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Björn Börsbo, Björn Gerdle and Michael Peolsson

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**IMPACT OF THE INTERACTION BETWEEN SELF-EFFICACY, SYMPTOMS, AND CATASTROPHIZING ON DISABILITY, QUALITY OF LIFE, AND HEALTH IN CHRONIC PAIN PATIENTS**

**BJÖRN BÖRSBO<sup>1,2</sup>, BJÖRN GERDLE<sup>1,3</sup>, MICHAEL PEOLSSON<sup>1,4</sup>**

<sup>1</sup> Rehabilitation Medicine, IKE, Faculty of Health Sciences, SE-581 85 Linköping

<sup>2</sup> Clinical Department of Rehabilitation Medicine, County Hospital Ryhov, SE-551 85 Jönköping

<sup>3</sup> Pain and Rehabilitation Centre, University Hospital, SE-581 85 Linköping

<sup>4</sup> School for Technology and Health, Royal Institute of Technology, Stockholm, Sweden

Correspondence: Björn Börsbo, MD, PhD. Clinical Department of Rehabilitation Medicine, County Hospital Ryhov, SE-551 85 Jönköping, Sweden. Tel: +46707922161.

Fax: +4636322622. E-mail: bjorn.borsbo@liu.se

## **Abstract**

*Purpose:* To investigate the interactions between self-efficacy—including subcomponents—and symptoms (pain, depression, and anxiety), catastrophizing, disability, quality of life, and health in a population of chronic pain patients.

*Method:* The study used 433 chronic pain patients including 47 patients with spinal cord injury-related pain, 150 with chronic whiplash-associated disorders, and 236 with fibromyalgia. The participants answered a postal questionnaire that provided background data, pain intensity and duration, and psychological- and health-related variables.

*Results:* In the multivariate context, depression, anxiety, catastrophizing, and disability were intercorrelated. Self-efficacy correlated positively with variables of quality of life and general health. These two groups of variables were negatively correlated. The pain variables—duration of pain, pain intensity, and spreading of pain—formed a third group of variables. Self-efficacy function was negatively correlated to these three pain variables. When regressing disability, quality of life, and health, we found that self-efficacy had a positive impact whereas symptoms, catastrophizing, and pain had a negative influence on these aspects. Different patterns of influencing variables were discerned for the three different analyses, and specific patterns of the subscales of self-efficacy corresponded to specific patterns of negative factors for the outcome of disability, quality of life, and health.

*Conclusion:* There is a complex interaction of psychological factors and symptoms and their positive and negative influence on disability, quality of life, and health.

The results indicate that it might be important to assess and influence both enhancing and deteriorating factors to ensure an effective pain management programme.

**Keywords:** pain, self-efficacy, depression, quality of life.

## **Introduction**

Perceived self-efficacy is defined as people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives [1]. Self-efficacy beliefs regulate human functioning through cognitive, motivational, affective, and decisional processes [2]. These beliefs affect whether individuals think in self-enhancing or self-debilitating ways, how well they motivate themselves and persevere in the face of difficulties, the quality of their emotional life, and vulnerability to stress and depression. Research verifies the predictive generality of efficacy beliefs as significant contributors to the quality of human functioning [3]. People with a high sense of coping efficacy adopt strategies and courses of action designed to change hazardous environments to benign ones. In this mode of affect regulation, efficacy beliefs alleviate stress and anxiety by enabling individuals to mobilize and sustain coping efforts. Self-efficacy operates as a cognitive regulator of stress and anxiety arousal [4].

Several studies have noted that high scores on self-efficacy are inversely related to pain intensity. This is relevant for different pain conditions such as arthritis [5], musculoskeletal pain [6], cancer pain [7], headache [8], pain in SCI (Spinal Cord Injury) [9], and other chronic pain [10]. Self-efficacy is inversely connected to depression [11,12] and explains 22% of the variance in the depression score [11]. Therefore, self-efficacy can be regarded as a factor that contributes to disability and depression beyond the role of pain severity [11].

Self-efficacy is a good predictor for pain-related disability [13,14]. In one study, self-efficacy was a better predictor of disability than fear avoidance and pain related fear [6].

The diathesis-stress model has been widely adopted as a guiding metatheory for understanding the influence of stressors. In this conceptual framework, external stressors constitute risk factors that act on personal predispositions to produce psychosocial effects [15,16]. The diathesis-stress model is often combined with epidemiological risk-buffer models [3]. Hence protective factors, such as self-efficacy, could buffer the adverse effect of stressors.

There is a lack of studies addressing the influence of self-efficacy on perceived quality of life and health in chronic pain, as for studies investigating the importance of the subcomponents included in the concept of self-efficacy.

The aim of this study was to investigate the interaction between self-efficacy, including subcomponents, and symptoms (pain, depression, and anxiety), catastrophizing, disability, quality of life, and health in a population of chronic pain patients.

