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ORIGINAL REPORT

LIFE SATISFACTION IN SUBJECTS WITH LONG-TERM MUSCULOSKELETAL PAIN IN RELATION TO PAIN INTENSITY, PAIN DISTRIBUTION AND COPING

Audny Anke, MD, PhD[1,2], Elin Damsgård, RN, PhD[3] and Cecilie Røe, MD, PhD[4,5]

From the [1]Department of Rehabilitation, University Hospital of North Norway, Tromsø, [2]Institute of Clinical Medicine, [3]Department of Health and Care Sciences, Faculty of Health Sciences, University of Tromsø, Tromsø, [4]Department of Physical Medicine and Rehabilitation, Oslo University Hospital Ullevål and [5]Faculty of Medicine, University of Oslo, Oslo, Norway

Objective: **To investigate levels of life satisfaction in subjects with long-term musculoskeletal pain in relation to pain characteristics and coping.**
Design: **Cross-sectional study.**
Methods: **A total of 232 (42%) respondents answered self-report questionnaires regarding life satisfaction, self-efficacy, sense of coherence, pain distribution and pain intensity at rest and during activity.**
Results: **Levels of life satisfaction and scores for sense of coherence were low. Pain intensity at rest was negatively correlated with global life satisfaction. This result was also obtained in multiple regression analyses together with the coping factors. The life satisfaction domains activities of daily living/contacts were negatively correlated with pain intensity during activity, and the domains work/economy were negatively correlated with pain distribution. Pain was not associated with satisfaction with family life, partner relationship or sexual life. Younger age, being married/cohabitant and being female were protective for some domains. Clinically meaningful subgroups with regard to adaptation were identified by cluster analysis, and the highest level of coping was found in the adaptive cluster with high life satisfaction/low pain intensity at rest.**
Conclusion: **Long-term pain is related to low levels of life satisfaction, and pain intensity and distribution influence satisfaction in different domains. Pain intensity is negatively associated with coping. The results support efforts to reduce pain, together with strengthening active coping processes and addressing individual needs.**

Key words: chronic pain; life satisfaction; life quality; coping; self-efficacy; sense of coherence.

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Correspondence address: Audny Anke, Department of Rehabilitation, University Hospital of North Norway, NO-9038 Tromsø, Norway. E-mail: audny.anke@uit.no

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INTRODUCTION

Long-term moderate-to-severe pain is present in 19–30% of the population and musculoskeletal pain conditions represent a major challenge (1, 2). Widespread pain has been reported to produce more problems with function, and is also often associated with higher pain intensity (3, 4). Many multidimensional pain treatment programmes include individual goal achievement, and newer studies indicate that the treatment of subjects with musculoskeletal pain should be individualized to a greater degree (5). To improve rehabilitation strategies we need descriptions of the patients' needs (6). The concept of life satisfaction can be defined as a measure of a patient's perception of the difference between his or her reality and his or her needs or wants. An individual's judgement of his or her life as a whole is thought to be based on an affective aspect and a rational aspect, and individuals weigh the degree to which they are satisfied with the various aspects of their life. The rational aspect describes the individual's level of contentment and may be explained as the degree to which an individual knows and believes that he or she can reach his or hers goals (7). An individual is satisfied with a domain of life or with life as a whole when aspirations and achievements are balanced, and the vast majority of people in the general population (70%) report that they are satisfied or very satisfied with life as a whole (8). In contrast, people with long-term musculoskeletal pain are found to have a considerably lower life satisfaction than the general population. However, few studies have addressed this issue, and the life satisfaction scores are presented in different ways (9–11).

According to the theory of adaptation, no change in life circumstances should lead to lasting changes in life satisfaction. Satisfaction can increase or decrease after important life events, but will eventually reach the original set point (12). Diener et al. (13) revised the adaptation theory and concluded that individuals differ in their adaptation to events, with some individuals changing and others not changing their set point. An important research goal is to identify the factors that control the adaptation process. Subjects with long-term pain have a condition that continues to draw attention, and these subjects need adaptive strategies to maintain a high level of life satisfaction (13). One finding that should be investigated further in relation to coping is that the intensity of pain has little or no relationship to the level of life satisfaction in subjects with long-term non-malignant pain (6, 14). Self-efficacy is one aspect of pain control that has been shown to influence personal goal-setting (15) and to have a positive impact on quality of life (16). The sense of coherence can be regarded as a personality orientation that facilitates the

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coping process (17) and has been shown to correlate with global life satisfaction in subjects with disabilities (18, 19). Theoretically, good coping resources and strategies could protect subjects with impairments, such as pain conditions, from a decrease in satisfaction with life by supporting, if necessary, reorientation towards new goals (20). No previous studies address the concomitant influence of pain characteristics, self-efficacy and sense of coherence on the satisfaction with life as a whole and the domains in life in subjects with musculoskeletal pain.

