

COPING IN PATIENTS WITH CHRONIC WHIPLASH-ASSOCIATED DISORDERS: A DESCRIPTIVE STUDY

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Objective: There are few studies of the way patients with chronic whiplash-associated disorders cope with pain and other aspects of the condition. This study analyses: (a) gender differences in coping strategies; (b) whether the patients can be sub-grouped based on their coping strategies and whether the sub-groups differ clinically; and (c) the relative importance of background variables, symptoms and coping for quality of life.

Design: A descriptive study.

Patients: A total of 275 consecutive chronic patients with whiplash-associated disorders referred to a university hospital.

Methods: A questionnaire covering background data, pain in different regions, symptoms not directly related to pain, Beck depression inventory, a Coping Strategy Questionnaire, a Life Satisfaction checklist (LiSat-11), SF-36 Health Survey and EuroQol instrument.

Results: Three groups of patients were identified with respect to coping. Whether or not active coping strategies were used had little influence on health-related quality of life. When regressing health-related quality of life items, the following regressors were the most important: degree of depression, number of not directly pain-related symptoms, and catastrophizing cognitions influenced by pain intensities.

Conclusion: A mixture of symptoms (pain and depression) and coping (catastrophizing) seem to be interwoven and explain patients' health-related quality of life. These characteristics should be assessed when planning rehabilitation.

Key words: coping, health, neck, pain, whiplash.

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INTRODUCTION

The medical consequences of whiplash trauma can be labelled whiplash-associated disorders (WAD) (1). Stiffness and pain in the neck and head are the most common acute symptoms, and sometimes symptoms such as paraesthesiae or weakness in

arms, dysphagia, visual and auditory disturbances, tinnitus and vertigo are present (2). WAD is a syndrome, and in the literature different anatomical structures have been reported as injured: muscles, facet joints, nerves, ligaments, discs, etc. (3). People who meet with such a trauma and develop acute symptoms sometimes develop a chronic condition; few patients who still have intensive symptoms 3 months after the trauma will recover (4). According to Barnsley et al. (4), the prevalence of chronic WAD is uncertain (14–42%). A recent systematic review was not able to present any definite figures (5). The prognosis varies according to the population sampled and the insurance/compensation system under which individuals are allowed to claim benefits. However, age, gender, baseline neck pain intensity, baseline headache intensity and baseline radicular signs and symptoms were identified as factors for recovery/chronicity. The systematic review concluded that large cohort studies investigating a wide range of factors are needed to understand the development to chronic WAD (5).

A variety of symptoms are often reported both in the acute and chronic stages: in addition to pain and other more or less somatic complaints, neuropsychological and psychological symptoms are also reported. Post-traumatic stress symptoms can be initiated through the trauma (6). Some patients gradually develop symptoms that have a more psychological nature which potentially threaten the patients' physical and cognitive function (7), disability or mental health (c.f. 8). Some of the psychological symptoms are likely to relate to the often dramatic change in a person's everyday life as a consequence of the trauma or the different symptoms. Depression, for example, has long been recognized as a possible consequence from living with chronic pain (9), although in many cases it might be more appropriate to speak of mood fluctuations, or reactions to a radically changed life situation, rather than a psycho-pathological disorder (for a discussion on this matter see Kleinman (10)). WAD can affect both everyday life performances and participation, involving a quality of life dimension (11) and indeed it touches the dimension of well-being.

The concept of coping, having roots in the studies of stress (12) that describe ways of coming to terms with a stressor, could in this context be seen at different levels: a physiological sensory level, a psychological level, a perceptual/affective level and a behavioural level. A general assumption is that these levels are intertwined (13). The way one thinks about one's situation and the way one behaves are reciprocal and patterns of dysfunctional

behaviour develop and manifest over time (14). A vicious circle can be entered where fear, catastrophizing thoughts, withdrawal behaviour and limitations in physical and social performances alter the relation between bodily functions, activities and participation in activities (15).

Rarely do studies highlight the relationship between coping and WAD. Patients with WAD are found to be significantly more dysfunctional with respect to physical and psychosocial aspects in performing in their everyday life than the mean population (16). Some studies have noted a strong correlation between psychological well-being in terms of emotional stress and the catastrophizing factor in the Coping Strategy Questionnaire (CSQ) (16). Catastrophizing is strongly associated with anxiety and depression scores in chronic pain patients (c.f., 8, 9, 17). Vlaeyen et al. (18) show a strong correlation between kinesiophobia and catastrophic cognitions in chronic low back pain. Other researchers have noted a strong association between estimations of one's health and the ability to cope (8, 19, 20).

Coping strategies have been differentiated into active and passive ones (19), where active refers to instrumental actions such as engaging in activities and using one's body actively while passive refers to activities such as withdrawal, resting, etc. It has been argued that active coping is related to a relatively high estimation of well-being and functional improvement in patients with low back pain and WAD (16, 21). Carroll et al. (22) investigate the relationship between pain, health-related factors, and active and passive coping in neck and low back pain patients. They report that a combination of active and passive strategies was used. Disabling pain was associated with the use of passive strategies regardless of levels of active coping. Thus, active coping strategies were relatively less important when it came to mastering pain. Neither a strong relation between the degree of pain intensity and active coping nor relations between depression and coping combinations were found (22).

