

Biopsychosocial predictors of pain, incapacity and depression in Brazilian chronic pain patients*

Preditores biopsicossociais de dor, incapacidade e depressão em pacientes brasileiros com dor crônica

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SUMMARY

BACKGROUND AND OBJECTIVES: This research is based on biopsychosocial chronic pain perspective, which suggests the presence of a dynamic interrelation among biological changes, psychological status and social context, where each dimension has a differentiated role in chronic pain, disability and emotional balance. This article has examined the applicability of pain, disability and distress predictors, proposed by biopsychosocial pain models, in a sample of Brazilian chronic pain patients.

METHOD: This is a transversal study carried out with a convenience sample of 311 participants seen by different pain centers located in the Southern and Southeastern regions of Brazil. Statistical analyses to evaluate tests properties and relationships among variables included *t* test, Analysis of Variance, correlations, multiple and logistic hierarchical regression. All statistical analyses were performed with the SPSS-14 software.

RESULTS: Organic, socio-demographic and cognitive

factors have contributed to disability, depression, pain intensity and employability in a differentiated way. In this sample, educational level, pain location and self-efficacy have contributed to disability; catastrophic thinking was the sole predictor of depression; gender and self-efficacy have contributed to pain intensity; and age, educational level, disability and self-efficacy were risk factors for unemployment.

CONCLUSION: Evidences described in the literature, based on the biopsychosocial perspective, which emphasizes the different role of biopsychosocial factors on pain, incapacity and mental distress were confirmed by this study.

Keywords: Biopsychosocial model, Chronic pain, Depression, Disability, Employment.

RESUMO

JUSTIFICATIVA E OBJETIVOS: Esta pesquisa foi baseada na perspectiva biopsicossocial de dor crônica, que sugere a existência de inter-relação dinâmica entre alterações biológicas, estado psicológico e contexto social, onde cada uma destas dimensões apresenta um papel diferenciado na dor crônica, incapacidade e ajuste emocional. Este estudo examinou a aplicabilidade de preditores de dor, incapacidade e sofrimento propostos pelos modelos biopsicossociais de dor em amostra de pacientes brasileiros com dor crônica.

MÉTODO: Estudo de corte transversal realizado com amostra de conveniência de 311 participantes atendidos em diversos centros de dor localizados no Sul e Sudeste do Brasil. As análises estatísticas para examinar as propriedades dos testes e relações entre as

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variáveis incluíram teste *t*, Análise de Variância, correlações, regressão hierárquica múltipla e logística. Todas as análises estatísticas foram realizadas com o programa SPSS-14.

RESULTADOS: Os fatores orgânicos, sócio-demográficos e cognitivos contribuíram para incapacidade, depressão, intensidade da dor e empregabilidade de forma diferenciada. Nessa amostra, grau de escolaridade, local da dor e autoeficácia contribuíram para incapacidade; pensamentos catastróficos foram o único preditor de depressão; gênero e autoeficácia contribuíram para a intensidade da dor; e idade, grau de escolaridade, incapacidade e autoeficácia foram fatores de risco para desemprego.

CONCLUSÃO: As evidências descritas na literatura baseadas na perspectiva biopsicossocial, que enfatizam o papel distinto de fatores biopsicossociais na dor, incapacidade e sofrimento mental foram confirmadas nesse estudo.

Descritores: Depressão, Dor crônica, Incapacidade, Modelo biopsicossocial, Trabalho.

INTRODUCTION

This research is based on a biopsychosocial perspective of chronic pain, which suggests the presence of a dynamic relationship among biological changes, psychological status and social context, emphasizing that such factors have different roles on chronic pain, disability and emotional imbalance¹⁻³. This project defines chronic pain as pain persisting for more than three months and this definition is consistent with several widely used epidemiological references⁴.

Chronic pain may severely impact people's functional capacity. However, this is not a universal phenomenon and, although some patients become physically disabled, others seem to be well adjusted to chronic pain. Since chronic pain is not synonym to disability, it is extremely important to identify which factors promote a maladaptive function due to this presentation.