The aim of the study was to investigate satisfaction with life as a whole and with 8 specific domains of life satisfaction in subjects with long-term musculoskeletal pain in an outpatient comprehensive rehabilitation clinic, as well as to compare the results with earlier findings by other research groups. Furthermore, the associations between the aspects of life satisfaction and basic demographic data, pain characteristics and coping factors were explored in univariate and multiple regression analyses. Finally, we studied the characteristics of subgroups with different levels of global life satisfaction and pain intensity, where a high level of life satisfaction indicated adaptation to pain, and we hypothesized that a strong individual sense of coherence could facilitate coping.

METHODS

Study design and participants

In this cross-sectional study, participants were recruited from the "Neck and Back" unit at the University Hospital of North Norway, Department of Physical Medicine and Rehabilitation, during the period from October 2005 through October 2006. The clinic receives patients with various musculoskeletal pain conditions referred from primary care physicians. Inclusion criteria for this study were a first-time visit for a painful musculoskeletal condition, understanding and speaking Norwegian, and age between 18 and 67 years. Patients with suspected malignant diseases were excluded. Approximately 5% of the referred patients did not meet the inclusion criteria and were excluded. Of the 549 eligible subjects 263 subjects (48%) gave informed consent. Thirty-one responders were subsequently excluded due to incomplete questionnaires (2 or more items missing in scales/subscales), leaving the data from 232 patients (42%). Three persons had not completed the item "satisfaction with life as a whole", leaving 229 subjects available for these analyses.

The mean age of the participating patients was 42.0 years (range 19–66 years), and 124 (53%) were female. The subjects underwent a clinical examination and comprised patients with painful conditions with different International Classification of Diseases (ICD-10) diagnoses in chapters M00–M99. Based on both clinical examination and pain drawings, the participating subjects were divided into 3 categories to reflect the dominant location of their pain: neck pain, 72 (31%): low back pain, 109 (47%): and multiple pain sites, 51 (22%). All respondents reported pain symptoms for at least 6 months, 90% had experienced pain for more than 1 year, and 23% had experienced pain for more than 10 years. There were no statistically significant differences between the participants and consenters with uncompleted questionnaires regarding age, gender and educational level. The individuals who gave consent had a higher educational level (80% with high school/university vs 64% among people who did not give consent) and included more men (47% vs 24% among those who did not give consent).

An overview of demographics and pain characteristics of the 229 participants that provided global life satisfaction scores is presented in the first column in Table I.

Table I. *Satisfaction with life as a whole in relation to demographic factors, pain and coping variables in 229 subjects with longstanding musculoskeletal pain*

	Total *n* = 229 (100%)	LiSat 1–3 Dissatisfied *n* = 65 (28%)	LiSat 4 Rather satisfied *n* = 104 (46%)	LiSat 5–6 Satisfied and very satisfied *n* = 60 (26%)	*p*-value
Age, years, mean (SD)	42.0 (10.0)	43.3 (10.2)	42.0 (10.5)	40.8 (9.7)	0.367
Gender, *n* women (% women)	123 (53)	31 (48)	56 (54)	36 (60)	0.386
Educational level, *n* (%)					
Primary school	45 (20)	16 (36)	23 (51)	6 (13)	
High school	116 (51)	30 (26)	56 (48)	30 (26)	
University	65 (29)	19 (29)	22 (34)	24 (37)	0.058
Work situation, *n* (%)					
Disability/rehabilitation pension	86 (39)	34 (40)	34 (40)	18 (21)	
Sick leave	70 (32)	18 (26)	32 (46)	20 (29)	
Work	63 (29)	9 (14)	33 (52)	21 (33)	0.017[a]
Pain location, *n* (%)					
Neck pain	71 (31)	22 (30)	34 (48)	14 (20)	
Low back pain	108 (47)	24 (22)	53 (49)	31 (28)	
Multiple pain sites	50 (28)	19 (38)	17 (34)	14 (28)	0.191
Pain characteristics, median (IQR)					
Pain distribution	14 (8.0–20.8)	16 (11.5–25.5)	12 (6–20)	11.5 (7.0–18.8)	0.004[a]
Pain intensity rest	6 (4–7)	7 (5–8)	5 (3–7)	5 (3–7)	0.002[a]
Pain intensity activity	8 (6–9)	8 (7–9)	7 (6–9)	8 (6–8)	0.121
Coping factors, median (IQR)					
Self-efficacy of pain	4.2 (3–5.4)	3.6 (2–5)	4.4 (3.2–5.4)	4.8 (3.4–5.8)	0.000[a]
Sense of coherence, *n* = 218	60.0 (53–66)	53.0 (49–60)	59.0 (54–64)	65.5 (60–70)	0.000[b]
Hopkins Symptom Checklist (HSCL-25), median (IQR)	1.76 (1.48–2.12)	2.2 (1.84–2.6)	1.76 (1.52–2.04)	1.44 (1.32–1.72)	0.000[b]

[a]Statistically significant between-group differences for LiSat score 1–3 vs LiSat score 4 and LiSat score 5–6. [b]Statistically significant between-group differences for all 3 LiSat score groups. The non-parametric Kruskal–Wallis test was used for continuous variables.
LiSat: Life Satisfaction checklist; IQR: interquartile range; SD: standard deviation.