As for passive coping, avoidance is one strategy. Avoidance, in this context, refers to "a pattern of behaviour that delays, or puts off, an undesirable situation or experience" (23). It has been argued that chronic musculoskeletal pain is associated with different kinds of avoidances: housework, body movements, leisure activities, social situations, etc. (18, 24). In the theoretical framework, the concept of avoidance has been closely related to the development of pain specific behavioural patterns (23). These authors further argue that avoidance is counter-productive to successful pain coping and to benefits from clinical treatments. They also found a variety of fears among patients related to pain and avoidance: fear of pain, fear of movement/(re)injury, fear of situations causing pain, etc. Coping with these different fears could generally be seen in the light of confrontation and avoidance. Confrontation as an active way of coping with pain is considered to improve recovery and rehabilitation outcome, while avoidance seems to put the patient in a zone of potential increase of fear of physical and psychological disability (25). The way patients cope with their pain involves different kinds of cognitive risk taking, estimations about to what extent a certain activity has the potential to

increase one's pain. These judgements, which in the worst case may lead to systematic misjudgements, have the power to codetermine participation and well-being and in many cases avoidances with the consequence of lack of predictability and control over one's pain (25). Crombez et al. (26) argue that patients, who could be referred to as principal users of passive strategies often avoiding potential pain situations, also described a greater fear for pain and re-injury (26). This group of patients reported more disability and complaints about physical activity than patients who confronted their pain. However, no differences were found in the experience of pain control between groups.

To summarize, several studies concerning chronic pain patients have highlighted the complex relation between pain, suffering, well-being and coping. However, studies of the way patients with WAD in the chronic stages cope with pain and other aspects of WAD are rare.

This study investigates the relationships between pain, symptoms not directly related to pain, coping and aspects of health-related well-being in patients with chronic WAD. Within this general aim we have analysed the following:

- Gender differences in coping strategies.
- How chronic WAD can be sub-grouped based on a patient's coping strategies, and how the identified sub-groups will differ clinically with respect to background variables, symptoms, and health-related aspects of life quality.
- The relative importance of background variables, symptoms and coping strategies with respect to health-related aspects of life quality are also examined.

Subjects

The present study is based on patients referred to the Pain and Rehabilitation Centre, Linköping University Hospital, Sweden and diagnosed with chronic symptoms after whiplash trauma. The group of subjects with chronic WAD consisted of 275 consecutive patients (38 ± 12 years, range 15–76 years; 65% women). The majority of the patients had chronic pain as a prominent symptom according to the referral letter. The patients were mainly referred from general practitioners.

METHODS

Each patient referred to the Pain and Rehabilitation Centre received a questionnaire shortly before the examination at the centre. The questionnaire was completed at home and was delivered to the physician at the visit to the centre. The questionnaire contained the following items and instruments:

- Age, sex and anthropometrical data.
- Number of days on sick-leave in the last 12 months, number of months out of occupation, degree of sick leave, degree of pre-retirement and number of visits to physician in the last 6 months.
- Pain intensity ratings at 11 predefined anatomical regions. For the rating of pain intensity, a visual analogue scale (VAS) was used; the scale was a 100-mm line 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.

