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## Perceived Social Support and Coping Responses Are Independent Variables Explaining Pain Adjustment Among Chronic Pain Patients

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**Abstract:** The purpose of the present study was to test a hypothetical model of the relationships between perceived social support, coping responses to pain, pain intensity, depressed mood, and functional disability (functional status and functional impairment) in a population of patients with chronic pain in a Spanish Clinical Pain Unit. It was postulated that social support and pain coping responses both independently influence reported pain intensity, depressed mood, and functional disability. Analyses were performed by Structural Equation Modelling. The results indicated that satisfaction with social support is significantly associated with a depressed mood and pain intensity, but not with functional disability. Although this effect is independent of the use of active coping responses by patients, there is a modest but significant relationship between social support and passive coping strategies, indicating that higher levels of perceived social support are related to less passive pain coping strategies. The findings underscore the potential importance of psychosocial factors in adjustment to chronic pain and provide support for a biopsychosocial model of pain.

**Perspective:** This article tested a hypothetical model of the relationships between social support, pain coping, and chronic pain adjustment by using Structural Equation Modelling. The results indicate that perceived social support and pain coping are independent predictors of chronic pain adjustment, providing support for a biopsychosocial model of pain.

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**Key words:** Social support, pain coping, chronic pain adjustment.

As an alternative to the biomedical model, the biopsychosocial model views pain as emerging from a complex interaction of biological, psychological, and social variables.<sup>1</sup> The model argues that several psychological factors play an important role in the genesis, exacerbation, and maintenance of recurrent pain conditions. From this perspective, 3 categories of psychological variables are viewed as important in predicting pain: cognitions, coping responses, and social environment variables, including social support.<sup>21</sup>

Social support is defined as the resources perceived as being available from others in social networks. The literature describes the beneficial and deleterious effects of support on chronic pain patients. Those chronic pain patients who report high levels of social support experience less distress and less severe pain, with higher levels of support associated with better adjustment.<sup>21,35,37</sup> On the other hand, support in the form of attention from spouses and solicitousness regarding patient pain behaviour is associated with heightened pain severity and overt pain behaviour.<sup>4,7,16,17,30,31</sup> One possible explanation for such contradictory findings is the inconsistent definition of support. Whereas some studies have considered the enacted aspects of support (eg, family members' attentive responses) that may unintentionally reinforce pain, other studies have considered the perceived aspects of support (eg, the availability of support in times of need).<sup>26</sup>

Various reasons can be considered in explaining how perceived support improves adjustment in chronic pain conditions. On the one hand, it can be argued that sup-

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port promotes certain adaptive coping responses, these strategies being the unique predictors of adjustment to pain. For example, some findings indicate that perceived social support indirectly influence pain severity by encouraging the use of specific coping strategies,<sup>18</sup> which beneficially affects long-term functional disability and pain.<sup>25</sup> On the other hand, it is possible that the support available diminishes pain severity, negative emotions, and functional disability, independent of coping responses. Thus, some findings<sup>23</sup> indicated that coping and satisfaction with social support are not necessarily related variables when explaining chronic pain adjustment. In addition, in the studies conducted by Evers et al,<sup>13,14</sup> the results showed that both pain coping and perceived support are independent predictors of functional disability and pain. Likewise, other findings<sup>21</sup> highlight the independent contribution of both maladaptive coping and perceived support to the prediction of depression, pain severity, and pain interference.