The study was approved by the Norwegian Regional Committee for Medical Research Ethics.

Measurement

The pain characteristics were registered according to the pain location, pain intensity and pain distribution, and the primary outcome was satisfaction with life as a whole and satisfaction in the 8 domains in life. Coping was measured as the patients' experience of control over their pain (self-efficacy of pain) and with a measure of the subjects' sense of coherence, which can be regarded as a general resource that facilitates coping. The covariates were demographic factors and emotional distress.

Pain intensity was measured for the last week using a numeric rating scale (NRS) from 0 (no pain) to 10 (worst pain imaginable). There was one scale for "pain during rest" (PI-R) and one scale for "pain during activity" (PI-A). Pain distribution on a continuum was assessed using pain drawings from the validated Norwegian form of the McGill Pain Questionnaire (21). On a drawing of the front and back of the body a total of 100 squares cover the whole body surface. The respondents are asked to shade the squares covering a painful area. The pain distribution (PD) was measured by calculating the percentage of body surface marked by the patients as painful (22).

Satisfaction with life was measured with the Life Satisfaction (LiSat-9) checklist that contains 1 global item and 8 domain-specific items (23). Each item was checked along a 6-grade ordinal scale, ranging from 1 (very dissatisfied) to 6 (very satisfied). In analyses the scale can be dichotomized into 1–4 (not satisfied) vs 5–6 (satisfied) or trichotomized into 1–3 (dissatisfied) vs 4 (rather satisfied) vs 5–6 (satisfied). The instrument has been validated in a nationally representative Scandinavian (Swedish) sample using an extended 11-item version (8). An acceptable level of sensitivity has been demonstrated also in patients with chronic musculoskeletal pain (20, 24).

Self-efficacy was assessed using the subscale of pain (SEP) in the Arthritis Self-Efficacy Scale (ASES) (25). The instrument has been validated for a Swedish population (26), and the Norwegian version of the ASES self-efficacy for pain subscale has been used in studies on back pain (4). The scoring options used a Likert scale ranging from "totally disagree" [0] to "totally agree" [10]. The raw scores for the 5 items are summed and then divided by 5, giving a possible range from 0 to 10. A higher score indicates a higher degree of self-efficacy for pain.

The sense of coherence was measured using Antonovsky's 13-item instrument sense of coherence (SOC-13) (17). The score of each item [1–7] is summed to a total with a possible range from 13–91, such that the higher the score, the stronger is the sense of coherence. High levels of reliability and content, face and construct validity have been found (27).

The demographic factors were age, gender, educational level, marital status and work status. Emotional distress is frequent in subjects with longstanding pain (4) and for comparison with other samples; this distress was assessed using the Hopkins Symptom Check List 25-questions version, comprising the dimensions of depression, anxiety and somatization (28). The items are scored on a scale ranging from not at all [1] to very much [4], summed, and divided by 25. A higher score indicates more psychological distress, and the cut-off is suggested to be 1.70 (29).

Statistics

Statistical analyses were performed using SPSS for Windows v. 16. The descriptive data are presented as the means and standard deviations (SDs), as medians and interquartile ranges (IQRs) or as proportions of subjects within predefined categories. Depending on whether the variables were continuous a Pearson's or Spearman's correlation coefficient was calculated. Age, PI-R and SOC were normally distributed. PD was skewed to the left, and minor skewing was also observed for PI-A (to the right) and SEP and Hopkins Symptoms Checklist (HSCL-25) (to the left). Values of $p < 0.05$ were considered statistically significant.

Global life satisfaction and satisfaction with the 8 domains (6-graded scales) were used as dependent variables in several stepwise multiple regression analyses. To determine whether the independent variables should be included, a simple linear regression analysis was used. The variables were entered as age, gender (male = 1, female = 2), marital status (1 = married/cohabitant, 2 = single), education (primary school 10 years = 1, higher education = 2), work status (1 = work, 2 = sick leave/pension), pain location, pain intensity (NRS), spread of pain, SEP score and SOC score. The variables with p-values < 0.1 in the pre-analysis (simple linear regressions) were then entered into a multiple linear regression model to quantify their effect on life satisfaction items. Forward multiple regression analysis was used. PI and PD were entered into the primary model and kept in the analysis as long as they were statistically significant. The main results are presented as the standardized Beta (ß) and the adjusted R^2. The expected directions of the Beta weights were positive for SEP and SOC, while the Beta weights for PI and PD were expected to be negative. Multicollinearity of the independent variables was examined using the variance inflation factor (VIF). The residuals were examined to check the model assumptions. Missing data on the HSCL-25 or the self-efficacy for pain scale were replaced with the mean value of the subscale when 1 item was missing.