## **Materials and methods**

### *Materials*

891 patients treated at the clinical rehabilitation departments at Linköping University Hospital and County Hospital Ryhov in Jönköping from 2002 through 2004 were invited to participate. The hospitals are the only hospitals providing clinical rehabilitation services in the region. The inclusion criteria were chronic pain ( $\geq 3$  months), age 20-55 years and the diagnoses Spinal Cord Injury (SCI) related pain, Fibromyalgia (FM), and Chronic Whiplash Associated Disorders (WAD). These diagnoses were chosen because they are relatively well defined clinical entities and represent both traumatic and non traumatic cause. Exclusion criteria were psychotic illness and ongoing abuse. The patients were selected from the case records. The diagnoses, settled by experienced clinicians, were obtained from the case records. The case definition of fibromyalgia followed the definition by American College of Rheumatology (ACR) 1990 [17]. The patients were sent a letter that asked them to participate and the patients who chose to participate received a questionnaire covering background data, psychological, and health-related items. Patients who did not return the questionnaire were reminded twice before they were indicated as dropouts.

Out of the 891 invited patients, we received 434 returned questionnaires after two reminders. One patient did not satisfy the inclusion criteria and was excluded. Thus a total of 433 patients – including 47 patients with SCI-related pain, 150 with WAD, and 236 with FM – participated. The Research Ethics Committee of the University of Linköping, Sweden approved the study (Dnr: M70-05).

## *Methods*

The questionnaire included the following variables and instruments. Swedish validated versions were used. References given below present the questionnaires and studies of psychometrical properties:

- ***Background data:*** Age and gender.
- ***Pain intensity ratings*** of nine predefined anatomical regions [18]. For the rating of pain intensity, a visual analogue scale (VAS) was used; the scale was a 100 mm long with defined end points (“no pain” and “worst pain imaginable”), but without marks in between (results in cm). All the questions regarding pain concerned the previous 7 days. The rating of the most painful region was used (VAS-max) [19,20].
- ***Pain Regions Index (PRI)***. Number of the above pre-defined anatomical regions associated with pain with a possible range of 0-9.
- ***Anxiety Sensitivity Index (ASI)*** is a 16-item self-reported questionnaire. Each item asks about the amount of fear the participant experiences in regard to bodily sensations commonly associated with anxiety. Participants are asked to rate each item on a 5-point Likert-like scale ranging from *very little* (0) to *very much* (4). The ratings on the 16 items are summed for a total ranging from 0 to 64. Studies have found support for test-retest reliability, criterion validity, and construct validity (e.g., support for the distinction between AS and trait anxiety) [21,22].



- ***Pain Anxiety Symptoms Scale-20 (PASS-20)*** is a short version of the 40-item PASS that measures fear and anxiety responses specific to pain. The PASS-20 has four 5-item subscales that measure Avoidance, Fearful thinking, Cognitive anxiety, and Physiological Responses to Pain. Participants rate each item on a 6-point scale ranging from *never* (0) to *always* (5). Reliability analyses with PASS-20 indicate good internal consistency akin to the PASS-40. Psychometric analyses reveal good convergent, discriminant, predictive, and construct validity [23,24].
- ***Hospital Anxiety and Depression Scale (HADS)*** is a self-rating scale in which the severity of anxiety and depression is rated on a 4-point scale. Seven questions are related to anxiety and seven to depression, both with a score range of 0–21. A score of 7 or less indicates a non-case, a score of 8–10 a doubtful case, and 11 or more a definite case. The instrument is widely used in clinical practice and research. Investigations have shown that the HADS is a psychometrically sound instrument. In this study, we used both subscales [25,26].
- ***The Pain Catastrophizing Scale (PCS)*** is a 13-item self-report measure designed to assess catastrophic thoughts or feelings accompanying the experience of pain. Respondents are asked to reflect on past painful experiences and to indicate the degree to which each of the 13 thoughts or feelings are experienced when in pain. The questionnaire uses a 5-point scale ranging from 0 (not at all) to 4 (all

the time). Subscales for rumination, magnification, and helplessness plus a total score are added up. In this study, we used the total score [27,28].

- ***Quality of Life Scale (QOLS-S)*** is composed of 16 items that together describe the quality of life concept: (i) Material comforts; (ii) Health; (iii) Relationships with parents, sibling and other relatives; (iv) Having and rearing children; (v) Close relationships with spouse or significant others; (vi) Close friends; (vii) Helping and encouraging others, participating in organizations, volunteering; (viii) Participating in political organizations or public affairs; (ix) Learning; (x) Understanding yourself; (xi) Work; (xii) Expressing yourself creatively; (xiii) Socializing; (xiv) Reading, music or watching entertainment; (xv) Participating in active recreation; and (xvi) Independence, being able to do things for yourself. A seven-point satisfaction scale is used. Clients estimated their satisfaction with their current situation. A higher total score shows higher satisfaction. The item scores are added to a total score, ranging from 16 to 112 [29,30].
- ***SF-36 Health Survey*** (Swedish version) is an instrument that intends to represent multi-dimensional health concepts and measurements of the full range of health states, including levels of well-being and personal evaluations of health. The instrument has eight dimensions (reported using a standardized scale from 0 – 100): physical functioning (SF 36pf), role limitations due to physical functioning (SF 36rp), bodily pain (SF 36bp), general health (SF

36gh), vitality (SF 36vit), social functioning (SF 36sf), role limitations due to emotional problems (SF 36re), and mental health (SF 36mh) [31].