Finally, some studies have taken into account the role that perceived support itself plays on chronic pain adjustment. Kerns et al,<sup>24</sup> found an indirect relationship between pain-relevant support and depression, although perceived support was directly related to pain and disability. Likewise, some findings indicate that perceived support was not significantly associated with depression.<sup>32</sup> However, other studies could lead to the conclusion that perceived support has a buffering effect,<sup>8</sup> indicating that it may be beneficial for persons who are experiencing stressful situations, such as chronic pain. In fact, there are findings indicating that higher levels of perceived support are associated with fewer depressive symptoms<sup>10,15,20,22,27</sup> and that a lack of emotional support is connected with depressive symptoms.<sup>3</sup>

Despite the evidence supporting the potential importance of perceived support in adjustment to chronic pain, as far as we know there are no studies analyzing the relationship between all the aforementioned psychosocial variables (support, coping, and pain adjustment) at the same time. Therefore, the purpose of this study was to test a hypothetical model of the relationships between perceived support, coping responses to pain, pain intensity, negative effect, and functional disability (functional status and functional impairment). Taking into account the results mentioned, it is postulated that perceived support and pain coping, considered as related exogenous variables in the model, both independently influence reported pain intensity, depressed mood, functional status, and functional impairment.

## Methods

### *Participants and Procedures*

The subjects consisted of 117 patients with chronic pain. Participants were recruited from the Clinical Pain Unit at the "Carlos Haya" University Hospital in Málaga (Spain). Subjects had to have experienced pain on a daily or almost daily basis for at least 6 months to be included in the study. None of them refused participation.

The mean age of study participants was 54.03 years (SD, 1.33). Most of the patients were women (71.8%,  $n = 84$ ). At the time of the study, 56.4% were retired and 66% were married. Thirty-seven percent of patients reported high school education or higher. The average duration of patient pain was 11.49 years (SD, 10.06; range 1–25 years). Some 12.9% reported primary complaints of lower back pain, leg pain, or both; 6% had mid or upper back pain; 22.2% had other musculoskeletal pain problems or headache; 20.2% reported joint pain as their primary complaint; and the remaining 20.9% reported widespread pain.

Each participant had a semistructured interview with a psychologist to collect relevant demographic, social, or medical history data. A battery of questionnaires including the measures described below were also completed by each participant. The patients were administered the measures prior to any treatment at the clinic.

The research project—of which this study is a part—was approved by the "Carlos Haya" University Hospital Ethics Committee. Informed consent was obtained prior to data collection. Participants were aware that the information collected was confidential.

## Measures

### Demographic and Pain-Related Measures

Subjects completed a questionnaire assessing sociodemographic and injury variables, including age, gender, employment status, marital status, educational level, circumstances of pain onset, time in pain, medications and other medical treatments, medical consultations, and surgery related to pain.

### Characteristic Pain Intensity

A self-monitoring technique was used. Subjects rated their current pain on a scale of 0 to 10, 3 times per day: After breakfast, lunch, and dinner. An average pain intensity score was calculated for the last week.

### Social Support

We assessed social support with the Spanish Version<sup>9</sup> of the Duke-UNC Functional Social Support Questionnaire,<sup>5</sup> an 11-item form questionnaire referring to 2 dimensions of functional social support: affective support and confidant support. Respondents are asked to rate their satisfaction with the different situations described on a 5-point scale, with 1 = very dissatisfied and 5 = very satisfied (eg, "Receive visits from friends and family"; "Able to count on people who are concerned about the situation"). The internal consistency of the Spanish version is good (Cronbach  $\alpha = .80$ ).

### Pain Coping

The Spanish Version<sup>11</sup> of the Vanderbilt Pain Management Inventory (VPMI)<sup>6</sup> was applied. This 18-item instrument asks patients to rate the frequency with which they use coping strategies when their pain reaches a moderate or greater level of intensity on a 5-point scale. The instrument is made up of 2 scales: Active (adaptive, eg,

“When you are in pain, you try to do something you enjoy”) and passive (maladaptive, eg, “When you are in pain, you tell others that it hurts a lot”) coping, based on their relationship to indices of pain and psychosocial functioning. Active and passive dimensions of coping were identified in the Spanish version and both scales showed good internal consistency (Cronbach  $\alpha = .80$  for active coping, and  $= .82$  for passive coping).