To identify the subgroups of adaptation (i.e. high life satisfaction) and no or incomplete adaptation (i.e. low life satisfaction), a K-mean cluster analysis with global life satisfaction (LS) and PI-R was performed. A cluster analysis identifies similar groups and classifies subjects into these groups. In K-mean cluster analysis, the number of clusters is defined, and each case is then assigned to the cluster for which distance to the cluster mean is smallest. First, the initial cluster centres are selected, and, following the completion of iteration steps with new computations, all cases are assigned to clusters. The final cluster centres are used to describe the clusters. A 4-cluster solution was successfully able to separate two groups with relatively high life satisfaction from two groups with relatively low life satisfaction. This cluster solution represented clinically meaningful subgroups, which were analysed further with respect to patient demographics and coping factors.

RESULTS

An overview of the level of satisfaction with life as a whole and with the 8 domains in life among subjects with longstanding musculoskeletal pain conditions is provided in Fig. 1. The scores for satisfaction with life as a whole were fairly normally distributed, with 28% of subjects being dissatisfied (scores 1–3), 45% being rather satisfied (score 4) and 26% being satisfied or very satisfied (scores 5–6). The subjects were most satisfied with their family life and partner relations, with 67–68% of subjects reporting that they were satisfied or very satisfied (scores 5–6), while satisfaction with their vocational situation received the lowest score, with 16% satisfied or very satisfied and 61% dissatisfied (scores 1–3). The subjects were also fairly satisfied (5–6) with their self-care ability (57%) and contacts with friends (53%), whereas only 20–30% reported satisfaction with their leisure situation, financial situation and sexual life. Table II shows the proportions of subjects who were satisfied, and the mean and median scores for satisfaction with life as a whole and for the 8 domains of life.

Table I presents 3 subgroups defined based on satisfaction with life as a whole. As shown, the median score of PI-R on the NRS was 6 (IQR 4–7), with higher scores for dissatisfied subjects. The subjects who were dissatisfied also had wider PD. Significantly fewer subjects working were dissatisfied