- ***The Pain Disability Index (PDI)*** is a 7-item self-report instrument based on a 10-point scale that assesses perception of the specific impact of pain on disability that may preclude normal or desired performance of a wide range of functions, such as family and social activities, sex, work, life-support (sleeping, breathing, eating), and daily living activities. The PDI has shown good reliability and validity in several studies [6,32]
- ***The arthritis self-efficacy scale (ASES)*** is a standardized questionnaire with 20 items that measure an individual's perceived self-efficacy to cope with the consequences of chronic arthritis. In this study, a validated Swedish version for chronic pain was used. The only modification made was to change the words 'arthritis pain' and 'arthritis' to 'pain' (this change was not validated). The first five-item subscale assesses self-efficacy perception for controlling pain (SE-PAIN). The second nine-item subscale assesses self-efficacy for performing functions in daily living (SE-FUNC). The six-item subscale measures self-efficacy for controlling other symptoms related to chronic pain (SE-SYMT). Each question is followed by a scale for marking the answer from 10 to 100. Each subscale is scored separately by taking the mean of the subscale items [33,34].

### *Statistics*

All statistical evaluations were made using the statistical packages SPSS (version 15.0) and SIMCA-P+ (version 11.1). Results in the text and tables are generally given as mean values  $\pm$  one standard deviation ( $\pm 1SD$ ).

*Principal component analysis* (PCA) using SIMCA-P+ was used to extract and display systematic variation in a data matrix and can be considered as a multivariate correlation analysis. A component consists of a vector of numerical values between -1 and +1 (referred to as loadings) and obtained significant components are uncorrelated. Variables that have high loadings (with positive or negative sign) on the same component are inter-correlated. Variables with high loadings (ignoring the sign) are considered to be of large or moderate importance for the component under consideration. Variables with high absolute loadings on a component but with different signs are negatively correlated.

*Partial least squares* or *projection to latent structures* (PLS) were used to regress one or several Y-variables using several other variables (X-variables) [35]. Regression coefficient was used to obtain detailed information whether the variable had a significant positive or negative impact as well as magnitude on the regressed outcome variable. The statistical significance of each coefficient is indicated as 95% confidence interval not including zero. The benefit of this procedure is to provide as single vector of concise model information per response variable. The disadvantage is that the correlation structure among the responses is lost, but this relationship has already been elaborated according to the PCA plot and the PLS table.

The VIP variable (variable influence on projection) gives information about the relevance of each X-variable and each Y-variable pooled over all dimensions. VIP is a weighted sum of squares of the PLS weights. Because the weights express the correlation between the X and Y matrices, they summarize the importance of the X-variables. The PLS regression coefficients may be re-expressed as a regression model and express the influence of each X-variable on Y in each single component. In the present study, the variable of importance for explaining Y was primarily identified by a VIP value  $\geq 1.0$  and secondarily by the regression coefficient in relation to Y.

Multiple linear regression (MLR) could have been an alternative method for the prediction, but it assumes that the regressors (X-variables) are independent. If multicollinearity (high correlations) occurs among the X-variables, the calculated regression coefficients become unstable and their interpretability breaks down [35]. PLS and PCA also have the advantages that they do not require interval-scale measurements and they are not sensitive to violations of multivariate normality [36]. Two concepts –  $R^2$  and  $Q^2$  – are further used to describe the results in PCA and PLS.  $R^2$  describes the goodness of fit: the fraction of sum of squares of all the variables explained by a principal component as is given both for X-variables and Y-variables.  $Q^2$  describes the goodness of prediction: the fraction of the total variation of the variables that can be predicted by a principal component using cross validation methods. Outliers were identified using the two powerful methods available in SIMCA-P: score plots in combination with Hotelling's  $T^2$  (identifies strong outliers) and distance to model in X-space (DModX) (identifies moderate outliers).

The proportion of missing data for each variable were: gender (0%), HADS-D (2.1%), HADS-A (1.4%), PCS (5.8%), PASS-20 (8.8%), ASI (8.3%), pain duration

(6.3%), pain intensity max (0.2%), different diagnoses (0 %), PRI (0.5%), PDI (6.0%), QOLS (3.0%) and ASES (3.4%).

In all statistical analysis,  $p \leq 0.05$  was regarded as significant.

## Results

*Background variables, self-efficacy, symptoms, catastrophizing, disability, quality of life, and health of the investigated cohort*

**Table 1:** Mean values ( $\pm$  one standard deviation, SD) of background data and the scales of pain intensity, pain duration and spreading of pain, depression, anxiety, catastrophizing, self-efficacy, disability, quality of life, and general health in 433 chronic pain patients.

| <i>Variables</i>              | <i>All</i><br>Mean (SD) |
|-------------------------------|-------------------------|
| <i>Gender (% men)</i>         | 18.2                    |
| <i>Age</i>                    | 42.1 (8.7)              |
| <i>Pain duration (months)</i> | 123.5 (86.0)            |
| <i>VAS.max</i>                | 76.9 (18.4)             |
| <i>PRI</i>                    | 7.3 (2.1)               |
| <i>HADS-D</i>                 | 7.9 (4.3)               |
| <i>HADS-A</i>                 | 8.1 (4.7)               |
| <i>PASS</i>                   | 48.5 (18.3)             |
| <i>ASI</i>                    | 21.4 (13.5)             |
| <i>PCS</i>                    | 21.2 (11.4)             |
| <i>SE-Pain</i>                | 41.4 (19.2)             |
| <i>SE-Symptoms</i>            | 50.7 (19.6)             |
| <i>SE-Function</i>            | 71.6 (22.2)             |
| <i>PDI</i>                    | 36.9 (12.1)             |
| <i>QoL</i>                    | 74.1 (15.9)             |
| <i>SF36-GH</i>                | 44.4 (20.9)             |

VAS= visual analogue scale (pain intensity); PRI= Pain Regions Index (spreading of pain), HADS-D= depression subscale of Hospital Anxiety and Depression Scale; HADS-A =anxiety subscale of Hospital Anxiety and Depression Scale; PASS=Pain Anxiety Symptoms Scale (anxiety); ASI= Anxiety Sensitivity Index (anxiety), PCS= The Pain Catastrophizing Scale; SE-Pain= the pain subscale of the arthritis self-efficacy scale; SE-Symptoms= symptoms subscale of the arthritis self-efficacy scale; SE-Function= functions subscale of the arthritis self-efficacy scale; PDI= The Pain Disability Index; QoL= Quality of Life Scale; SF36-GH= general health subscale of SF-36 Health Survey.