### Negative Effect

Subjects completed the 7-item depression scale of the Hospital Anxiety and Depression Scale (HADS).<sup>38</sup> Ratings may range from 1 (almost never) to 4 (very often). The HADS is a practical screening tool for identifying and quantifying depression (and anxiety) in the medical outpatient clinic for nonpsychiatric patients. The Spanish Version of the scale shows appropriate validity and high internal consistency (Cronbach  $\alpha = .86$  for depression).<sup>28</sup>

### Functional Status and Functional Impairment

The Impairment and Functioning Inventory (IFI) is composed of 37 items each referring to an activity related to one of the following areas: Household, autonomy behaviours, leisure, and social relationships.<sup>29</sup> The IFI has been specifically developed for patients with chronic pain and takes into account the distinguishing features of Spanish culture. The instrument gives an index of functioning, an index of impairment and scores for each of these areas, and offers advantages in assessing patients with a long history of pain where the degree of deterioration is at least as informative as the current level of functioning. The subscales and the global scales showed high reliability (Cronbach  $\alpha = .84$  for functional status and  $.85$  for functional impairment). Factor analytic techniques supported the hypothesized internal structure.<sup>29</sup>

### Data Analysis

To consider simultaneously the influence of the exogenous variables (social support and pain coping) on all the endogenous variables (pain intensity, depressed mood, and functional disability—functional status and functional impairment) the analysis was performed by Structural Equation Modelling with AMOS 6.0 software.<sup>2</sup>

**Table 1. Descriptive Statistics on Study Variables**

VARIABLE	MEAN	SD	SKEWNESS	KURTOSIS
Social support	40.13	12.87	-0.69	-0.72
Active coping	13.36	4.79	0.37	-0.72
Passive coping	20.46	5.98	0.13	-0.46
Pain intensity	5.90	1.27	-0.76	1.88
Depression	19.67	6.30	-0.37	-1.09
Functional status	100.13	35.19	-0.08	-0.44
Functional impairment	12.27	5.66	0.78	0.56

**Table 2. Initial Model: Standardized Coefficients**

EXOGENOUS VARIABLES	ENDOGENOUS VARIABLES			
	DEPRESSION	PAIN INTENSITY	FUNCTIONAL STATUS	FUNCTIONAL IMPAIRMENT
Social support	-.12*	-.11*	.02	.01
Active coping	-.40*	.00	.30*	-.13
Passive coping	.29*	.17*	-.03	.05

\* $P < .05$ .

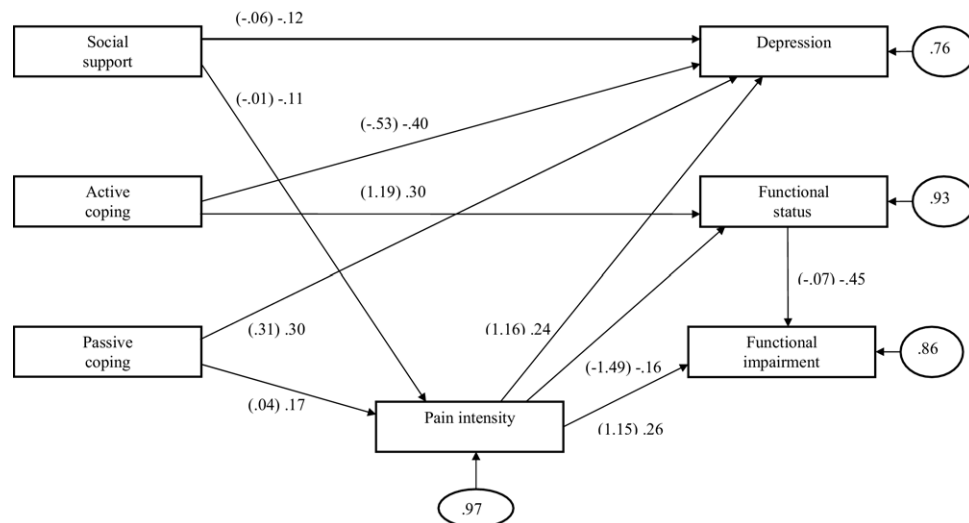
No outliers were evident in the analysis. There were small amounts of missing data amounting to no more than a few cases on any given variable. In addition, there was no coherent pattern to the missing data. Following Tabachnik and Fidell's<sup>33</sup> recommendations, a test of mean differences between cases with missing and non-missing values was first performed for all variables with missing data. Given that there were no differences between groups, the means were calculated from available data and used to replace missing values. Since variables were normally distributed, the estimation method was Maximum Likelihood (ML).