- Number of the predefined anatomical regions associated with pain (Pain Regions index, *PR index*, with a range from 0 to 11).
- Radiating pain to arms and/or legs. For each symptom the patient chose among the following alternatives for each symptom: 0 = “no, never”; 1 = “no, seldom”; 2 = “yes, occasionally”; 3 = “yes, often”.
- The Beck Depression Inventory (BDI) evaluates 21 symptoms of depression into a scale ranging between 0 and 63 (27). Scores of less than 10 indicate no or minimal depression, 10–18 indicates mild to moderate depression, 19–29 indicates moderate to severe depression and scores of 30 or more indicate severe depression (28). For psychiatric patients a screening cut-point of 12/13 is suitable, while 9/10 is appropriate in screening medical patients (used in the present study). The BDI is considered as an established and well-researched scale (28).
- Twenty-four different symptoms – not directly related to pain – were registered: sleeping difficulties, tachycardia, bowel problems, gastritis, fatigue, weak voice, nausea, anxiousness, difficulties with changes in light intensity, concentration problems, difficulties with swallowing, hoarseness, difficulties with urinating, vertigo, blurred vision, colon irritable, sound sensitivity, changes in alcohol sensitivity, light sensitivity, feeling of fullness of ear, irritability, memory problems, impaired visual field and low mood. For each symptom the patient picked one of the following alternatives: 0 = “no, never”; 1 = “no, seldom”; 2 = “yes, occasionally”; 3 = “yes, often”. In the regressions these symptoms were dichotomized (0–2 vs 3).
- An index that counted number and frequency of the not directly pain-related 24 symptoms was also computed (Non Pain Symptoms index, NPS index, possible range from 0 to 72).
- The CSQ is frequently used to measure patients’ way of coping with pain and includes 8 types of coping strategy with the aim of describing patients’ ways of coping with pain (8). These coping strategy types are: diverting attention, re-interpreting pain sensation, coping self-statements, ignoring pain sensations, praying and hoping, catastrophizing, increased behavioural activities and pain behaviour. Each strategy is evaluated according to its frequency of use, ranging from never (0) to always (6) with a maximum score of 36. Two additional questions concern the perception of control and possibility to minimize pain. The Swedish version of the CSQ was used in this study (29).
- The Life Satisfaction checklist (LiSat-11) consisted of estimations of life satisfaction in general as well as 10 specific domains to be estimated: satisfaction with vocational situation, financial situation, leisure situation, contact with friends and acquaintances, gender life, activities of daily living (ADL), family life and partnership (30). Two additional variables had been added to this list: satisfaction with physical health and psychological health. Each item has 6 possible answers: 1 = very dissatisfying; 2 = dissatisfying; 3 = fairly dissatisfying; 4 = fairly satisfying; 5 = satisfying; 6 = very satisfying.
- The SF-36 Health Survey (Swedish version) is an instrument that gives a representation of multi-dimensional health concepts and measurements of the full range of health states, including levels of well-being and personal evaluations of health (31). The instrument covers 36 questions covering 8 items or dimensions: physical functioning, role limitations due to physical pain, bodily pain, general health, vitality, social functioning, role limitations due to emotional problems, and mental health. A final single item, reporting health transition, is used to capture health changes over the past 2 years. Each item score is coded, summed, and transformed to a standardized scale calculated from a specific score algorithm ranging from 0 to 100 with 2 end points (worst and best possible health state, respectively). This study uses the transformed score.
- The EuroQol instrument measures a patient’s perceived state of health (32). A state of health is defined as combinations of 5 dimensions and three levels of choice (no problems, some problems, or severe problems) for each dimension: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. This descriptive system covers the first part of the instrument. The answers are coded (1–3). The codings are transformed by a table or by use of an algorithm into a score (EQ-5D). A second part concerns a self-estimation of today’s health according to a 100-point scale, a “thermometer” (EQ-VAS) with defined end points (high value indicates good health and low value indicates bad health). Thus the 2 parts comprise different aspects related to health as quality of life.

In this study and in the specific item values, the total score for the self-estimation scale is used.

Statistics

All statistical evaluations were made using the statistical packages SPSS (version 10.0) and SIMCA-P (version 9.0). Generally, results in the text and tables are given as mean values ± 1 standard deviation (± 1 SD). ANOVA was used to test differences between groups, and χ^2 was used for analysing whether groups had different distributions. A cluster analysis (based on the K-means algorithm) was used to identify subgroups of patients with WAD. The cluster analysis was made using the different CSQ scales as input variables with the option to identify 3 clusters (sub-groups). The 3 clusters were then compared using ANOVA with respect to the other variables under investigation in order to investigate whether the heterogeneity of CSQ were also found for the other variables under investigation.

The aim of using partial least squares or projection to latent structures (PLS) using SIMCA-P was to predict 1 or several Y-variables using several other variables (X-variables) (33). Components with Eigenvalues ≥ 2.00 were considered as non-trivial components. The VIP variable (variable influence on projection) gives information about the relevance of each X-variable and each Y-variable pooled over all dimensions, and the VIP > 1.0 is significant. Two more concepts are used to describe the results: R^2 and Q^2 . R^2 describes the goodness of fit, the fraction of sum of squares of all the variables explained by a principal component. Q^2 , in turn, describes the goodness of prediction, the fraction of the total variation of the variables that can be predicted by a principal component by use of cross validation methods (33). Multiple linear regression (MLR) could have been an alternative method for the prediction, but it assumes that the regressors (X-variables) are independent, and only one Y-variable at a time can be predicted. If multicollinearity (high correlations) occurs among the X-variables, the calculated regression coefficients become unstable and their interpretability breaks down (33). Moreover, MLR assumes that a high subject to variables ratio is present (5–10). Such an assumption does not exist for the PLS regression; in fact, PLS can handle ratios lower than 1.0. Outliers were identified using the 2 powerful methods available in SIMCA-P: (a) score plots in combination with Hotelling’s T^2 (identifies strong outliers) and (b) distance to model in X-space (identifies moderate outliers). In all statistical analysis, $p \leq 0.05$ was regarded as significant.

RESULTS

Gender differences

No systematic gender differences were found for the variables under investigation except for anthropometrics. Only number of visits to physicians in the last 6 months (men: 4.2 ± 2.6 visits and women: 3.4 ± 2.6 visits; $p = 0.036$), pain intensity (VAS) of the lower back (men: 4.0 ± 2.5 and women: 5.3 ± 2.6 ; $p = 0.003$) and the change of health in the last 12 months (men: 48.6 ± 11.9 and women: 45.1 ± 13.4 ; $p = 0.037$) showed significant differences.

