Perceived health competence (Smith *et al*., 1991) was also included, reflecting beliefs in one's own capability to effectively manage health outcomes.

Regarding pain coping strategies, FMS patients are higher users of passive strategies (praying/hoping, avoidance behaviours) than other chronic pain patients (Mellegard, Grossi, Joaqium, and Soares, 2001), and this type of coping showed a stronger relationship with health outcomes than an active coping style (Pastor, Lledó, Martín-Aragón, López-Roig, and Rodríguez-Marín, 2001), thus we decided to analyse only the contribution of this coping style in health status impact in order to be parsimonious (Figure 1).

The contribution of this study is to consider simultaneously: the three main dimensions of FMS health status, the three constructs of control beliefs and the coping style most

frequently used among FMS patients, and to consider emotions as a part of the process. The findings will highlight how specific beliefs, passive coping and emotions could be implicated in FMS chronic pain conditions. Thus results will indicate the main goals for treatment, an important issue for these patients due to the limited treatment efficacy found until now (Pastor *et al.*, 2003).

Method

Participants

Participants were 315 females diagnosed with FMS. These patients were recruited from the rheumatology services (RU; $n = 214$) and primary care services (PC; $n = 101$) of public hospitals in Alicante (Spain). The means chronicity of pain in years was 9.80 ($SD = 10.22$) and 12.90 ($SD = 11.10$) for PC and RU patients respectively, with an average number of tender points of 12.60 ($SD = 2.69$) in RU patients and 15.26 ($SD = 3.55$) in PC. The average of fatigue reported was 3.15 ($SD = 1.03$) and 3.37 ($SD = 1.07$) for PC and RU patients, ranging from 0 *(never)* to 4 *(always)*. The means age years was 49.80 ($SD = 10.39$) for PC patients and 52.70 ($SD = 9.01$) for RU patients. Most participants were married (78% in PC and 80% in RU) and had a college education (50% in PC and 54% in RU). Thirty-four and thirty-six per cent of patients were homemakers in the PC and RU samples respectively, while 35% in the PC and 26% in the RU samples were employed. Patients from PC and RU clinics did not differ significantly on any socio-demographic variables (all *p's* > .01). Participants were not involved in psychological treatment and they were receiving standard medical treatment, mainly analgesics (Lledó, Pastor, Pons, López-Roíg, and Terol, 2009).

Procedure

The patients were interviewed in their respective services. They were recruited consecutively by study physicians from among those who attended their clinical consultation, had been diagnosed with FMS at least one year before and provided written informed consent before participating in study procedures. First, the physician completed a standard diagnostic protocol regarding onset of FMS, clinical symptoms, disease severity and current pharmacologic and non-pharmacologic treatment. The protocol was carried out by experienced rheumatologists using standard clinical practice procedures. Fibromyalgia diagnoses were made according to published ACR criteria (Wolfe *et al.*, 1990). Additionally, the socio-demographic characteristics were assessed. Then, an appointment was arranged with each patient one week later, during which a trained psychologist administered the remaining questionnaires. Selection criteria stipulated that subjects be at least 18 years old, have no psychiatric diagnosis and no other medical rheumatic disease (last two conditions by medical record and defined as present if required ongoing medical examination or reported pharmacological treatment).

Data collected in this study were part of a larger project with the aim of identifying differences between patients treated at primary and specialty care levels. Due to the fact that PC and RU samples did not significantly differ on the variables included in this study we elected to combine both samples in order to maximize statistical power and increase the stability of the data.

Measures

Health status was measured by the following instruments:

– Pain intensity-Numerical Rating Scale (NRS). Pain intensity was evaluated by four items, which asked about the maximum, minimum, usual pain of the previous week and pain intensity at the time of the interview (Jensen, Turner, Turner, and Romano, 1996). All items were assessed on a 0-10 numerical rating scale from 0 (*no pain at all*) to 10 (*the worst pain you can imagine*). The Spanish version of this scale that was used has shown good psychometric properties (Martín-Aragón *et al.*, 1999). In our sample, high internal reliability was shown across the four items (Cronbach's alpha = .83). Therefore, the mean score of these four items was used as a pain intensity measure.