### Results

Men and women were compared by performing Student's  $t$  tests to determine if these 2 groups were comparable. The 2 groups did not differ in any of the variables. Table 1 presents the descriptive statistics for all of the continuous variables used in the models.

Paths were defined from each exogenous variable to each of the 4 endogenous variables. Analyses were performed on the covariance matrix. Table 2 shows the standardised coefficients of the initial model. As can be seen, perceived social support has a negative effect on pain intensity and depression, and passive coping has a positive effect on depression and on pain intensity. On the other hand, active coping has a negative effect on depression and functional impairment and a positive effect on functional status.

All residual variances were assumed to be uncorrelated, whereas exogenous variables were assumed to be correlated. To obtain a parsimonious model, all paths were deleted that were not statistically significant in the initial model. For this reason, no link is depicted in Fig 1 between active coping and functional impairment, although the path was included in the initial model. In addition, the relationships suggested by the modification indexes were included; specifically, a path from functional status to functional impairment, and path from pain intensity to depression, functional status, and functional impairment. All the suggested paths are plausible and refer to relationships between the endogenous variables that were not considered in the initial model. All path coefficients were statistically significant ( $P < .05$ ). Both unstandardized and standardized path coeffi-



**Figure 1.** Final model. Rectangles are measured variables, circles are standardized error variances, values in parentheses are unstandardized path coefficients, values not in parentheses are standardized path coefficients, straight lines with arrows are presumed paths between variables. All exogenous variables were assumed to be correlated, but these correlations are omitted from the diagram to reduce clutter.

coefficients are presented, with unstandardized coefficients in parentheses. The final model accounts for 42%, 12%, 26%, and 5% of the variance of scores on depression, functional status, functional impairment, and pain intensity, respectively.

Correlations between the exogenous variables are omitted for purposes of clarity. Passive coping has a negative relationship with active coping ( $r = -.45$ ) and a weaker negative relationship with perceived support ( $r = -.11$ ). Active coping has no relationship with perceived support ( $r = .08$ ).

The various goodness-of-fit indexes calculated indicated that the estimated model provides a good fit to the data<sup>19</sup>:  $\chi^2 = 22.82$ ,  $df = 14$ ,  $P = .08$ ;  $GFI = .96$ ;  $AGFI = .90$ ;  $CFI = .95$ ;  $RMSEA = .07$ ; close-fit test  $P$  value  $< .22$ ; standardized  $RMR = .038$ . These are the more traditional indices of global fit, whereas when the  $\chi^2$  fit index is statistically nonsignificant, this is consistent with perfect model fit; the goodness-of-fit indexes ( $GFI$ ,  $CFI$ , and  $AGFI$ ) with high values ( $GFI > .90$ ,  $CFI > .90$ , and  $AGFI > .80$ ) are associated with a good model fit; the root mean square error of approximation ( $RMSEA$ ) with values smaller than  $.08$  and a nonsignificant close-fit test are considered suitable; and regarding the root mean square residual and standardized root mean square residual ( $RMR$ )—with the smallest possible value being 0—the smaller the value of the standardised  $RMR$ , the better the model fit.

As can be seen (Fig 1), social support yielded 2 statistically significant path coefficients. The first was to pain intensity, with individuals characterized by higher levels of perceived support reporting less pain intensity. The second path was to depression indicating that higher levels of perceived support were associated with lower levels of depressed mood. Perceived support also had 2 indirect effects on functional status and functional impairment due to the mediating role of pain intensity.