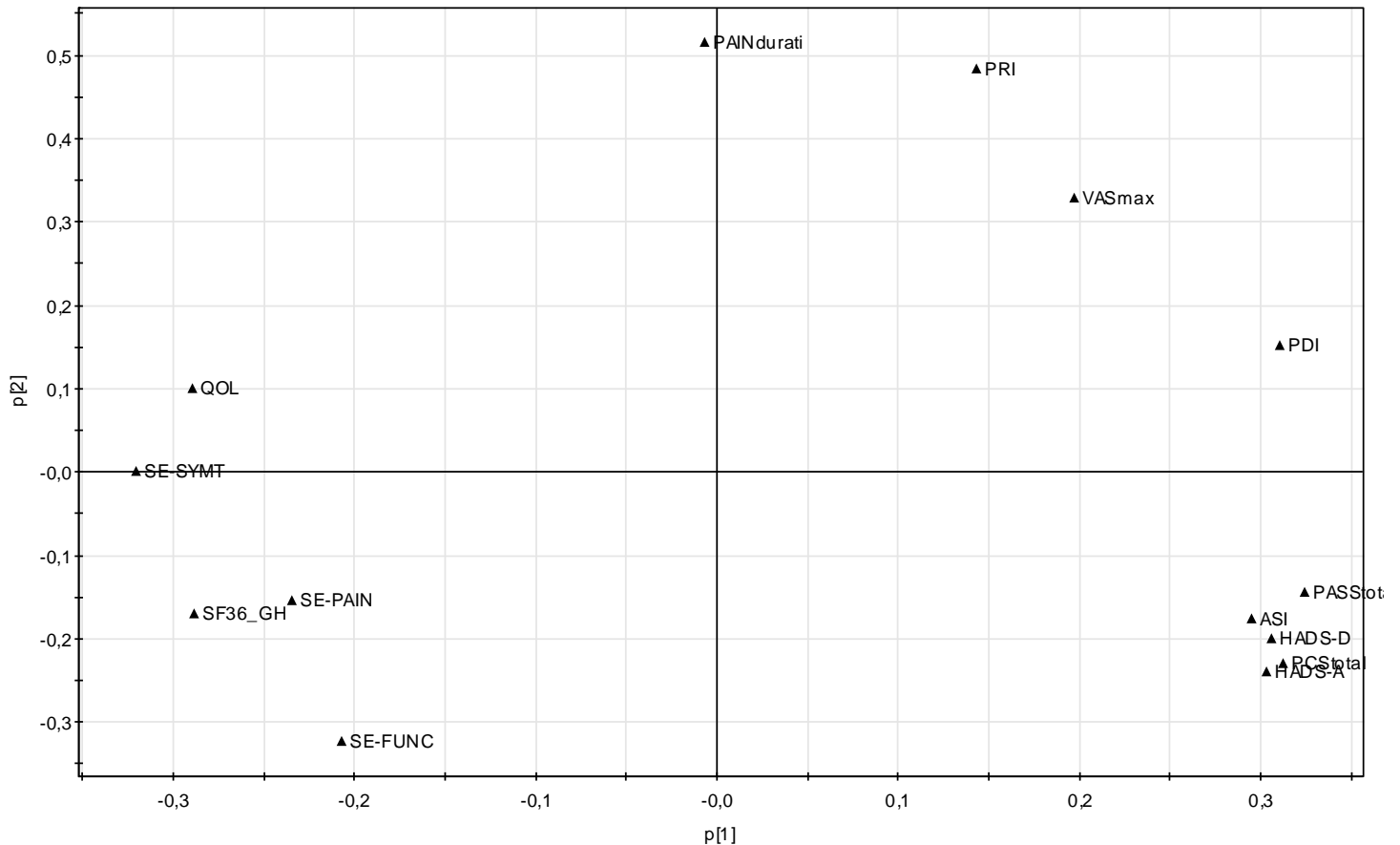
The investigated cohort had a majority of women (82%) and a mean age of 42 years. (The non-responding group: 69% women, mean age 41 years). The majority of the patients participating in this study were born in Sweden (88.1%), 77.0% were married or cohabiting, 85.5% of the patients had children living home. 25.1 % of the patients had studied at University (or corresponding education level). The proportion working (various degrees) was 41.7% while 6.3% reported that they currently were studying.