– Sickness Impact Profile (SIP; Berger, Bobbit, Carter, and Gilson, 1981). Physical and psychosocial dimensions of health status were assessed with the Spanish adaptation of the SIP (Badía and Alonso, 1994). The SIP is a 136-item questionnaire divided into two dimensions: *Physical impact* (contains *Mobility, Ambulating, and Body care* and *Movement* subscales) and *Psychosocial impact* (contains *Social relations, Communication, Intellectual activity* and *Emotional activity* subscales). Participants choose items to describe how their situation is affected by their pain problem. Higher scores indicate greater impact on the specified dimension. The SIP has demonstrated good validity and reliability with various samples, including chronic pain samples (Badía and Alonso, 1994; Jensen, Turner, Romano, and Lawler, 1994). The reliability in this sample was good (α = .86 for physical dimension, α = .90 for psychosocial dimension). The SIP was selected for two reasons. First, physical impact scores reflect behaviour rather than perceived capability to engage in behaviour, and thus scores did not conceptually overlap with the self-efficacy measure below. Second, psychosocial impact items address multiple areas, but not anxiety or depression, which permitted us to assess psychosocial impact separately from emotional status.

Emotional status was measured by:

– Hospital Anxiety and Depression Scale (HAD; Zigmond and Snaith, 1983). Emotional status was evaluated by the Spanish adaptation of the HAD (Terol, Rodríguez-Marín, López-Roig, Martín-Aragón, and Pastor, 1997). Fourteen items are distributed in two factors: *Anxiety* and *Depression*. Patients rate each item on a 4-point scale, from 0 (*not at al*) to 3 (*most of the time*). High scores indicate higher anxiety or depression. This scale has been shown to be valid and reliable (López-Roig *et al.*, 2000; Terol *et al.*, 1997). In our sample, the Cronbach alphas were .78 for the *Anxiety* subscale and .82 for the *Depression* subscale.

Control beliefs and coping:

– Chronic Pain Self-efficacy Scale (CPSS; Anderson, Dowds, Pelletz, Edwards, and Peeters-Asdourian, 1995). Self-efficacy beliefs were evaluated by the Spanish adaptation of the CPSS (Martín-Aragón *et al.*, 1999). Nineteen items are distributed among three factors: a) *Self-efficacy for coping with symptoms,* b) *Self-efficacy for physical function,* and c) *Self-efficacy for pain management*. Participants indicate their perceived ability to perform a specified activity or achieve a

specific outcome. Responses are recorded on an 11 point scale from 0 (*not at all confident)* to 10 (*completely confident*). High scores indicate higher self-efficacy perceptions. In this study we used the total score (the mean of the three subscales) in order to reduce the number of variables. This Spanish adaptation has shown good psychometric properties (Martín-Aragón *et al.*, 1999). In our sample, the internal consistency was satisfactory for the total scale score (α = .88).

– Multidimensional Pain Locus of Control Scale (MPLC; Toomey, Lundeen, Mann, and Abashian, 1988). The Spanish adaptation of the MPLC was used (Pastor *et al.,* 1990). The MPLC assesses beliefs about the contingency relationship between behaviours and pain outcomes. The Spanish adaptation contains 15 items, where responses are scored on a six point scale; from 0 (*totally disagree*) to 5 (*totally agree*), distributed in four factors: *Internal, Fate, Chance* and *Professionals*. In this study we only used the Internal locus of control factor in order to assess personal control. Higher scores on this subscale indicate a stronger internal locus of control. The internal consistency reliability in this sample for this factor was α = .62.

– Perceived Health Competence Scale (PHCS; Smith, Wallston, and Smith, 1995). To assess the perceived health competence we used the Spanish adaptation of the PHCS (Pastor *et al.*, 1997). This scale measures the degree to which an individual feels capable of effectively managing his or her health outcomes. The eight items of the PHCS combine both outcome and behavioural expectancies. Responses are recorded on a 5 point scale, from 0 (*completely disagree)* to 4 (*completely agree*). Higher scores indicate higher competence. The internal consistency in this sample was satisfactory (α = .80).

– Chronic Pain Coping Inventory (CPCI; Jensen, Turner, Romano, and Strom, 1995). *Coping strategies* were evaluated by the Spanish adaptation of the CPCI (Martín-Aragón *et al.*, 1998). One of the advantages of this scale is that it provides assessment of behavioural coping strategies in contrast to previous coping measures which primarily assess cognitive responses to pain (Anderson *et al.,* 1995). The adaptation includes 24 items with three dimensions: *Illness-focused*, which includes resting, asking for assistance, and guarding coping strategies; *Wellness-focused*, which includes relaxation, task-persistence, exercise/stretching, and coping self-statements; and finally *Seeking social support*. Subjects were asked to indicate the number of days during the last week they used each strategy to cope with pain. Higher scores indicate greater use of the strategy. As mentioned above, in this study we elected to consider exclusively the illness-focused coping dimension. Cronbach alpha in this sample was α = .76 indicating a valid and reliable instrument for measuring illness-focused coping (Martín-Aragón *et al.*, 1998).