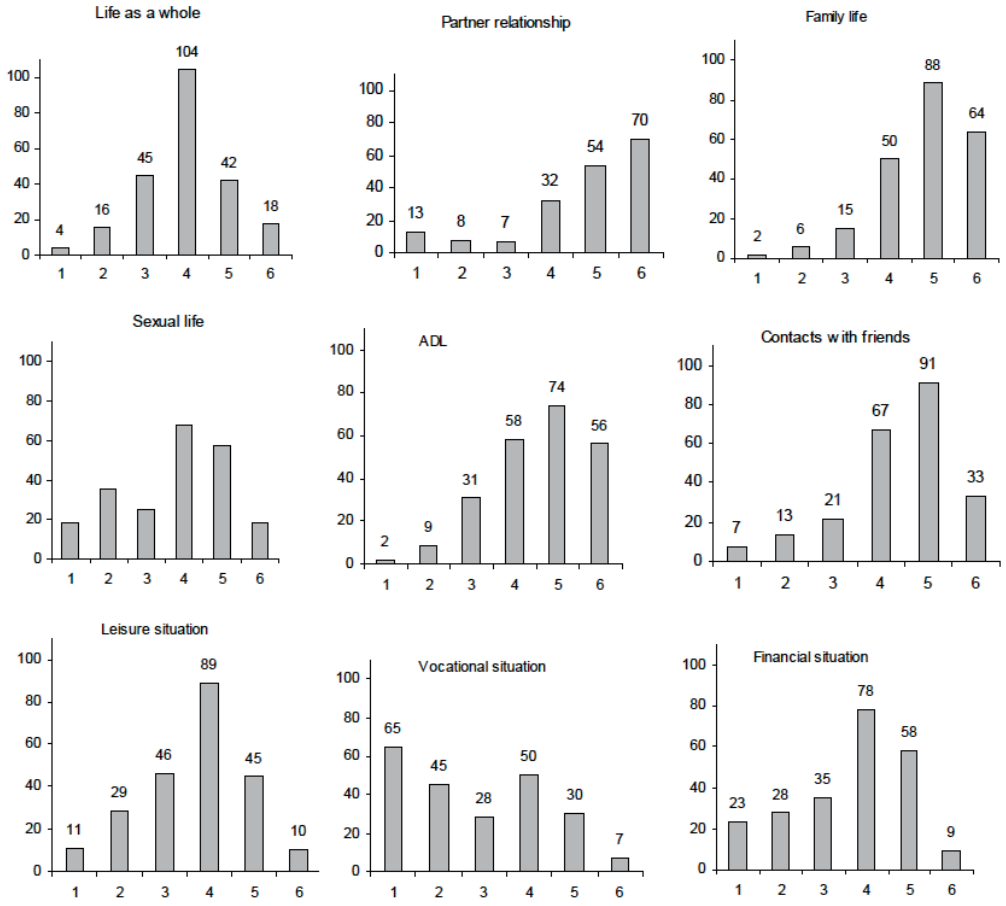

Fig. 1. Self-reported levels of satisfaction with life as a whole and for 8 domains in life in subjects with long-term musculoskeletal pain. Columns 1–6 list the number of subjects with the following life satisfaction scores: 1 = very dissatisfied, 2 = dissatisfied, 3 = rather dissatisfied, 4 = rather satisfied, 5 = satisfied, and 6 = very satisfied.

with life as a whole. The SEP and SOC differed markedly and significantly across the 3 life satisfaction groups.

As shown in the bottom rows of Table II, the prevalence of subjects with high levels of life satisfaction was lower than in a Swedish reference population (8). Next, the relationships between the demographic and coping variables and all the life satisfaction items were analysed. As presented in Table II, significantly more women than men were satisfied with their family life and leisure situation. Higher education was associated with increased satisfaction with life as a whole and with the partner relationship and financial situation, and satisfaction with the financial situation significantly decreased in people on sick leave or receiving pensions compared with subjects who were working. Eighty-eight percent of subjects on sick leave, rehabilitation or disability pension were not satisfied with their vocational situation. Being single was associated with less satisfaction with the closeness domains and the economy domain.

All of the pain characteristics were statistically significantly correlated with satisfaction with life as a whole. The Spearman correlations were PD –0.194 ($p < 0.01$), PI-R –0.240 ($p < 0.001$), and PI-A –0.150 ($p < 0.05$). As shown in Fig. 2, PI-R and PI-A were related to the global LiSat scores. Satisfaction with the ADL was negatively correlated with PI-R (–0.299), PI-A (–0.340) and PD (–0.205), while satisfaction with leisure was negatively correlated with PI-R (–0.204) and PD (–0.144) but not PI-A. Satisfaction with vocation was weakly associated (< 0.2) with PD and PI-A. The more emotionally pertinent questions about satisfaction with family life, partner relationship and contacts with friends were not correlated with the pain factors. The SOC was statistically significantly associated with satisfaction with life as a whole (–0.458, $p < 0.001$) and with all the life satisfaction domains, with Spearman's correlations between 0.270 and 0.442 ($p < 0.001$) for all the domains except for a weaker correlation observed for ADL satisfaction (0.147, $p < 0.05$). The SEP appeared to be related to life satisfaction in a different pattern, showing the highest correlation with satisfaction with ADL (–0.336, $p < 0.001$) and life as a whole (–0.259, $p < 0.001$), followed by leisure (0.217, $p < 0.001$), vocational (–0.165, $p < 0.05$) and financial situation (–0.143, $p < 0.05$), while no significant associations were found with domains

Table II. *Demographic factors in relation to satisfaction with life as a whole and the 8 life satisfaction domains, given as proportions (%) of satisfied subjects (LiSat scores grades 5–6). Corresponding levels of satisfaction within each item in a reference population (Fugl-Meyer et al. (8)) and a relevant study (Silvemark et al. (9)) are also given*

	Life as a whole *n*=229 %	Partner relationship *n*=184 %	Family life *n*=225 %	Sexual life *n*=221 %	ADL *n*=230 %	Contacts with friends *n*=232 %	Leisure situation *n*=230 %	Vocational situation *n*=225 %	Financial situation *n*=231 %
Age, years									
<42	29	68	68	39	61	52	21	15	26
≥42	23	67	68	29	52	55	27	18	32
Gender									
Women	29	72	75*	34	63*	57	29*	18	29
Men	23	62	59*	33	49*	49	18*	14	29
Marital status									
Married/cohabitant	27	75**	73*	38*	57	56	25	20	32**
Single	26	25**	55*	23*	55	49	21	10	16**
Educational level									
Primary school 10 years	13*	51*	59	28	50	57	20	9	11**
Higher education	30*	72*	69	35	59	53	25	19	33**
Work situation									
Sick leave or pension	24	67	66	34	50**	53	21	12**	25*
Work	33	69	69	31	71**	54	29	29**	38*
Pain location									
Neck pain	21	64	70	43	66	56	24	18	31
Low back pain	29	69	67	28	56	53	25	21	28
Multiple pain sites	28	68	65	33	45	51	22	6	27
Present study (% satisfied)	26	67	68	34	57	53	24	16	29
Mean (SD)	4.0 (1.0)	4.7 (1.5)	4.8 (1.1)	3.8 (1.4)	4.6 (1.2)	4.4 (1.2)	3.7 (1.2)	2.8 (1.5)	3.6 (1.3)
Median (variance)	4 (1.1)	5 (2.2)	5 (1.1)	4 (2.0)	5 (1.3)	5 (1.4)	4 (1.4)	3 (2.4)	4 (1.8)
Fugl-Meyer et al. (8)									
(% satisfied)[a]	70	82	81	56	95	65	57	54	39
Median (variance)	5 (0.8)	5 (1.0)	5 (0.8)	5 (1.3)	6 (0.4)	5 (1.0)	5 (1.2)	5 (1.7)	4 (1.4)
Silvemark et al. (9)									
(% satisfied)[b]	21	64	59	28	44	32	12	11	19