Subgroups based on CSQ

The CSQ scales were used as input variables in a cluster analysis that identified 3 subgroups (clusters), which differed significantly upon all scales as intended (Table I, upper part). The first group ($n = 99$) was characterised by low active coping strategies, relatively high degree of catastrophizing, and the lowest control over pain and ability to decrease pain. With the exception of catastrophizing, this group also scores lowest on all other cognitive items. The second group ($n = 91$) showed the lowest degree of catastrophizing and best control over and ability to decrease pain. This group generally showed intermediary

Table Ia. Cluster analysis based on the different scales of Coping Strategy Questionnaire (CSQ) (above the dotted line). The 3 identified clusters have been compared with respect to background data (Table Ia), symptoms (Table Ib), and health-related quality of life issues (LiSat-11, SF36, and EuroQol) (Table Ic). p-values are given; * significant difference between the 3 clusters. Note that the table is divided into 3 parts (a-c)

Subgroups Variables	All Mean (SD)	Group 1 Mean (SD)	Group 2 Mean (SD)	Group 3 Mean (SD)	ANOVA p-value
<i>Scales of CSQ</i>					
Diverting attention	12.1 (7.4)	7.6 (5.9)	11.6 (6.1)	19.0 (5.1)	<0.001*
Reinterpret pain sensations	6.5 (6.9)	2.0 (2.9)	4.8 (4.8)	14.7 (6.0)	<0.001*
Coping self-statement	16.0 (7.7)	9.4 (5.5)	18.3 (5.6)	22.2 (5.4)	<0.001*
Ignoring pain sensations	13.1 (7.5)	6.9 (5.3)	14.9 (5.6)	19.2 (5.6)	<0.001*
Praying or hoping	12.6 (7.7)	10.3 (7.3)	10.4 (6.2)	18.5 (6.9)	<0.001*
Catastrophizing	13.9 (7.8)	15.3 (8.8)	9.9 (6.1)	17.1 (6.3)	<0.001*
Increased behavioural activities	13.3 (6.9)	8.3 (5.3)	14.6 (5.8)	18.5 (5.4)	<0.001*
Control over pain	2.5 (1.3)	1.5 (1.2)	3.3 (0.9)	2.7 (1.2)	<0.001*
Ability to decrease pain	2.3 (1.2)	1.6 (1.1)	3.2 (0.7)	2.2 (1.1)	<0.001*
<i>Background data</i>					
Age (years)	38.1 (11.6)	38.5 (12.1)	37.2 (10.6)	39.8 (11.8)	0.373
Gender (% women)	65.3	69.1	59.6	67.6	0.357
Weight (kg)	72.8 (15.3)	74.8 (16.5)	70.8 (13.1)	72.0 (16.3)	0.205
Length (cm)	172 (9)	173 (10)	171 (8)	170 (9)	0.043*
Months since in occupation	19.9 (31.4)	19.9 (26.7)	21.0 (41.8)	18.8 (22.6)	0.936
Days sick leave last 12 months	206 (143)	195 (148)	208 (139)	213 (145)	0.776
Degree of sick leave	2.3 (1.8)	2.5 (1.8)	2.3 (1.8)	2.2 (1.9)	0.526
Degree of pre-retirement	0.8 (1.5)	0.7 (1.5)	0.8 (1.5)	0.9 (1.6)	0.744
No. visits to physicians	3.8 (2.7)	4.1 (2.9)	3.5 (2.0)	3.8 (3.1)	0.304