There are strong evidences that chronic pain may be associated to physical disability, emotional disorders and social difficulties. In addition, it has been recognized that emotional, cognitive and social factors mediate the subjective experience of pain¹⁻³.

According to the biopsychosocial model of pain⁵, chronic pain manifestation and maintenance are dynamic functions of predispositions, stimulations, preceptor responses and maintaining factors. Predisposing variables may include genetic factors, learning pro-

cesses and occupational factors. Preceptor stimulations may be external and internal and involve stressors and values able to trigger several autonomic and musculoskeletal responses (e.g.: sympathetic activation and muscle tension). Such responses are mediated by perception and interpretation of physiological processes or symptoms and may involve expectations, learning processes and beliefs, as well as coping strategies. Maintaining variables may be influenced by learning factors and other psychosocial factors. According to this model, biological aspects may trigger, maintain or modulate physical changes; psychological factors influence the evaluation and perception of physiological signs, and social factors shape behavioral responses to perception of physical changes⁵.

Several reviews of the role of psychosocial factors on chronic pain, especially neck and low back pain, have described the role of such factors in chronic pain precipitation, in the transition from acute to chronic pain and in chronic pain-related physical disability¹⁻³. There are evidences that cognitions, mood and behavioral/environmental interactions are associated to chronic pain. Cognitive factors include pain-related beliefs, such as self-efficacy, catastrophic thinking, fear, avoidance and acceptance¹. Affective/mood factors include anxiety, depression and stress^{2,3}. Behavioral/environmental interactions include learning and reinforcement processes. These factors seem to play an important role in the relationship among chronic pain, disability and mental distress.

Although being a severe public health problem in several societies, most chronic pain studies come from few North American, European and Oceania countries. So, there is the need to generate knowledge in this area also in developing countries, to evaluate the matching of such evidences to other population samples. Based on these assumptions, this study has examined factors contributing to disability, pain intensity, depression and employability in a Brazilian sample of chronic pain patients.

METHOD

This is a transversal cohort, descriptive, comparative, correlational and predictive study using demographic, clinical and psychological measurements in a group of chronic pain patients.

Participated in this study 311 chronic patients referred by 9 institutions, being 7 pain clinics, 1 rheumatology outpatient setting and one acupuncture clinic in Brazil, who met inclusion and exclusion cri-

teria. This was a convenience sample and data were collected from March to October, 2005.

Inclusion criteria were chronic pain almost every day for more than 6 months, age between 18 and 81 years; more than 4 years of formal education; be interested in participating in the study and have approximately 40 minutes available to answer the questionnaires. Exclusion criteria were cancer pain; major mental disorder, for example, psychosis; have questionnaires with more than 10% of unanswered items.

Chronic pain patients seen by pain clinics or similar institutions who agreed to participate were referred by health professionals to the investigators who provided participants with relevant information, two copies of the free and informed consent term and tests to be answered. After answering, the researcher or research assistant has checked the questionnaires to avoid incomplete items. Clinical data were collected from patients' medical records and questionnaires were identified by a numeric code to keep data confidentiality. This research was carried out according to the principles of the Declaration of Helsinki. Data collection has not interfered with patients' treatment.

Data were organized in spreadsheets and analyzed by the SPSS-14 statistical program. Statistical analysis of descriptive data was used to characterize the sample. Tests psychometric properties were examined through the analysis of major components and reliability tests. Chi-square, *t* and ANOVA tests were used to compare results among groups. Correlation, multiple hierarchical regression and logistic regression tests were used to analyze relationships among variables.

Tools

The socio-demographic questionnaire consisted of data related to age, gender, educational level, income, profession and professional bond. The clinical inventory has investigated issues related to major complaint (diagnosis, pain location, pain intensity and duration), use and type of medication, type of intervention to which patient had been submitted.