The duration of the pain condition was about 10 years, which with interest fulfill the criteria for chronic pain (i.e.,  $\geq 3$  months). The mean pain intensity rating (VAS:  $77 \pm 18$  mm) implicates severe pain. Severe pain can be defined as pain intensity according to VAS in the range 71-100 mm [37]. The PRI was 7.3 out of 9 predefined anatomical regions, which generally imply a prominent spreading of pain. The HADS-D level ( $7.9 \pm 4.3$ ) indicates mildly depressed mood at group level; the range for depressed mood is 7-10. HADS-A ( $8.1 \pm 4.7$ ) indicates mild to moderate anxiety, range 7-10.

#### *Multivariate variable overview - PCA*

To give an overview of the correlation pattern of the different variables displayed in table 1 (except for gender and age), a PCA was made. The significant model obtained ( $R^2 = 0.55$ ,  $Q^2 = 0.35$ ) consisted of two significant components (table 2 and figure 1). The PCA analysis generated two main plots. The loading plot (figure 1a) describes the relations between variables; details concerning the loadings of the first (p1) and the second (p2) component are given in table 2. According to the first component (p1), anxiety (PASS, ASI,





**Figure 1a:** The PCA loading plot illustrates the relationships between the variables (loadings of first versus loadings of second component). For detailed interpretation of figure 1, see Results. For explanation of abbreviations, see text.

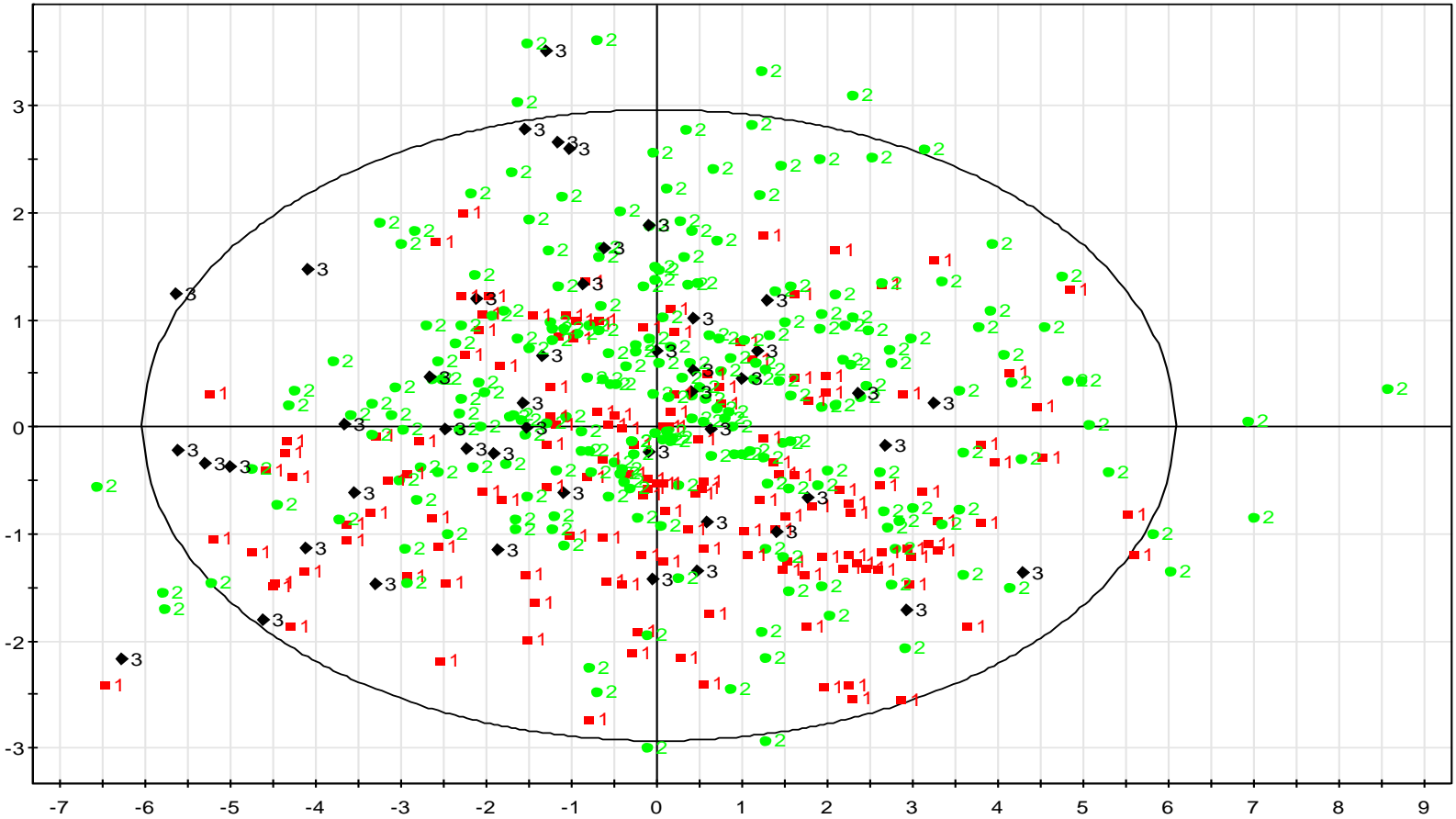
and HADS-A), catastrophizing (PCS), disability (PDI), and depression (HADS-D) had high positive loadings (positively intercorrelated) whereas the three self-efficacy variables (SE-PAIN, SE-FUNC, SE-SYMT), quality of life (QOLS-S), and general health (SF36-GH) showed high negative loadings (also intercorrelated). That is, these two groups of variables loading on the first component were negatively intercorrelated. The three pain variables (VASmax, PRI, and Pain duration) were intercorrelated: they had high positive loadings according to the second component (p2). These three variables were negatively correlated with SE-FUNC (i.e., they had a negative loading). From these results (presented in figure