Table Ib

Subgroups based on CSQ	All Mean (SD)	Group 1 Mean (SD)	Group 2 Mean (SD)	Group 3 Mean (SD)	ANOVA p-value
<i>Pain symptoms</i>					
Pain intensity – head	5.9 (2.1)	6.1 (2.2)	5.4 (1.8)	6.2 (2.2)	0.036*
Pain intensity – neck	6.2 (2.1)	6.4 (2.2)	5.5 (1.8)	6.9 (1.8)	<0.001*
Pain intensity – shoulders	5.5 (2.3)	5.7 (2.4)	4.9 (2.0)	5.9 (2.0)	0.015*
Pain intensity – hands	4.6 (2.5)	4.7 (2.8)	3.9 (2.3)	5.1 (2.5)	0.069
Pain intensity – upper back	5.3 (2.3)	5.7 (2.5)	4.2 (2.0)	6.1 (1.9)	0.000*
Pain intensity – low back	4.9 (2.6)	5.2 (2.8)	4.0 (2.2)	5.5 (2.5)	0.006*
PR index	5.9 (2.4)	5.8 (2.3)	5.7 (2.4)	6.5 (2.4)	0.058
Pain radiation arm	2.0 (1.1)	1.9 (1.2)	2.0 (1.0)	2.2 (1.0)	0.217
Pain radiation leg	1.3 (1.2)	1.3 (1.2)	1.2 (1.1)	1.5 (1.2)	0.244
BDI	14.1 (8.6)	15.8 (9.6)	11.6 (6.1)	15.9 (9.0)	0.001*
<i>Non pain symptoms**</i>					
NPS index	6.8 (5.3)	7.2 (5.3)	5.7 (5.5)	7.7 (5.2)	0.044*
Sleeping difficulties	0.49 (0.50)	0.44 (0.50)	0.50 (0.50)	0.55 (0.50)	0.395
Tachycardia	0.04 (0.19)	0.03 (0.17)	0.04 (0.19)	0.04 (0.21)	0.914
Bowel problems	0.13 (0.33)	0.13 (0.34)	0.14 (0.35)	0.11 (0.31)	0.827
Gastritis	0.13 (0.34)	0.19 (0.39)	0.11 (0.31)	0.09 (0.29)	0.134
Fatigue	0.66 (0.47)	0.60 (0.49)	0.72 (0.45)	0.68 (0.47)	0.269
Weak voice	0.03 (0.18)	0.02 (0.15)	0.04 (0.19)	0.04 (0.21)	0.713
Nausea	0.14 (0.35)	0.07 (0.26)	0.15 (0.36)	0.21 (0.41)	0.033*
Anxiousness	0.11 (0.31)	0.15 (0.36)	0.03 (0.18)	0.15 (0.36)	0.025*
Difficulties with changes in light intensity	0.21 (0.40)	0.19 (0.39)	0.26 (0.44)	0.16 (0.37)	0.308
Concentration problems	0.38 (0.49)	0.37 (0.49)	0.40 (0.49)	0.39 (0.49)	0.941
Hoarseness	0.04 (0.21)	0.05 (0.22)	0.06 (0.24)	0.01 (0.12)	0.369
Difficulties with swallowing	0.05 (0.22)	0.03 (0.18)	0.08 (0.28)	0.04 (0.20)	0.283
Difficulties with urinating	0.05 (0.22)	0.03 (0.18)	0.06 (0.24)	0.07 (0.26)	0.523
Vertigo	0.32 (0.47)	0.25 (0.44)	0.40 (0.49)	0.32 (0.47)	0.122
Blurred vision	0.13 (0.33)	0.13 (0.34)	0.12 (0.32)	0.14 (0.35)	0.941
Colon irritable	0.08 (0.27)	0.08 (0.28)	0.06 (0.24)	0.09 (0.29)	0.748
Sound sensitivity	0.23 (0.42)	0.19 (0.39)	0.27 (0.45)	0.23 (0.42)	0.410
Changes in alcohol sensitivity	0.13 (0.33)	0.11 (0.32)	0.12 (0.33)	0.16 (0.37)	0.729
Light sensitivity	0.19 (0.39)	0.18 (0.38)	0.21 (0.41)	0.17 (0.38)	0.750
Feeling of fullness of ear	0.13 (0.34)	0.12 (0.32)	0.12 (0.33)	0.18 (0.39)	0.451
Irritable	0.41 (0.49)	0.34 (0.48)	0.44 (0.50)	0.44 (0.50)	0.301
Memory problem	0.35 (0.48)	0.29 (0.45)	0.37 (0.49)	0.43 (0.50)	0.166
Impaired visual field	0.08 (0.27)	0.10 (0.30)	0.05 (0.22)	0.08 (0.27)	0.479
Low mood	0.22 (0.42)	0.29 (0.45)	0.18 (0.39)	0.18 (0.39)	0.154