Roland-Morris Disability Questionnaire (RMDQ) is a self-report measurement created to evaluate physical disability in low back pain patients. RMDQ has 24 statements, each item is scored zero or one and total score may vary from 0 to 24, indicating from no disability to severe disability. RMDQ is simple to apply, correct and analyze and is validated for many populations⁶.

Pain Self-Efficacy Questionnaire (PSEQ) has 10 items

scored in a Likert-type scale (0 to 6), associated to the words "not a bit confident" and "totally confident". Items describe different tasks referred as problematic by chronic pain patients. High scores reflect stronger self-efficacy beliefs. PSEQ validity and reliability have been confirmed through comparisons of this measurement with other tools in different populations⁷.

The Pain Self-Statements Questionnaire was developed based on cognitive scheme and automatic thinking concepts. The catastrophic thinking scale is composed of 9 items scored on a Likert scale (0 to 5). Construct, reliability and sensitivity validity of this tool have been confirmed for different populations, including Brazil⁸.

The Chronic Pain Acceptance Questionnaire (CPAQ)⁹ was developed to measure pain acceptance of chronic pain patients. Its 20 items consist in statements scored on a Likert scale (0 to 6) associated to the words "never true" to "always true". Studies have described medium and moderate correlations of this tool with depression, anxiety and disability measurements, thus supporting the validity of this measurement⁹.

The Depression, Anxiety and Stress Scale (DASS) was developed to be a measure of depression, anxiety and stress with low inter-correlation among these factors. This tool has 3 scales (depression, anxiety and stress) made up of 42 items scored on a Likert-type scale (0 to 3). The depression scale has 14 items especially characterized by low self-esteem and motivation symptoms without somatic depression items. DASS has adequate psychometric properties and is validated for the Brazilian population⁸.

Study approved by the Ethics Committee of the University (protocol 430/2004).

RESULTS

Table 1 shows demographic and clinical characteristics of the sample.

There has been normal age distribution with higher concentration between 43 and 54 years of age. The ratio of females as compared to males was almost 3:1. Most participants were married, 39 participants (12.5%) were divorced or separated and 17 (5.5%) were widows. Sample was quite heterogeneous in educational level with slight concentration of participants with university degrees. A substantial number of participants was unemployed (41%) due to chronic pain.

As to pain location, a substantial number of participants has referred pain in two or more locations (45%), followed by neck, shoulders and upper limbs (15.5%), and

Table 1 – Demographic and clinical characteristics of the sample.

Socio-demographic characteristics	
Age group (years)	N (%)
18 – 30	39 (12.5)
31 – 42	61 (19.6)
43 – 54	105 (33.8)
55 – 66	69 (22.2)
67 – 81	37 (11.9)
Mean ± SD	48.9 (14.06)
Gender	
Male	81 (26.0)
Female	230 (74.0)
School attendance	
4 to 8 years	101 (32.5)
9 to 11 years (including technical course)	89 (28.6)
University	121 (38.9)
Pain location	
Head, face, neck	36 (11.6)
Cervical region, shoulders and upper limbs	48 (15.5)
Chest and abdomen	14 (4.5)
Back or spine	16 (5.1)
Lower limbs	22 (7.1)
Pelvic, anal or genital region	5 (1.6)
Lumbar region and lower limbs	30 (9.6)
Pain in two or more locations	140 (45.0)
Pain duration	
3 months to 1 year	28 (12.2)
More than 1 and less than 3 years	60 (19.3)
3 to 5 years	87 (28.0)
6 to 9 years	39 (12.5)
More than 10 years	87 (28.0)
Mean pain intensity in recent weeks (NVS)	
1 to 4 (mild)	70 (22.5)
5 to 6 (moderate)	94 (30.2)
7 to 10 (severe)	147 (47.3)

NVS = numeric visual scale

back pain with or without irradiation to lower limbs (14.7%). Lower limbs pain (7.1%) was described as a different category because in general it was associated to knee or joint pain, in general caused by arthritis. Most patients had pain for more than three years

(68.5%). Approximately 22% of patients had mild pain (1 to 3), but most participants have reported severe pain (7 to 10, 47.3%).