Study design and statistical analysis

According to scientific classification, this work is an *ex post facto* study (Montero and León 2007; Ramos-Álvarez, Moreno-Fernández, Valdés-Conroy and Catena, 2008).

Descriptive analysis and Pearson intercorrelations for all study variables were conducted by SPSS 14. We used LISREL 8.54 for path analyses (Jöreskog and Sörbom, 1993). This approach tests an *a priori* specified theoretical model and determines whether a given data set is consistent with it (*i.e.,* whether the model adequately fits the data). We specified the model based on prior theoretical and empirical work as detailed above. The path diagrams are shown in Figure 1. Model tests was based on the covariance matrix and we used maximum likelihood estimation. This is the most widely-used and recommended technique because it uses all available information and is robust against moderate departures from normality (Kelloway, 1998). A sample size of at least 200 observations is an appropriated minimum for this analysis (Kelloway, 1998).

SEM techniques provide structural parameters, tests of relationships among constructs (path information) and global measures of model fit. Concerning path information, LISREL estimates standardized parameters and *t* values corresponding to a completely standardized solution. The resulting *t* values are interpreted using the critical values for the *Z* test. That is, values above 1.96 are significant at the $p < .05$ level.

For assessing the adequacy of fit of the specified model, there are a number of different indices that can be used. Researchers recommend using multiple measures of fit (Kelloway, 1998). Following recommendations of Kelloway (1998) we used the root mean square residual (RMR), root mean square error of approximation (RMSEA), goodness of fit index (GFI) and adjusted goodness of fit index (AGFI) as absolute fit indices (*i.e.,* evaluating the ability of the model to reproduce the covariance matrix). Regarding comparative fit indices (whether the model under consideration was better than a null or independence model) we used comparative fit index (CFI), non-normed fit index (NNFI) and incremental fit index (IFI). Based on these results, analyses can be repeated after deleting the nonsignificant paths in order to develop a more parsimonious model (simplified model). The fit indices and cut-off criteria used in the present study are shown in the results section.

Results

Preliminary analyses

Table 1 presents the mean, standard deviations and Pearson intercorrelations for all study variables. Cognitive control variables were significantly correlated with all health status outcomes. Illness-focused coping and emotional variables were significantly correlated with all health status variables with the exception of illness-focused coping with anxiety.

TABLE 1. Descriptive statistics and intercorrelations of study variables ($N = 315$).

	$M \pm SD$	2	3	4	5	6	7	8	9
1.Self-efficacy	58.96±17.37	.58**	.39**	-.27**	-.32**	-.60**	-.61**	-.51**	-.42**
2. PHC	41.37±19.17		.45**	-.16**	-.47**	-.56**	-.35**	-.49**	-.37**
3. ILC	58.22±21.84			-.09	-.28**	-.37**	-.18**	-.31**	-.29**
4. IFC	48.66±23.91				.08	.15*	.33**	.18**	.20**
5. Anxiety	58.37±22.17					.56**	.31**	.58**	.25**
6. Depression	35.05±22.23						.49**	.64**	.37**
7. Physical impact	13.81±11.31							.54**	.37**
8. Psychosocial impact	28.64±16.83								.39**
9. Pain intensity	5.85±1.82								

Notes. PHC = *Perceived health competence*; ILC = *Internal locus of control*; IFC = *Illness-focused coping*; PI = *Physical impact*; PSI = *Psychosocial impact*. All scores were transformed ranging from 0 to 100, excepting pain intensity scores.

p <.05; **p* < .01.

Model testing

The fit indices associated with the model are presented in Table 2. All general fit indices (excepting the RMSEA) and the majority of comparative fit indices (excepting the NNFI) indicated a good fit. However the parsimony index (AGFI) indicates that the model could be improved by deleting non-significant paths (Kelloway, 1998). When analyses were repeated, deleting all non-significant paths at the same time, the parsimony indices and the NNFI improved. This indicates that the simplified model fits the data better than the baseline or original model (see Table 2).

TABLE 2. Fit indices of model and simplified model.