** yes, often = 1 and other alternatives = 0.

Table Ic

Subgroups Variables	All Mean (SD)	Group 1 Mean (SD)	Group 2 Mean (SD)	Group 3 Mean (SD)	ANOVA <i>p</i> -value
<i>Scales of LiSat-11</i>					
Life as a whole	3.7 (1.4)	3.5 (1.4)	4.1 (1.3)	3.5 (1.4)	0.003*
Vocational situation	2.9 (1.7)	2.7 (1.6)	3.5 (1.6)	2.6 (1.7)	0.002*
Financial situation	3.6 (1.4)	3.5 (1.4)	3.8 (1.4)	3.4 (1.4)	0.099
Leisure	3.3 (1.5)	3.1 (1.4)	3.6 (1.5)	3.2 (1.5)	0.022*
Contacts with friends	4.1 (1.5)	3.9 (1.5)	4.3 (1.5)	4.2 (1.4)	0.208
Sexual life	3.6 (1.7)	3.5 (1.7)	3.7 (1.6)	3.7 (1.6)	0.809
ADL	4.8 (1.3)	4.7 (1.4)	5.1 (1.2)	4.5 (1.3)	0.044*
Family life	4.8 (1.2)	4.6 (1.3)	4.9 (1.1)	4.8 (1.2)	0.236
Partnership relations	4.4 (1.6)	4.2 (1.8)	4.6 (1.6)	4.5 (1.4)	0.321
Physical health	2.6 (1.4)	2.4 (1.4)	2.7 (1.4)	2.6 (1.3)	0.302
Psychological health	3.8 (1.3)	3.6 (1.4)	4.1 (1.2)	3.6 (1.3)	0.040*
<i>Scales of SF36</i>					
Physical functioning	57.0 (21.1)	60.4 (30.2)	59.3 (19.3)	52.8 (20.8)	0.113
Role physical	11.0 (24.6)	13.3 (32.5)	9.6 (20.8)	10.7 (24.7)	0.625
Bodily pain	24.5 (15.1)	23.0 (18.6)	28.9 (13.3)	21.3 (14.7)	0.005*
General health	44.2 (20.9)	43.8 (25.1)	49.1 (21.3)	40.3 (19.3)	0.043*
Vitality	29.3 (19.9)	24.5 (21.1)	35.8 (18.6)	28.1 (18.3)	0.000*
Social functioning	56.4 (28.5)	52.9 (34.8)	61.7 (24.7)	54.2 (27.6)	0.099
Role emotional	52.4 (45.6)	50.0 (48.1)	64.0 (43.8)	39.1 (44.6)	0.003*
Mental health	61.3 (21.2)	56.2 (24.0)	69.1 (17.0)	58.4 (21.4)	0.000*
Reported health transition	46.4 (13.0)	50.0 (20.0)	46.7 (13.0)	42.4 (13.7)	0.010*
<i>Scales of EuroQol</i>					
Mobility	1.4 (0.5)	1.4 (0.5)	1.2 (0.4)	1.5 (0.5)	0.002*
Self-care	1.2 (0.4)	1.2 (0.4)	1.1 (0.3)	1.3 (0.5)	0.131
Usual activities	2.2 (0.6)	2.3 (0.6)	2.2 (0.6)	2.1 (0.7)	0.273
Pain/discomfort	2.6 (0.5)	2.7 (0.5)	2.5 (0.5)	2.7 (0.5)	0.002*
Anxiety/depression	1.8 (0.6)	2.1 (0.6)	1.6 (0.6)	1.9 (0.6)	<0.001*
EQ-5D	0.3 (0.3)	0.2 (0.3)	0.4 (0.3)	0.2 (0.3)	<0.001*
Reported health transition	1.5 (0.6)	1.5 (0.6)	1.5 (0.7)	1.6 (0.5)	0.190
EQ-VAS (thermometer)	40.6 (20.1)	38.0 (20.0)	45.5 (19.1)	37.8 (20.6)	0.019*

ADL: activities of daily living.

activity upon pain in all other the coping scales. The third group ($n = 72$) had relatively high control over and ability to decrease pain. It also had the highest activity on all other scales including the catastrophizing scale.

In the next step, we investigated whether the 3 clusters differed with respect to symptoms and health-related quality of life (Table I). No differences were found between the three clusters with respect to age, anthropometrics, employment status, or number of visits to physicians recent 6 months (Table Ia, lower part). Pain intensities were generally significantly lower in the second group with no significant differences between the 2 other groups (Table Ib); similar patterns were also found for the BDI and NPS indexes. Five of the LiSat-11 scales showed significant differences between the 3 groups; the satisfactions were generally significantly higher in the second group with no significant differences between the other 2 groups (Table Ic). Both EQ-VAS and EQ-5D of the EuroQol instrument showed a significantly better situation in the second cluster (Table Ic). The scales of the SF36 instrument showed significant differences for 6 out of 9 scales and with a pattern similar to the results of LiSat-11 and EQ (Table Ic).

Relative importance of background variables, symptoms and coping when regressing aspects of life quality

It was impossible to regress the number of visits to physicians or

employment status using background variables, symptoms and coping variables.

In order to analyse if and how the different symptoms and CSQ scales interacted with health-related quality of life items, the variables "life in general" of LiSat-11, "general health" scale of SF36 and "EQ-5D", and "EQ-VAS" of Euroqol were chosen as 4 dependent variables (Y-variables); they were significantly intercorrelated according to univariate analysis (r -values: 0.34–0.51; p -values <0.001). When the 4 variables were regressed simultaneously ($R^2 = 0.28$, $Q^2 = 0.26$), it was found that BDI, the catastrophizing scale of CSQ, and NPS index were the strongest regressors followed by the pain intensities in different regions and PR index (Table II). The ability to decrease pain and control pain (measured by the CSQ instrument) was also associated with the aspects of life quality, but interestingly it was of significantly weaker importance.

A similar pattern was found when we regressed these 4 variables separately (life in general of LiSat-11: $R^2 = 0.27$, $Q^2 = 0.19$; the general health scale of SF36: $R^2 = 0.32$, $Q^2 = 0.27$; EQ-5D: $R^2 = 0.35$, $Q^2 = 0.28$, and EQ-VAS: $R^2 = 0.37$, $Q^2 = 0.31$). These regressions had in common that BDI was the strongest regressor followed by the catastrophizing scale of CSQ or NPS index in an alternating second and third position. Hereafter, the regressors were directly pain-related variables (pain intensities of different anatomical regions and PR index).