Mean pain intensity by the numeric visual scale (NVS) was 6. Most patients (82.4%) were under different types of drugs (e.g.: analgesics, anti-inflammatory drugs). The prevalence of other diseases was also investigated; 28% of participants referred hypertension, 18% referred depression, 10% endocrine dysfunctions and 5% diabetes. Data below describe multiple and logistic regressions results aiming at analyzing the contribution of clinical, demographic and psychological variables to disability, pain intensity, depression and employability.

Among socio-demographic, clinical and psychological variables, only those with significant correlations with dependent variables (disability, depression, pain intensity and employability), as well as with significant *t* and ANOVA tests values, have participated in the regression analysis. Significance of *p* was established as 0.001 using a Bonferroni correlation. This procedure was used to minimize type I and II errors, which could occur as a function of the sample size.

A block of socio-demographic and clinical variables was included in each model used for regression, aiming at controlling associations between them and the dependent variable (e.g.: educational level, pain intensity) followed by a block of psychological variables (included during the second phase of the analysis). To interpret the significance level of regressions results, and once more aiming at controlling type I error, a Bonferroni correlation was applied by dividing *p* values by the number of independent variables present in the equation. Established *p* value is shown at the bottom of each table (e.g.: for disability analysis, 0.05 was divided by the number of variables present in equation 13, resulting in $p = 0.004$).

Socio-demographic and clinical variables present in the first block of analysis have contributed to 22% of the disability variance, but only educational level and pain location have reached significant levels. In the second stage of analysis, psychological variables included have contributed to 25% of disability variance, however in this group only self-efficacy had a significant *p* value (beta = -0.51, $p < 0.001$).

In the analysis of depression predictors, socio-demographic and clinical variables (not shown in the article due to space limitation), after controlling first block variables, cognitive and disability variables have contributed to additional variance of 30%, and only catastrophic thinking has significantly contributed to depression.

Table 2 – Multiple Hierarchical Regression Analysis (MHR) predicting disability.

Stages and predictors	Total R ²	F	GL	Change in R ²	F (mudança)	Beta ^a	t
Variable criterion:							
Disability							
Stage 1:	0.2	21.40**	306	0.2	21.40**		
Education						-.19	-4.2**
Gender						.01	0.2
Pain intensity						.11	2.4
Pain location						.19	4.3**
Stage 2:	0.47	29.47**	301	0.25	28.30**		
Depression						.04	0.77
Participation in activities							1.32
Willingness to live with the pain							-1.52
Catastrophic thinking						.07	1.31
Self-efficacy						-.51	-8.23**

^a Standardized regression coefficient * $p \leq 0.004$ ** $p \leq 0.001$

The analysis of pain intensity predictors has shown that only gender (female, beta 16, $p = 0.007$) and self-efficacy (beta -28, $p = 0.001$) have significantly contributed to pain intensity.

Logistic regression was used to examine the contribution of clinical, socio-demographic and psychological variables to employability (being unemployed). Correlation values were analyzed and, as previously described, there were no significant correlations suggesting multicollinearity. Continuous variables had to be re-codified into binary variables to enable logistic regression. After this, correlation values were again analyzed and were lower than 0.30, indicating no multicollinearity.

For better logistic analysis interpretation, since analyzed variables had different amplitudes (e.g.: scores varied from 0 to 24 for RM questionnaire and from 0 to 60 for self-efficacy questionnaire), all variables were re-categorized as dichotomous. In the dependent variable employability, participants who were working were scored zero and unemployed as a function of pain were scored 1.

Since employability is influenced by age, only participants aged between 18 and 65 years were included in the analysis ($n = 222$). Participants aged above the cut-off point (45 years) received score 1 and below cutoff point received score zero. Patients with pain in any location were coded with zero and patients with pain in

one or more locations with 1; pain duration for up to five years (0) and for more than 6 years (1); pain intensity up to 5 (0) and higher than 6 (1); patients with basic education or high-school were scored as 1 and with university degree 0.