*$p<0.05$, **$p<0.01$.
[a]Swedish reference population; $n=2533$; mean 39.1 years, SD 12.6; 48% female (Fugl-Meyer et al. (8)).
[b]Patients with long-term non-malignant pain; $n=294$; mean 38.1 years, SD 9.4; 66% female (Silvemark et al. (9)).
ADL: activities of daily living; LiSat: Life Satisfaction checklist; SD: standard deviation.

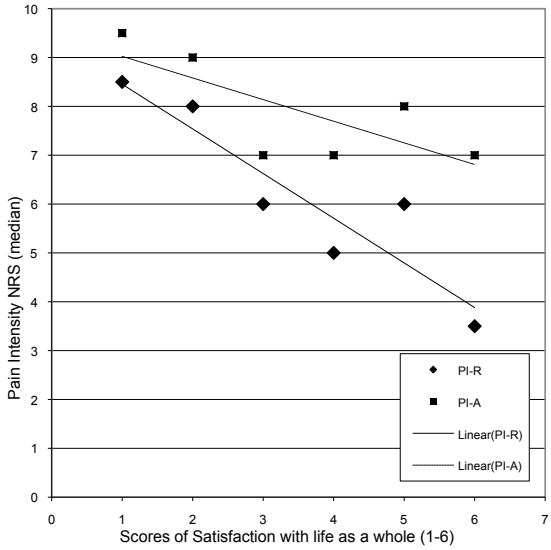

Fig. 2. Scatter diagram and trend-lines for the median scores of pain intensity at rest (PI-R) and during activity (PI-A) related to scores for global life satisfaction. On the horizontal axis, 1=very dissatisfied, 2=dissatisfied, 3=rather dissatisfied, 4=rather satisfied, 5=satisfied, and 6=very satisfied.

that are regarded as "closeness domains" (family life, partner relationship, sexual life, and contact with friends) (8).

The correlation analyses further showed that HSCL-25 and the subscale of depression were closely negatively correlated with the SOC (–0.60, $p<0.001$).

Regression analysis with life satisfaction as a dependent variable

The collected results of the forward stepwise multiple regression analyses with global life satisfaction and satisfaction with the domains are shown in Table III. The resulting model for satisfaction with life as a whole included PI-R, SEP and SOC with an adjusted R^2 of 0.257, which explained 26% of the variance in the global life satisfaction scores. Not living alone, lower age and female gender contributed to increased satisfaction with family life, together with a higher SOC. Much of the same pattern observed for family life was observed for the domains of partner relationship and sexual life. Females were also more often satisfied with leisure than men, and a high SEP was associated with increased satisfaction with this domain. Increased satisfaction with the vocational situation was independently associated with working (beta –0.348), less PD and higher SOC scores.

Table III. *Forward multiple regression analysis of satisfaction with life as a whole and satisfaction with the 8 life satisfaction domains in subjects with long-term musculoskeletal pain*

	Standardized beta coefficients								
Independent variable	Life as a whole	Partner relationship	Family life	Sexual life	ADL	Contacts with friends	Leisure situation	Vocational situation	Financial situation
Demographics									
Age		–0.132*	–0.163**	–0.130*					0.132*
Gender			0.161**		0.184**		0.184**		
Marital status		–0.585***	–0.168**	–0.169*					–0.205**
Educational level									0.120*
Work disability								–0.348***	
Pain characteristics									
Pain location					–0.194**				
Pain distribution								–0.133*	–0.142*
Pain intensity rest	–0.151*								
Pain intensity active					–0.283***	–0.127*			
Coping factors									
Self-efficacy of pain	0.140*				0.235***		0.158*		
Sense of coherence	0.399***	0.274***	–0.419***	0.283***		0.296***	0.293**	0.228***	0.329***
Adjusted R^2	0.257	0.461	–0.251	0.114	0.237	0.106	0.153	0.218	0.249

*$p<0.05$, **$p<0.01$, ***$p<0.001$.
Gender (1=male, 2=female); marital status (1=married/cohabitant, 2=single); educational level (1=primary school, 2=higher education); work disability (1=working, 2=sick leave/disability); pain location (1=neck/shoulder, 2=low back, 3=multiple pain sites).