Table II. The simultaneous partial least squares (PLS) regressions of the scale “life in general” of LiSat-11, the scale “general health” of SF36, and the scales “EQ-5D” and “EQ-VAS” of Eurocol. VIP and coefficients (i.e. PLS scaled and centred regression coefficients) are shown for the significant regressors of each model (i.e. variables with VIP >1.0). R² and Q² are also given for the model. In the table, the univariate correlations between the dependent variables and the significant regressors are also given

Dependent variables	VIP	LiSat-11 life in general		SF36 general health		EuroQol EQ-5D		EuroQol EQ-VAS	
		Coeff	Univariate correlation	Coeff	Univariate correlation	Coeff	Univariate correlation	Coeff	Univariate correlation
BDI	2.75	-0.08	-0.553**	-0.09	-0.538**	-0.10	-0.466**	-0.10	-0.489**
NPS index	2.34	-0.06	-0.387**	-0.08	-0.434**	-0.08	-0.278**	-0.09	-0.424**
CSQ catastrophizing	2.28	-0.06	-0.316**	-0.08	-0.435**	-0.08	-0.369**	-0.09	-0.430**
Pain intensity – neck	1.91	-0.05	-0.222**	-0.06	-0.276**	-0.07	-0.412**	-0.07	-0.414**
Pain intensity – hands	1.73	-0.05	-0.262**	-0.06	-0.250**	-0.06	-0.274**	-0.07	-0.293**
Pain intensity – low back	1.72	-0.05	-0.258**	-0.06	-0.339**	-0.06	-0.363**	-0.07	-0.378**
PR index	1.61	-0.04	-0.185**	-0.05	-0.379**	-0.06	-0.432**	-0.06	-0.309**
Pain intensity – upper back	1.56	-0.04	-0.195**	-0.05	-0.237**	-0.05	-0.428**	-0.06	-0.374**
Pain intensity – head	1.56	-0.04	-0.146**	-0.05	-0.243**	-0.05	-0.339**	-0.06	-0.427**
Pain intensity – shoulders	1.46	-0.04	-0.173**	-0.05	-0.183**	-0.05	-0.323**	-0.06	-0.342**
CSQ decrease pain	1.24	0.03	0.223**	0.04	0.212**	0.04	0.208**	0.05	0.245**
CSQ pain control	1.14	0.03	0.172**	0.04	0.220**	0.04	0.213**	0.04	0.208**
Pain radiating – leg	1.12	-0.03	-0.102 ns	-0.04	-0.297**	-0.04	-0.173*	-0.04	-0.258**
R ²	0.28								
Q ²	0.26								

ns = non-significant, * $p < 0.005$, ** $p < 0.001$.

BDI: Beck Depression Inventory, NPS index: Non Pain Symptoms index, CSQ: Coping Strategy Questionnaire, PR index: Pain regions index.

Because BDI was considered the most important regressor, we decided to examine the distribution of this variable, but no extreme distribution was found. This agreed with the multivariate analysis for multivariate outliers. The number of patients that score severe depression on BDI is relatively low. Similar results are also obtained for the other items reflecting psychological well-being.

DISCUSSION

Major results

The major results of the present study that will be discussed are listed below:

- Few gender differences existed in this group of patients with chronic WAD with respect to symptoms, coping and aspects of health-related quality of life.
- Three groups of patients were identified with respect to coping strategies and 3 different patterns of coping emerged. Whether or not active coping strategies were used, this seemed to have little influence on health-related quality of life.
- When investigating the relative importance of background data, symptoms (pain and others) and coping strategies with respect to health-related quality of life items, the following variables were the most important: BDI, NPS index and catastrophizing cognitions, respectively. Thus pain intensity was not one of the most important regressors although having significant importance. The number of symptoms not directly related to pain (NPS index) taken together were more important than any specific symptom in isolation.

- BDI was an important and prominent contributor to well-being despite the fact that a low proportion of patients scored a more serious depressive state. This indicates that relatively small deviations must be taken seriously when planning treatment and rehabilitation.

Gender

Few specific gender differences were found with respect to symptoms, coping and aspects of health-related quality of life. Thus when considering the levels of depression and other psychological items of well-being measured in different questionnaires, there were no indications of statistically significant gender specific differences. This agrees with Söderlund & Lindberg (16). Although these authors found gender specific differences according to the Sickness Impact Profile scale (SIP) items “alertness behaviour” and “home management”, they did not find any gender differences in disability, depression/anxiety, pain intensity, or in the use of coping strategies. Investigating coping in patients with musculoskeletal pain, Jensen et al. only found a significant gender difference with respect to the CSQ item “catastrophizing”; women tended to use this strategy more often than men (34).

Subgroups with respect to coping strategies (CSQ)