All variables were re-codified aiming at maintaining the same direction, that is, contributing factors received score 1 (e.g.: older people = 1), including psychological tests where the third quartile was used as cutoff point. Participants with high scores in RM questionnaire, catastrophic thinking scale and depression scale were scored 1 and with scores below the third quartile, 0. The direction was opposed in the self-efficacy and acceptance questionnaire; patients with high scores received zero and with low scores 1.

Logistic analysis was performed using a process of backwards elimination of independent variables. At every stage, the effect of removing a variable was tested using likelihood coefficients (likelihood ratio test) at a significance level of 0.05. Odds ratio, beta coefficients and confidence intervals were examined at every stage to prevent errors resulting from inter-venient variables and provide the goodness of fit of the best model. The sixth stage was evaluated as the best regression model and although not having significant values ($p \geq 0.05$) some independent variables were maintained in the equation since they collaborated for

the best model. Several coding models of variables and stages were performed (Table 3).

this sample, self-efficacy beliefs were also a major risk factor for unemployment.

Table 3 – Logistic regression for employability with OR values, p levels and confidence interval

Variables	Adjusted Odds ratio*	CI 95%	p value
Age (≥ 45 years = 1)	0.39	0.20 – 0.74	0.004
Educational level (≤ 11 years = 1)	3.49	1.81 – 6.74	0.001
Physical disability – RMDQ (score ≥ 17 = 1)	2.75	1.27 – 5.97	0.01
Self-efficacy - PSEQ (score ≤ 25 = 1)	2.52	1.06 – 6.00	0.04
Acceptance - CPAQ ^a (score ≤ 51 = 1)	1.92	0.86 – 4.30	0.11

RMDQ = Roland-Morris Disability Questionnaire; PSEQ = Pain Patient's Self-Efficacy Questionnaire; CPAQ = Chronic Pain Acceptance Questionnaire.

* Variables included in the analysis: pain intensity, pain location, pain duration, gender, depression and catastrophic thinking.

^a Variable maintained in the analysis due to its contribution to obtain the best model.

Among all variables present in the analysis, only educational level, age, physical disability and self-efficacy have significantly contributed to unemployment of chronic pain patients.

Although considering that variables are measured in different scales, educational level seems to be the highest risk factor for unemployment in this population, that is, individuals with less than 11 years of formal education (odds ratio = 3.49, $p = 0.001$) have 3.5 more chance of being unemployed than patients with university degree. Patients with high RMDQ scores have 2.7 times more chance of being unemployed, as compared to those with lower physical disability levels (odds ratio = 2.75, $p = 0.001$). Participants above 45 years of age had 61% more chance of being unemployed as compared to those below 45 years of age.

DISCUSSION

Our results indicate that although socio-demographic (e.g.: educational level) and clinical (e.g.: pain location) variables do contribute to physical disability, self-efficacy beliefs had the most significant contribution to disability and pain intensity. The contribution of the self-efficacy variable to disability found in our study has been frequently described in the literature^{1,5,7} and is once more confirmed in a different culture (Latin American) than those investigated by most studies (Anglo-Saxon). These results indicate that even when different socio-demographic, clinical and psychological variables are taken into consideration, self-efficacy beliefs seem to be a major predictor of disability. It is also important to consider that in

Our self-efficacy beliefs results reinforce the importance of this construct, which proposes that self-efficacy is a major predictor of behaviors (e.g.: disability levels). The contribution of self-efficacy beliefs to disability is also in line with the coping strategies model, which considers that coping strategies are moderated by beliefs, among other aspects. Based on this perspective, it is to be expected that chronic pain patients with low self-efficacy have more chances of having less effective coping strategies, which could mediate physical disability and efforts to remain employed or working, despite of their chronic pain. Some studies confirm this perspective indicating that self-efficacy beliefs are one of the most important predictors of disability and treatment outcomes^{1,10}.