**Table 2:** Principal component analysis of the different variables. A 2-component (p1 and p2) model was obtained ( $R^2 = 0.55$ ). Loadings of importance for each component are in bold type. The bottom row shows the variation ( $R^2$ ) of each component.

| <i>Variables</i> | <b>p[1]</b>  | <b>p[2]</b>  |
|------------------|--------------|--------------|
| PASS.            | <b>0.32</b>  | -0.14        |
| PCS              | <b>0.31</b>  | -0.23        |
| PDI              | <b>0.31</b>  | 0.15         |
| HADS-D           | <b>0.31</b>  | -0.20        |
| HADS-A           | <b>0.30</b>  | -0.24        |
| ASI              | <b>0.30</b>  | -0.18        |
| VASmax           | 0.20         | <b>0.33</b>  |
| PRI              | 0.14         | <b>0.48</b>  |
| PAINduration     | 0.00         | <b>0.51</b>  |
| SE-FUNC          | <b>-0.21</b> | <b>-0.32</b> |
| SE-PAIN          | <b>-0.23</b> | -0.16        |
| SF36_GH          | <b>-0.29</b> | -0.17        |
| QOLS-S           | <b>-0.29</b> | 0.10         |
| SE-SYMT          | <b>-0.32</b> | 0.00         |
| $R^2$            | <i>0.44</i>  | <i>0.11</i>  |

VAS= visual analogue scale (pain intensity); PRI= Pain Regions Index (spreading of pain), HADS-D= depression subscale of Hospital Anxiety and Depression Scale; HADS-A =anxiety subscale of Hospital Anxiety and Depression Scale; PASS=Pain Anxiety Symptoms Scale (anxiety); ASI= Anxiety Sensitivity Index (anxiety), PCS= The Pain Catastrophizing Scale; SE-Pain= the pain subscale of the arthritis self-efficacy scale; SE-Symptoms= symptoms subscale of the arthritis self-efficacy scale; SE-Function= functions subscale of the arthritis self-efficacy scale; PDI= The Pain Disability Index; QoL= Quality of Life Scale; SF36-GH= general health subscale of SF-36 Health Survey.

1a and table 2), it can also be concluded that subjects differ relatively prominently with respect to the variables with high loadings on the first component ( $R^2=0.44$ ) unlike the variables with high loadings on the second component ( $R^2=0.11$ ).



**Figure 1b:** The PCA score plot illustrates the relationships between the subjects according to the scores of first component versus the scores of second component. The complementary loading plot (Figure 1a) shows the relationships between the variables. For detailed interpretation of Figure 1b, see Results. WAD=1, FM=2, and SCI=3.

The second plot generated from the PCA is the score plot, which describes the relations between the subjects; in addition, the different diagnoses are denoted. The first score plot made, including all variables, showed a minor discrimination between the three diagnoses and mainly identified FM (data not shown). In the second plot made (figure 1b), the variable for spreading of pain (PRI) was excluded because it is a diagnostic criteria for FM. This made it impossible to recognize any diagnosis specific pattern of the subjects; that is, there is no diagnosis specific pattern in the influence of the different variables in the model.

### *Regression of disability, quality of life and general health*

As evident from the PCA (figure 1a and table 2), disability, quality of life, and general health were intercorrelated; however, as seen in figure 1a, they were graphically separated, which indicates moderate correlation. Thus, in the next step, using PLS in three different analyses – disability (PDI) ( $R^2=0.54$ ;  $Q^2=0.52$ ), quality of life (QOLS-S) ( $R^2=0.55$ ;  $Q^2=0.52$ ), and general health (SF36-GH) ( $R^2=0.44$ ;  $Q^2=0.42$ ) – were regressed. These regressions used the scales of depression (HADS-D), anxiety (HADS-A, PASS, ASI), catastrophizing (PCS), self-efficacy (SE-PAIN, SE-FUNC, SE-SYMT), pain intensity (VAS max), duration of pain (PAIN duration), and spreading of pain (PRI) as regressors (table 3).

HADS-D, PASS, PCS, and VASmax correlated positively with PDI, while SE-FUNC and SE-SYMT were negative significant regressors (left column in table 3).

Quality of Life (QOLS-S) was significantly influenced only by two variables, SE-SYMT (positively correlated) and HADS-D (negatively correlated) (middle column in table 3).

For general health (SF-36 GH), there are two promoting variables (i.e., positive regressors): SE-SYMT and SE-PAIN. General health was negatively influenced by, in descending order, PCS, PASS, PRI, HADS-A, ASI, and HADS-D (right column in table 3)

**Table 3:** Three different PLS analyses – regression of disability, quality of life, and general health – using the scales for depression, anxiety, catastrophizing, self-efficacy, pain intensity, duration of pain, and spreading of pain as regressors. At the bottom rows are given  $R^2$  for X and Y variables together with  $Q^2$ .