As intended, we identified 3 subgroups based on CSQ (Table Ia). In our study, the 3 identified groups differed with respect to how they cope with their pain. Teasdale studied the relationship between cognitive coping strategies and depression and he found a diversity of strategies, altering negative thoughts, diverting attention, confronting fearful situations, increasing self control, physical exercise, etc. (35). However, he did not find any single

technique more successful than another. In this study, it seems as a certain group of patients (subgroup 2) was more successful than other groups. Characteristics of this group were that catastrophizing cognitions and praying and hoping together with re-interpretations of pain sensations were less used while self-statements, ignoring and increasing behavioural activities were more actively used. Whether or not active coping strategies were used seemed to have little influence on the well-being variables. Sub-group 2 estimated their well-being higher than the other groups. Furthermore, both group 1 and 3 scored moderately high on BDI (mean 15.8 and 15.9; $p = 0.001$). However, although group 1 and 3 presented similar relatively high BDI scores, group 3 seems to control and decrease pain more successfully (group 3: control 16.4/decrease 13.4 – group 1: control 9.2/decrease 9.7, $p = 0.000$). In comparison, the second group uses a more selective approach combining both a high and low frequency of passive and active strategies. This group was also found to control and decrease pain most successful (19.8 and 18.9). This blend of high and low and active and passive ways of coping is in line with Carroll et al. (22) who found that disabling neck/low back pain was correlated strongly to a specific pattern combining a high and low frequency of passive coping, but the level of active coping seemed to have less importance. In this study, the results of the regression analysis agree with Carroll et al.'s results; the amount of active coping strategies lacked importance. Thus when it comes to taking control over and ability to decrease pain, we agree that part of the explanation could be that differences in success between the groups might be due to the selective and preferably dynamic way of accommodating to variations in the pain in different ways. Sub-group 2 had a relatively high degree of pain control and ability to decrease pain. Furthermore, they generally had lower pain intensities and a better situation according to the SF-36 instrument item, "bodily pain" ($p = 0.005$). However, according to the EQ item pain/discomfort, there was just a slight difference between the 3 groups. Moreover, only approximately 1–1.5 scale units differed between the groups' mean scores according to the pain intensity scales, and it could be questioned whether this difference *per se* had clinical importance. On the other hand, the second subgroup not only differed with respect to pain intensity but also for other variables such as BDI, PR index, NPS index and aspects of health-related quality of life, which could indicate individual practical consequences.

Health-related quality of life and relationships with other variables

In rehabilitation of patients with chronic pain, improved health-related quality of life is often considered an ultimate goal. When investigating the relative importance of background data, symptoms (pain and others) and coping strategies with respect to aspects of health-related quality of life a specific pattern emerged. BDI, NPS index, and catastrophizing cognitions emerged as the most prominent regressors of the well-being items (VIP 2.75–2.28). Thus both BDI and catastrophizing cog-

nitions were prominent factors contributing to well-being. The validity of this pattern can (to some extent) be questioned due to the fact that some of the regressors (for instance NPS and PR-index) had insufficiently known psychometric characteristics.

Söderberg & Lindberg (16) found just 1 item of the CSQ instrument that contributed significantly to emotional distress, catastrophizing. Catastrophizing has also been recognized as an important predictor of depression (36) and anxiety (25). It has been found that high frequency of passive coping could trigger depressive symptoms in the context of high pain intensity (37). Their study also indicates that passive coping over time may intensify the relationship between pain and depressive symptoms in contrast to patients applying a more active way of coping. Weickgenant et al. (38) also found that depressed patients were more likely to use passive strategies like avoidance than non-depressive patients. Passive coping has also been correlated with psychological distress in contrast to persons who face their pain more actively (39). A strong relationship has also been reported between catastrophic cognitions and fear of physical movements and activities (18) and between pain-related fear-avoidance beliefs and disability (40).

Furthermore, the NPS index was more important than any specific not-pain related symptom in isolation. Thus the result shows that none of these non-pain symptoms in isolation significantly contributed to the well-being items, but the amount of symptoms did.

Pain intensity in different body regions (in significance order: neck, hands, and lower back) also contributed (VIP 1.92–1.72), but pain intensity was not one of the most prominent factors contributing to health-related life quality. Pain intensity has been reported to be an important factor contributing to various forms of disability (16), which in turn is related to the chronicity dimension of pain. In clinical practice, pain intensity is often favoured as the most important indicator of health-related life quality, but our results suggest that a more complex pattern of variables is important. For example, a reasonable idea is that pain intensity affects the afflicted person's well-being in a direct way. However, neither the univariate nor multivariate analysis show any particularly strong correlations between pain intensities and aspects of health-related quality of life. This is a bit surprising, and we believe this shows that the relationship between pain intensity and well-being needs to be interpreted in a broader light covering both direct and indirect influences. For instance, Turner et al. (36) found that pain intensity contributed significantly to the prediction of depression, although of minor influence. To conclude, we argue that the pain intensity in itself seems to be an ambiguous direct indicator of well-being even if we consider the pain intensity factor as a significant contributor to quality of life.

A practical rehabilitation medicine point of view

From a rehabilitation viewpoint, the present results might be important when it comes to the interaction with patients in the health and medical care setting. Understanding the factors that contribute to health-related quality of life and coping seems

urgent. It might be important in future research to investigate how patients with WAD combine different coping strategies and degrees of frequency of strategies. Recognizing that a single factor (i.e. pain) does not necessarily explain a patient's health-related quality of life is important. Understanding that a complex mixture of factors influence quality of life seems important when planning the rehabilitation process. Based on the results of this study, it seems reasonable to target both certain coping strategies (i.e. catastrophizing) and different symptoms (pain and depression) during the process of rehabilitation in order to improve health-related quality of life in patients with chronic WAD.

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