PD was also negatively related to financial satisfaction, while PI-A influenced satisfaction with ADL and contacts with friends.

The characteristics of the subgroups from the cluster analysis are shown in Table IV. A 4-cluster solution gave the following patterns: high LS and low PI-R (adaptation), high LS and high PI-R (adaptation), low LS and low PI-R (no adaptation), and low LS and high PI-R (no adaptation). As expected, there were statistically significant differences between the clusters in the scores of life satisfaction and PI-R. However, PI-A, PD and the coping factors also differed. The scores of both SOC and SEP were highest in cluster 1 with high LS/low PI-R. The SOC score for cluster 1 was statistically significantly higher than the SOC score for cluster 2, which had the same high level of global life satisfaction, but a different pain intensity ($p=0.027$).

Table IV. *The 4 clusters based on the degree of pain intensity at rest (PI-R) and levels of global life satisfaction. Demographic characteristics, pain intensity activity (PI-A), pain distribution (PD) and scores on the coping factors of self-efficacy of pain (SEP) and sense of coherence (SOC) are given*

	Cluster 1 High LS and low PI "Adaptation" $n=55$	Cluster 2 High LS and high PI "Adaptation" $n=61$	Cluster 3 Low LS and low PI "No adaptation" $n=73$	Cluster 4 Low LS and high PI "No adaptation" $n=40$	p-value
Global life satisfaction, mean, (SD)	4.4 (1.0)	4.4 (0.8)	3.8 (0.8)	2.9 (1.1)	<0.001[a]
Pain (PI-R), mean (SD)	2.4 (0.9)	7.2 (0.7)	5.0 (0.8)	8.8 (0.9)	<0.001[b]
Median PI-R (IQR)	3.0 (2.0–3.0)	7.0 (7.0–8.0)	5.0 (4.0–6.0)	9.0 (8.0–10.0)	
Age, years, mean, (SD)	39.5 (11.5)	42.2 (9.7)	42.7 (9.8)	44.1 (9.4)	ns
Gender (% female)	55.0	64.0	47.0	50.0	ns
Education (% > primary school)	81.0	83.0	78.0	78.0	ns
Marital status (% married/cohabitant)	75.0	59.0	67.0	75.0	ns
Pain location, *n*					ns
Low back	33.0	25.0	34.0	16.0	
Neck	13.0	20.0	27.0	11.0	
Multiple pain sites	9.0	16.0	12.0	13.0	ns
PI-A, median (IQR)	6.0 (4.0–8.0)	8.0 (7.0–9.0)	7.0 (5.5–8.0)	9.0 (8.0–10.0)	<0.001[c]
PD, median (IQR)	10.0 (5.0–16.0)	15.0 (9.0–26.0)	14.0 (8.0–20.0)	15.5 (10.25–28.25)	<0.001[d]
SEP, median (IQR)	5.0 (3.8–6.2)	4.0 (2.6–5.2)	4.4 (3.4–5.4)	2.8 (2.0–4.9)	<0.001[e]
SOC, mean (SD)	63.0 (8.3)	59.6 (8.3)	58.5 (7.2)	54.7 (8.5)	<0.001[f]

[a]Global life satisfaction: $p<0.01$ between all clusters except between 1 and 2.
[b]PI-R: $p<0.01$ between all clusters.
[c]PI-A: $p<0.01$ between all clusters.
[d]PD: $p<0.01$ between cluster 1 and 2 and between 1 and 4.
[e]SEP: $p<0.01$ between cluster 1 and 2 and between 1 and 4.
[f]SOC: $p<0.01$ between cluster 1 and 3 and between 1 and 4. $p<0.05$ between 1 and 2 and between 2 and 4 and between 3 and 4.
SD: standard deviation; LS: life satisfaction; ns: not significant.

DISCUSSION

The main findings of this study were that the intensity of pain at rest was negatively associated with satisfaction with life as a whole in subjects with longstanding musculoskeletal pain and that pain intensity during activity and pain distribution were related to satisfaction with certain domains of life. The coping factors self-efficacy of pain and sense of coherence, together with the pain characteristics, were found to be significant determinants of life satisfaction in multiple regression analysis.

Levels of satisfaction with life as a whole and the domains of life satisfaction

Satisfaction with life as a whole was markedly reduced in the study subjects, compared with a reference population (8), to a level that is comparable to and even lower than life satisfaction in subjects with disabilities after severe trauma (20, 30) or stroke (31, 32). One explanation for this low level could be the lack of verifiable somatic changes to explain the subjects' pain. Silvemark et al. (9) found even lower scores in patients with non-malignant pain who had been referred to a rehabilitation clinic in Sweden. One explanation could be that 17% of the Swedish participants were born outside of northern Europe (9), whereas few participants in the present study had a non-European background, because relatively fewer immigrants live in the study region. Thus, immigrant status is not a valid explanation in this study.