As to the contribution of different studied variables to depression, only catastrophic thinking could predict depression. This result is often described in the literature, which suggests that catastrophic thinking is one of the most important predictors of depression, even when compared to other variables, such as coping, acceptance and self-efficacy beliefs and strategies¹¹.

Altogether, our study results suggest that depression in chronic pain patients may be influenced by other factors, in addition to pain intensity, disability and self-efficacy. As proposed by cognitive-behavioral models, cognitions strongly measure how people interpret the nature of their reality, which could affect their mood. In addition, one may suggest that catastrophic thinking further contributes to pain evaluative and affective dimensions. Based on this model, one may expect that catastrophic thinking really significantly contributes to depression, especially if there has been understanding that depression may be a consequence of chronic pain. So, depression in this population

seems to be not only associated to their level of disability or their pain intensity, but it seems to be more related to evaluative-cognitive processes.

The non contribution of acceptance to disability, depression and pain intensity was not in line with literature results⁹. However, these differences may be associated to CPAQ validity and reliability, and to the lack of control of some cognitive variables in those studies (e.g.: self-efficacy).

As to depression, it has not significantly contributed to disability, pain intensity or unemployment. Although the high prevalence of depression among chronic pain patients and its well-known important role, such as the association between depression and poor treatment response, the nature of this relationship is unknown.

Another important factor of studies describing relationships between pain intensity, depression and disability, is that such results have wide variability⁹. Such variations may have several reasons, among them measurement errors. For example, many studies evaluating such relationships use depression scales with somatic depression symptoms, which may increase depression scores in this population and, as a consequence, increase the contribution of this variable to disability¹². In addition, other studies indicate no major contribution of depression to disability, especially when the contribution of other variables is considered (e.g.: catastrophic thinking or self-efficacy)¹². Based on these evidences, it is important to consider that when measurements without somatic depression items are used, this variable loses its disability predicting value. This perspective reinforces evidences proposed by models indicating that depression may be better understood as a consequence of pain, but it may also indirectly influence other variables (e.g.: number of medical visits).

When we examined risk factors for being unemployed, educational level, age, physical disability and self-efficacy were employability predictors. Although this being one of the first studies evaluating the contribution of self-efficacy to employability, there are evidences of its contribution to the employability of chronic pain patients¹³.

Understanding the role of other work-related environmental variables (e.g.: social security, availability of adapted jobs) is critical for the understanding of factors involved with employability in this population¹⁴, however, as isolated factor, low self-efficacy seems to be a risk factor for unemployment and for physical disability. The contribution of other variables to un-

employment in this population has been described in several countries¹⁴. In addition, it is important to consider that educational level and age are unemployment predictors even for healthy individuals.

The contribution of several biopsychosocial factors to disability, depression, pain intensity and unemployment is widely described in the literature. Described evidences were confirmed by our results, which suggest that physical disability and emotional imbalance seem to depend less on biological aspects than on psychosocial variables.

According to ethnic-social models of pain, social learning is a fundamental process to establish pain-related sense and attitudes. These models propose that attitudes, beliefs and expectations are socially shaped and that culture plays an important role in the response to pain, thus it should be taken into consideration. However, recent studies show that when different ethnic groups are paired considering major intervenient variables, such as income or social class, differences tend to be lower¹⁵.

Our results were similar to most evidences described in the literature and confirm biopsychosocial pain models. Evidences^{1,2,5} supporting these models suggest a dynamic relationship among biological changes, psychological status and social context and these factors have different roles in chronic pain, disability and emotional imbalance. In this sense, studies based on this perspective have shown that physical disability and emotional imbalance are not just a function of biological factors.

Our results allow the hypothesis that although there are differences among groups with regard to type of response to pain, which should be taken into consideration, chronic pain patients tend to be more similar than different. This implies that multidimensional treatment models created in developed countries may be more often used in Brazil, although they should be adapted and tested.

This is a transversal cohort study carried out with a convenience sample, which imposes some limitations regarding the establishment of causal relationships and generalization of results.

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