Fit indices	Cut-off criteria	Model values	Simplified model values
		General fit	
RMR	< .08	.02	.04
RMSEA	< .08	.23	.07
GFI	> .90	.98	.96
AGFI	> .90	.44	.91
		Comparative fit	
NNFI	> .95	.66	.97
IFI	> .90	.98	.98
CFI	> .95	.98	.98

Notes. RMR = Root mean square residual; RMSEA = Root mean square error of approximation; GFI = Goodness of fit index; AGFI = Adjusted goodness of fit index; NNFI = Non-normed fit index; IFI = Incremental fit index; CFI = Comparative fit index.

Table 3 includes standardized b parameters for the first structural analyses.

**TABLE 3.** Model β coefficients of baseline model structural analyses.

	IFC	Anxiety	Depression	PI	PSI	Pain
Self-efficacy	-.30*	-.06	-.41*	-.43*	-.22*	-.28*
PHC	-.01	-.44*	-.32*	.03	-.05	-.24*
ILC	.04	-.06	-.07	.06	-.02	-.05
IFC		.01	-.01	.18*	.04	.10
Anxiety				.04	.35*	.07
Depression				.21*	.32*	.04

Notes. PHC = Perceived Health Competence; ILC = Internal Locus of Control; IFC = Illness-Focused Coping; PI = Physical Impact; PSI = Psychosocial Impact.

*p < .05

In order to portray the results graphically, we present the simplified model with the direction of significant paths represented by arrows and significant standardized β parameters. For each variable specified in the model, LISREL calculates the R^2 value for each endogenous variables, which is interpreted the same as an R^2 value in regression. The variance explained values are presented also below each endogenous variable (Figure 2).

FIGURE 2. The variance explained values.
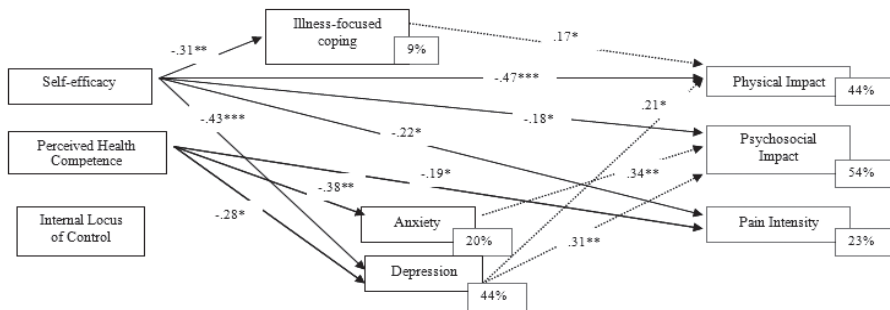
Notes. Significant path coefficients are standardized β weights (of simplified model). Doted arrows indicate endogenous paths.

*p < .05; ** p < .01; *** p < .001.

As can be seen in Figure 2, regarding relationships between the cognitive control variables and hypothesized mediators (coping and emotions), the model explains 9% of the variance in illness-focused coping through direct effects of self-efficacy; 20% of the variance in anxiety through the direct effects of perceived health competence; and 44% of the variance in depression through the direct effect of self-efficacy and perceived

health competence. Regarding health status outcomes, the model accounts for 44% of the variance in physical impact by direct effects of self-efficacy, and its indirect effects through illness-focused coping and depression (structural coefficients of these three variables suggest that direct effect is stronger than indirect paths, Table 4). In addition, physical impact variance is accounted for by indirect effect of perceived health competence through depression.

TABLE 4. Direct and indirect effects on outcomes by control cognitions.

Physical impact	Psychosocial impact
-.47 (Self-efficacy)	-.18 (Self-efficacy)
-.14 (Self-efficacy + IFC)	-.18 (Self-efficacy + Depression)
-.18 (Self-efficacy + Depression)	-.04 (PHC + Anxiety)
-.07 (PHC + Depression)	.03 (PHC + Depression)

Notes. PHC: Perceived Health Competence; IFC: Illness-Focused Coping. β weights of simplified model are used.

On the other hand, 54% of the variance in psychosocial impact is accounted for by direct effect of self-efficacy and by indirect effects through depression. In addition, the psychosocial impact variance is accounted for by indirect effects of perceived health competence through depression and anxiety. In this case, self-efficacy direct effects no appear stronger than indirect effect through emotions.

Finally, the model accounted for 23% of the variance in pain intensity through direct effects of self-efficacy and perceived health competence, thus clearly only direct effects of control cognitions account for pain. The total variance accounted for health outcomes ranged from 23% for pain to 54% for psychosocial impact.