| Disability (PDI)      |            |              | Quality of Life (QOLS) |            |              | General Health (SF-36 GH) |            |              |
|-----------------------|------------|--------------|------------------------|------------|--------------|---------------------------|------------|--------------|
| <i>X-variables</i>    | <i>VIP</i> | <i>Coeff</i> | <i>X-variables</i>     | <i>VIP</i> | <i>Coeff</i> | <i>X-variables</i>        | <i>VIP</i> | <i>Coeff</i> |
| HADS-D                | 1.27       | +0.21        | <i>SE-SYMT</i>         | 1.42       | +0.31        | <i>SE-SYMT</i>            | 1.22       | +0.14        |
| PASS                  | 1.14       | +0.10        | HADS-D                 | 1.72       | -0.47        | <i>SE-PAIN</i>            | 1.02       | +0.13        |
| PCS                   | 1.10       | +0.03        | PASS                   | 1.07       | ns           | <i>SE-FUNC</i>            | 0.73       | +0.07        |
| VASmax                | 1.00       | +0.19        | PCS                    | 1.07       | ns           | PCS                       | 1.19       | -0.09        |
| PRI                   | 0.64       | ns           | HADS-A                 | 1.04       | ns           | PASS                      | 1.17       | -0.09        |
| <i>SE-FUNC</i>        | 1.17       | -0.24        | ASI                    | 0.95       | ns           | PRI                       | 1.11       | -0.21        |
| <i>SE-SYMT</i>        | 1.16       | -0.14        | <i>SE-PAIN</i>         | 0.85       | ns           | HADS-A                    | 1.10       | -0.08        |
| <i>SE-PAIN</i>        | 0.89       | -0.10        | VASmax                 | 0.60       | ns           | ASI                       | 1.10       | -0.09        |
| HADS-A                | 1.00       | ns           | <i>SE-FUNC</i>         | 0.58       | ns           | HADS-D                    | 1.00       | -0.08        |
| ASI                   | 0.97       | ns           | PRI                    | 0.41       | ns           | VASmax                    | 0.69       | ns           |
| PAINdur               | 0.02       | ns           | PAINdur                | 0.39       | ns           | PAINdur                   | 0.22       | ns           |
| <b>R<sup>2</sup>X</b> | 0.53       |              | <b>R<sup>2</sup>X</b>  | 0.59       |              | <b>R<sup>2</sup>X</b>     | 0.54       |              |
| <b>R<sup>2</sup>Y</b> | 0.54       |              | <b>R<sup>2</sup>Y</b>  | 0.55       |              | <b>R<sup>2</sup>Y</b>     | 0.44       |              |
| <b>Q<sup>2</sup></b>  | 0.52       |              | <b>Q<sup>2</sup></b>   | 0.52       |              | <b>Q<sup>2</sup></b>      | 0.42       |              |

VAS= visual analogue scale (pain intensity); PRI= Pain Regions Index (spreading of pain), HADS-D= depression subscale of Hospital Anxiety and Depression Scale; HADS-A =anxiety subscale of Hospital Anxiety and Depression Scale; PASS=Pain Anxiety Symptoms Scale (anxiety); ASI= Anxiety Sensitivity Index (anxiety), PCS= The Pain Catastrophizing Scale; SE-Pain= the pain subscale of the arthritis self-efficacy scale; SE-Symptoms= symptoms subscale of the arthritis self-efficacy scale; SE-Function= functions subscale of the arthritis self-efficacy scale; PDI= The Pain Disability Index; QoL= Quality of Life Scale; SF36-GH= general health subscale of SF-36 Health Survey.

## Discussion

### *Major findings.*

- In the cross-sectional perspective, self-efficacy had an enhancing influence on perceived quality of life and general health and a reducing influence on disability, whereas pain intensity, spreading of pain, catastrophizing, depression, and anxiety had the opposite influence.
- The self-efficacy subcomponents had different relative importance regarding disability, quality of life, and general health.

### **Background variables, self-efficacy, symptoms, catastrophizing, disability, quality of life, and health.**

In this study, the patients were selected from two clinical departments specialized in management of severe chronic pain conditions. The patients referred to these clinical departments are a selected sample of patients with complicated chronic pain. On account of this, pain intensity, pain duration, and spreading of pain showed very high values at group level (table 1). This selection of patients diminishes the possibility to generalize our results to all patients with chronic pain, but the design gives the opportunity to study long-term effects of severe chronic pain.

The degree of depression and anxiety, measured by HADS, barely reaches the cut off levels for clinical depression at group level. The comorbidity and impact of depression and anxiety in chronic pain conditions have been described earlier [38,39]. Qualitative differences between depression as a result of chronic pain and depression as a primary psychiatric disorder have been reported and the term

‘affective distress’ has been suggested [40]. In spite of the relatively low scoring of these variables, they seem to have a great impact on the outcome of disability, quality of life, and health in chronic pain patients. This emphasises the assessing and the importance of considering these psychological factors in the clinical context.

### *Multivariate pattern of correlations*

According to the multivariate analysis (figure 1a and table 2), the psychological factors (depression, anxiety, and catastrophizing) showed high loadings on the first component (p1), implicating a great impact on the model. They were positively correlated to disability and negatively correlated to quality of life, general health, and self-efficacy variables. The later were also intercorrelated with a great impact on the model. Earlier studies have shown positive relationships between disability and depression [41], anxiety [42], and catastrophizing [43]. The negative relationship to quality of life and general health has also been confirmed earlier for depression and catastrophizing [44], but not for anxiety.