Active coping yielded 2 statistically significant path coefficients. The first was to depression, indicating that higher levels of active coping were associated with lower levels of depressed mood. Active coping also had statistically significant effects on functional status, with individuals characterized with higher levels of active coping reporting higher levels of functional status.

Passive coping yielded 2 statistically significant path coefficients. The first was to depression, with individuals characterized by higher levels of passive coping reporting higher levels of depression. Passive coping also had a weak but statistically significant effect on pain intensity, indicating that higher levels of passive pain responses were related to higher levels of pain severity. Moreover, passive coping had 2 indirect effects on functional status and functional impairment due to the mediating role of pain intensity.

Reported pain intensity yielded 3 statistically significant path coefficients. The first was to depression, indicating that individuals who report higher levels of pain are more depressed. The second path coefficient was to functional impairment, with individuals characterized with higher levels of pain reporting higher levels of functional impairment. Pain intensity also had statistically significant effects on functional status, because individuals with higher levels of pain report lower levels of functional status. Some of the effect of pain intensity on functional impairment was due to the mediating role of functional status, ie, because individuals with higher levels of pain intensity report lower levels of functional status and because those with higher levels of functional status report lower levels of functional impairment, it follows that those with higher levels of pain intensity also report higher levels of functional impairment. Rather, pain intensity seems to have an independent effect on functional impairment irrespective of functional status.

## Discussion

The purpose of the present study was to test a hypothetical model of the relationships between perceived support, coping responses to pain, pain intensity, depressed mood, and functional disability (functional status and functional impairment) in a population of patients with chronic pain in a Spanish Clinical Pain Unit. It was postulated that social support and pain coping responses both independently influence reported pain intensity, depressed mood, and functional disability.

The findings partially support our predictions. As has been pointed out previously,<sup>13,14,21,23</sup> this study found that perceived support and pain coping strategies appear to make independent contributions to chronic pain adjustment, suggesting once more that different psychosocial variables may play different roles in adjustment to pain.<sup>21</sup> According to our results, perceived support is significantly associated with depressed mood and pain intensity but not with functional disability. Although this effect is independent of the use of active coping responses by patients, there is a fairly modest but significant relationship between perceived support and passive coping strategies, indicating that higher levels of perceived social support are related to less passive pain coping strategies. Passive pain responses are also related to pain intensity and depressed mood, suggesting that both variables independently contribute to explaining pain levels and negative affect. Therefore, these results do not support those indicating that perceived support leads to more adaptive pain coping and improved coping effectiveness that, in turn, beneficially affects long-term disability.<sup>18,25</sup>

In contrast to expectations, perceived support did not influence functional disability. This result is contrary to those obtained in previous research showing that perceived support from significant others was linked to greater activity levels.<sup>13,14,20,23,24</sup> In the studies carried out by Evers et al,<sup>13,14</sup> social support assessed at the time of diagnosis consistently predicted a less unfavourable course of functional disability at 1-, 3-, and 5-year follow-up, whereas passive pain coping had a detrimental effect on functional disability only at 1- and 3-year follow-up, once again highlighting the independence of both factors on pain adjustment. In fact, our results indicate that the only 2 variables that significantly influence functional status are active pain coping responses and perceived pain intensity. This result is expected regarding active pain responses, as this coping strategy has been shown to be related not only to higher activity levels, but to positive affect.<sup>6,12,21,34</sup> However, according to the findings obtained in this study, active pain coping was not associated with less intense pain but did have an effect on the use of passive strategies—which are directly related to pain—indicating once again that although passive and active pain responses are related pain coping strategies, they play different roles in pain adjustment.<sup>12,14</sup> Whereas passive pain coping increases depression and pain severity, when active coping is practiced, the level of depression decreases and the level of

daily activity increases. Therefore, both pain coping responses must be considered in pain treatment programs because “they represent patients’ coping strengths and weakness.”<sup>34</sup>