Discussion

This study used SEM to test relationships between control beliefs, illness-focused coping, emotions and health outcomes in FMS patients. The model was developed considering both theory and previous research results in chronic pain. The model that was evaluated adequately fit the data. Overall, results indicate that there are both meaningful direct and indirect effects of control cognitions on health status. Also, emotions proved to have an important mediating role considering the number and magnitude of significant effects, in contrast with passive coping mediator role.

The use of illness-focused coping that includes strategies such as Guarding, Asking for Assistance and Rest did not affect psychosocial and emotional status or pain intensity. On the other hand, the model supported the crucial role of perceived health competence and self-efficacy as determinants of all health status areas examined. It is important to underscore that pain intensity was only affected by direct paths from self-efficacy and perceived health competence (explaining 23% of its variance), and that neither coping nor emotions played a significant mediating role. Furthermore, depression

had a strong effect on physical and psychosocial impact while anxiety affected only psychosocial impact. This study suggests the importance of focusing psychological interventions on control beliefs, that include a competence element, and on negative emotions. The latter can be considered as an important resource to neutralize physical and psychosocial impact.

Results obtained regarding illness-focused coping are contrary to previous cross-sectional studies in FMS. In our research this dimension only significantly mediates the relationship between self-efficacy and physical impact of FMS. Some studies reported that passive coping strategies (equivalent to illness-focused coping in the current study) did not predict higher physical impact in FMS samples (Nicassio and Radojevic, 1993; Nicassio, Schoenfeld-Smith, Radojevic, and Schuman, 1995; Nicassio *et al.*, 1997). Furthermore, previous studies with FMS patients found that passive coping predicted higher emotional impact and pain intensity (Nicassio and Radojevic, 1993; Nicassio *et al.*, 1997; Nicassio, Schoenfeld-Smith, Radojevic, and Schuman, 1995; Nicassio and Schuman, 2005), which does not occur in the tested model. The results of this research could be explained by differences in coping measures used. The illness-focused dimension contains only behavioural strategies, whereas the passive coping dimension from the Coping Strategies Questionnaire (Rosenstiel and Keefe, 1983) and VPMI (Brown and Nicassio, 1987) includes also cognitive strategies (such as praying and hoping, wishful thinking among others).

Finally, in contrast to previous studies carried out in heterogeneous chronic pain samples, our findings do not provide support for illness coping as a mediator of the effects of control beliefs on psychosocial or pain outcomes in FMS (*e.g.,* Arnstein *et al.*, 1999, 2000; Camacho and Anarte, 2003; Chian-Chin and Ward, 1996; Ramírez-Maestre *et al.*, 2008). Given the coping measure used in this study, this conclusion must be limited to behavioural coping focused on illness as a potential mediator.

In general, the model supported the crucial role of competence control beliefs, general and specific (perceived health competence and self-efficacy respectively) as determinants of all health status areas examined. As shown in previous studies, self-efficacy appears to be more closely linked to physical functioning than other variables (Arnstein, 2000; Chian-Chin and Ward, 1996; González *et al.,* 2009; Oliver and Cronan, 2005; Velasco, Zautra, Peñacoba, López, and Barjola, 2008; Vinaccia, Contreras, Restrepo-Londoño, Cadena, and Anaya, 2005) and perceived health competence more closely linked to anxiety (*e.g.,* Martín-Aragón, 1999). These results are in agreement with theoretical proposals that control beliefs predict behaviours and emotions (Fernández and Edo, 1994; Schermelleh-Engel *et al.*, 1997; Schwarzer, 1992). The large percentage of variance in health outcomes that was explained by direct and indirect control belief effects is important to emphasize; control beliefs along with anxiety and depression effects accounted for 54% of the variance in psychosocial impact, and control beliefs along with depression and illness-focused coping explained 44% of the variance in physical impact. Thus, enhancing these competence beliefs in treatment may produce notable changes in these health status outcomes.

It is important to underscore that pain intensity was only affected by direct paths from self-efficacy and perceived health competence (explaining 23% of its variance), and

that neither coping nor emotions played a significant mediating role. This issue is particularly important for FMS patients due to its intractable and distressing features, and widespread location. Additionally these results suggest the importance of the cognitive dimension in explaining the pain of FMS, in addition to the emotional, behavioural and sensory components, as other studies have suggested (Geisser *et al*., 2003). Thus, remarkably, feeling a sense of control over the condition per se directly affects pain intensity ratings.