The subscales of self-efficacy are positively correlated to life quality and general health and negatively correlated to disability. These results implicate that self-efficacy acts as a positive contributor to perceived quality of life and health and diminishes disability in chronic pain patients. Lackner et al.[14,45] have shown that self-efficacy expectations of physical capabilities (functional self-efficacy) were significantly related to physical function (lifting), and the positive correlation to quality of life and health have been confirmed in earlier studies [9,46].

The pain variables (pain duration, pain intensity, and spreading of pain) were positively intercorrelated and not correlated with depression, anxiety, catastrophizing, quality of life, general health, disability, or the variables for pain self-efficacy (SE-PAIN) and self-efficacy symptoms (SE-SYMT). However, the pain variables correlated negatively to self-efficacy function (SE-FUNC). One could expect that there should be a correlation between the pain variables

**and the self-efficacy beliefs concerning the ability of handling pain. In an earlier study on patients with chronic WAD [46], we found that subgroups of patients with high pain intensity differ from subgroups with low pain intensity mainly in life quality variables referring to physical functioning (activities of daily living, mobility, and physical functioning). These findings might emphasize the importance of enhancing the beliefs in the ability (self-efficacy) and the actual ability of physical functioning to reduce the consequences of pain rather than trying to influence the pain itself.**

We found no discernible correlation pattern with respect to the different diagnostic groups (WAD, FM, and SCI). Concerning the variables assessed, this might indicate that there was variation within all patients rather than a specific related variation.

Thus the outcomes of disability, quality of life, and health are likely dependent on the chronic pain state per se more than the underlying diagnosis/disease or injury.

#### **Regression of disability, quality of life, and general health**

**The three different cross sectional regressions shared the common feature that the self-efficacy variables acted as positive contributors (lowering disability and improved quality of life and general health) while symptoms, including pain variables, and catastrophizing lowered the positive outcome. There were different patterns of influencing variables for the three different analyses. A specific pattern of the different positively acting self-efficacy variables corresponded to a specific pattern of the negatively influencing factors. For *disability* where depression showed the strongest negative impact, self-efficacy symptoms (i.e., the believes of capability to handle pain related symptoms) were an important regressor of low disability. The pain related anxiety, catastrophizing, and pain intensity, which are considered to play a role in fear of activity and disability [47-49], might correspond to the high value of self-efficacy function.**

**The only two significant regressors for the outcome of *quality of life* were depression (negative impact) and self-efficacy symptoms (positive impact). The**



**dominating role of depression for perceived quality of life might be due to a general reduced activity and social withdrawal, which has been found to characterize depression in chronic pain patients [50].**

**There is a mixed pattern for the predictors of low perceived *general health*. It consists of pain-related anxiety and catastrophizing but also general anxiety and depression. Self-efficacy symptoms (SE-SYMT) is the most important positive predictor of general health. It is notable that the spreading of pain (i.e., PRI) had a considerable impact on general health. This resembles the results of an earlier study of chronic WAD patients [51]. The relative positive importance of self-efficacy pain (SE-PAIN) might correspond to this finding.**

**In the diathesis-stress model, external stressors constitute risk factors that act on personal predispositions to produce psychosocial effects [15,16]. This study points out the possible applicability of this theoretical model when looking on the negative influencing factors on disability, quality of life, and health as stressors and diatheses (personal vulnerability). This cross-sectional study also might support the role of self-efficacy as protective factors prohibiting the development of negative psychosocial and health effects of chronic pain. This agrees with the theoretical framework of positing self-efficacy as a factor that can *buffer* the adverse effects of stressors (epidemiological risk-buffer model) or as *proactive shaping* of life circumstances (proactive agentic model)[3].**

### **Methodological considerations**

The patients were selected from two clinical departments that specialize in managing severe chronic pain conditions. Hence future studies should investigate patients in an earlier stage and with a less complicated clinical picture. Furthermore, our study is a cross sectional study, which makes it impossible to make any statement about causality. Future studies should scrutinize the self-efficacy subcomponent self-efficacy symptoms, which is found to be important in this study. A prospective study of the effect of a pain managing programme trying to enhance self-efficacy

symptoms and evaluating the effect on disability and quality of life might be fruitful. The return rate of the questionnaires was low. The non-responding individuals exhibited a gender bias. This might affect the results. However, in a cluster analysis of the same study group [52], there was no significant gender difference between the groups based on psychological and pain variables.

**The problem with a low return rate for men when using postal questionnaires is known from other studies [53] and our results should be confirmed in future studies with a higher response rate.**

#### **Possible clinical implications**

**Self-efficacy is an important promoting factor and is possible to influence using a pain management programme [54]. Efforts to increase patients' self-efficacy for coping with and managing pain and related problems may have unique additional benefits. This study shows that it might be important to assess the different subscales of self-efficacy and the corresponding negatively influencing factors in order to reduce disability and enhance quality of life and health in an effective way.**

#### **Conclusions**

**Addressing *disability*, perceived *quality of life*, and *health* in chronic complicated pain patients, there was an interaction between self-efficacy variables and symptom variables and catastrophizing and pain variables in a cross sectional perspective. Self-efficacy has a positive impact, whereas symptoms, catastrophizing, and pain have a negative influence. There are specific patterns of the subscales of self-efficacy and a corresponding pattern of negative factors for the outcome of *disability*, *quality of life*, and *health*. We believe that it is important to assess and influence both enhancing and deteriorating factors in order to design effective pain management programmes.**

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**The authors report no conflicts of interest. The authors alone are responsible for  
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