With respect to pain intensity, the final adjusted model showed a relationship between pain level and functional status and between pain level and functional impairment, indicating that the degree of deterioration of patients with a long history of pain not only depends on their activity levels but on how much pain they are currently suffering. According to our findings, perceived pain severity influences both functional status and functional impairment, regardless of the relationship between both variables; in addition, active pain coping responses positively influence the level of daily activity (functional status). Considering that active coping is defined as the patients’ attempts to control their pain or to function despite their pain,<sup>6,12</sup> it can be argued that active coping responses have much in common with the confrontation behaviours postulated by the fear-avoidance model.<sup>36</sup> The model assumes that patients who use confrontation behaviours are those who maintain appropriate levels of daily activities, resulting in higher functional capacity. According to our results, the use of active pain coping certainly increases the level of functional status.

As expected, our results allow us to conclude that perceived support is directly related to depressed mood, with higher levels of support associated with less depressed mood. This beneficial effect has been emphasized in several studies.<sup>15,20,21,23</sup> Therefore, it can be argued that perceived support has a buffering effect on negative affect, in contrast to studies suggesting an indirect relationship between support and depression,<sup>24</sup> or findings indicating that social support is not significantly associated with depression.<sup>32</sup>

In the present study, the findings suggest that patients receiving higher levels of social support not only showed decreases in depression, but in pain intensity (which, in turn, decreases functional impairment and increases functional status), pointing to the beneficial effect of perceived social support on people with chronic pain.<sup>15,20,21</sup> Nevertheless, pain severity and negative affect are also influenced by pain coping responses. These results support previous arguments indicating that poor clinical presentations are linked to high pain, disability and depression in patients, who, in turn, are more likely to report high levels of passive pain coping and less perceived support.<sup>23,34</sup> Taking into account that the passive pain coping scale used in this study is a composite measure of coping, it is not possible to know which particular strategies contribute to these results. However, considering that one of the most consistent findings in the literature has been that catastrophizing is a strong predictor of adjustment to pain, it can be hypothesized that this coping strategy is to a great extent the one responsible for some of the results described. In fact, the results of a previous work using the specific coping strategies derived from the composite ones showed that only the catastrophizing scale was related to both negative mood

and pain intensity.<sup>11</sup> Research is needed to substantiate not only this hypothesis, but to determine the specific interaction between catastrophizing and perceived social support in pain adjustment. Regarding studies on the social context of pain catastrophizing, research supports an association between catastrophizing and solicitous responses to pain from others,<sup>4,7</sup> but it remains unclear how catastrophizing interacts with perceptions of social support, and how this interaction impacts on pain experiences.

This study has several limitations that should be considered. First is the exclusive reliance on self-report measures. It is likely that shared method variance accounts for at least some of the associations found between the study measures. Second, the research relied on cross-sectional measures of pain coping; therefore the results are not able to capture the dynamic process of pain coping. Again, because of the cross-sectional study design, identification of causal relationships is not possible. Longitudinal research designed to follow coping variables over time would help to develop causal models showing the influence of these variables on pain adjustment. Fourth, because very broad categories of social support and coping responses have been considered, the generality of the data is limited. Daily diary methods would be useful to better capture the process of dealing with pain at

different times and in particular cases. Fifth, the study was performed in the context of an ongoing clinical trial; therefore it is possible that the medical treatment condition influenced concurrent pain and pain interference. It is also important to recognize that although the sample size is adequate for the number of variables examined,<sup>33</sup> replication with a larger sample would increase confidence in the reliability of the results.

Despite these limitations, the findings provide support for a biopsychosocial model of pain.<sup>1,21</sup> They not only underscore the potential importance of psychosocial factors in adjustment to chronic pain but also suggest that the mechanisms by which these psychosocial variables influence outcome are independent of each other, pointing to the potential benefit of interventions that seek to alter environmental factors on long-term adjustment to chronic pain.

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