The internal locus of control construct did not show significant effects on any health status area considered. Although the subscale showed a low reliability coefficient (.62), which may be problematic, this result coincides with other studies in chronic pain and FMS patients, which similarly found that internal locus of control did not predict any health status outcome (Nicassio *et al*., 1999). Based on the theoretical assumption that the contingency element (cognitive connection between one's own actions and outcomes) is required for competence beliefs (Wallston, 1992), it may be interesting, in future studies, to test for indirect effects of internal locus of control on health behaviours and outcomes through the competence element as a mediator. It is noteworthy that neither emotional variable examined (anxiety nor depression) affected pain perception per se, a relationship documented in other chronic pain problems (Newth and DeLongis, 2004; Strahl, Kleinkncht, and Dinnel, 2000), and recently in FMS patients (González *et al.,* 2009).

In contrast, results of our study suggest that depression and anxiety are independent of pain intensity in FMS, consistent with other studies carried out in FMS (Buckelew *et al*., 1994; Kurtze *et al.,* 1998; Thieme, Turk, and Flor, 2004). Possibly, other negative emotions (anger, fear, and/or frustration) may influence pain intensity in FMS as suggested by other studies (Bruehl, Chung, Burns, and Biridepalli, 2003; Sayar, Gulec, and Tophas, 2004). On the other hand, emotions could influence pain intensity through their effect on physical and psychosocial functioning. In this sense, in another study with FMS patients and with the same structural equation model methodology, the relationship between cognitive-affective resources and pain heat tolerance was mediated by physical functioning (Velasco *et al.,* 2008). Thus, other pathways to pain intensity may thus be operative.

Depression had a strong effect on physical and psychosocial impact while anxiety affected only psychosocial impact. It may be reasonable to assume that depression affects these health outcomes through decreasing activities or through negative perception of functioning on these areas. The unique effect of anxiety on psychosocial impact (which reflects activities in daily life which involve interpersonal relations), could indicate that the anxiety reported by FMS patients has an important social component. In this sense it is possible that anticipatory anxiety may lead to avoiding social interaction activities. Future studies should explore anxiety in FMS because it is the major negative emotion experienced and also has a strong effect on psychosocial impairment.

Several limitations must be mentioned regarding the results of the present study. We could have split the sample into two smaller subsamples for cross-validation purposes, but instead we chose to examine a single large sample size in order to increase stability of the results. Therefore, cross validation studies to test this model are required. The

cross-sectional design of this study allows only for the evaluation of relationships at one point in time and does not allow causal interpretations among the variables. Results were discussed based on directions proposed in the model. Additionally, when a model fits the data this does imply necessarily that it is the most plausible model; in fact there can be many equivalent models all of which will fit the data (Kelloway, 1998). Future research using longitudinal data for providing evidence on the causal relations between variables is required. However, some longitudinal studies carried out in FMS support the positive role of self-efficacy in health status (Cronan, Serber, and Walen, 2002; Menzies, Taylor, and Bourguignon, 2006). Finally health status measures were self-report not observed behaviours.

Conclusions

In summary, this study provides evidence that control perceptions and emotions are central elements explaining the overall impact of FMS on patients. The model tested showed that competence beliefs are a good predictor of adaptation due to both direct and indirect effects on health status areas. Thus, in FMS patients with a long chronic pain process, therapeutic efforts should prioritize increasing control beliefs regarding managing health, pain and function in order to produce meaningful improvement in emotional distress, physical and psychosocial functioning, and pain intensity. From the opposite perspective, a lack of sense of control could be seen as an important psychosocial factor contributing to chronification, hence evaluating this factor early in the course of FMS could provide a useful tool for clinicians to estimate likely prognosis and adaptation, and guide early psychosocial intervention. Another important treatment targets are anxiety and depression levels, not only because they are important areas in themselves, but also because their reduction may provide important resources for decreasing physical and social impact of FMS.

Therefore from a clinical point of view and taking into account the obtained results, standard protocols evaluations should include control beliefs related to competence perception and negative emotions. These issues should be the main goals of treatment in order to improve FMS health status outcomes. To increase sense of efficacy or beliefs in their ability to manage the problem, it is necessary to involve the patients in the successful achievement of small targets, in order to increase their experience of success in coping with the problem and, therefore, their perception of competence in dealing with it. Another area that requires consideration is the field of relations between health professionals and patients. Given the influence of health professionals in these relations, verbal persuasion and educational communication with the patient would have a positive effect by reinforcing these beliefs.

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