The finding that the emotion-related domains, also called "closeness" (8), such as satisfaction with family life and partner relationship, tend to score higher than the other domains has been previously reported (9, 33). The reason that satisfaction with these domains was higher than that with other domains is unclear; however, this finding may illustrate the independent judgement of aspirations and achievements for each life satisfaction domain (23).

Life satisfaction and demographic factors

The finding that global life satisfaction is largely independent of age, gender and education agrees with other studies (8, 9), and the positive effect of being married or cohabitating is also found in the general population (8). Positive associations between an older age and a higher level of vocational and financial satisfaction have been found previously, while in this study, a younger age was positively associated with satisfaction in the closeness domains. As in previous studies, working respondents were more satisfied with vocation and economy (9). The low level of satisfaction with vocation agrees with earlier studies in populations with a high degree of work disability (33), and further widespread pain increased dissatisfaction with the work situation. The finding that women were more satisfied with family life is reported in a general German survey (34), while greater satisfaction with leisure among women than among men seems to be a particular finding in this population. This finding could indicate that men with long-term pain, especially in older age groups, have lower coping abilities and greater difficulties both with managing family life and reaching goals in their spare time than women.

Life satisfaction and pain characteristics

In contrast to previous reports, pain intensity was related to life satisfaction, and this incongruence may be due to the different study populations, analyses or measures between studies (9, 33). The duration of pain has been shown to be important, because subjects with a long pain duration experience more pain and lower life satisfaction than do subjects with a shorter pain duration (4). Furthermore, pain at rest may better differentiate between the global life satisfaction groups than pain during activity, although activity-related pain has been observed to be related to psychological distress (35). In addition, as observed in our analyses and not previously reported, the main difference in pain intensity was found between participants who were markedly dissatisfied (grades 1–3) and participants with higher global life satisfaction scores. Finally, as shown in the cluster analysis, some subjects with high pain intensity successfully adapt and report high life satisfaction. Although many studies have demonstrated that a wider pain distribution increases functional problems (3, 36), only satisfaction with the domains of vocation and economy was lower in patients with a greater spread of pain. Our opinion is that the strengthening of active coping processes and pain control are of central importance for increasing activity and functioning of subjects in pain rehabilitation programmes, and should be continued together with efforts to reduce pain intensity. In fact, participation in a cognitive-behavioural interdisciplinary rehabilitation programme has been shown to decrease pain intensity, and increase satisfaction with physical and psychological health (11, 37).

Life satisfaction and coping

Despite the consistent finding of lower life satisfaction in subjects with long-term non-malignant pain, the causality between pain and life satisfaction is not conclusive. However, earlier studies found that life satisfaction is lower in subjects with a longer pain duration and higher pain intensity than in subjects with a relatively shorter pain duration and lower pain intensity (4). Furthermore, life satisfaction is consistently found to be lower in people with different types of severe disabilities (13, 38), and the presence of pain has been shown to be a determinant of further decreases in satisfaction in subjects with disabilities for reasons other than long-term pain conditions (20, 39, 40). Conditions that continue to draw attention have been predicted to influence well-being, but the novelty of certain circumstances wears off and therefore draws less attention over time (13). The presence of pain must be an example of a condition that never ceases to draw attention. The results of this and other studies raise the question of whether persistent pain affects life satisfaction, and whether subjects with painful conditions had average life satisfaction before the onset of pain. These questions could be answered with longitudinal, population-based studies.

A strong positive association between the SOC scores and life satisfaction has previously been reported (20). However, the mean SOC value in the present population with pain was below what Antonovsky (18) defined as "normal" (> 62), and this finding was present in all clusters in the current study

except for the adaptation cluster, which presented high LS/low PI-R. The theoretically stable personality orientation SOC is known to change after certain events (19), and we propose that SOC may be negatively affected by persistently painful conditions, thereby reducing the subject's coping ability. The subjects' experience of control over the pain (SEP) is unsurprisingly positively associated with many life satisfaction items; however, SEP was most strongly correlated with satisfaction in the ability to perform daily activities, possibly because individuals with low self-efficacy more often experience increased pain during activity (35).

Strengths and limitations

One weakness of this study is the lack of a control group. However, reference values from a study conducted in Scandinavia were available for comparison, and the levels of life satisfaction were generally in accordance with the few existing studies on populations with long-term pain. Other limitations include the high rate of non-responders and the differences found in the demographics between responders and non-responders. The selection of participants with higher education could cover a possible difference between the scores on life satisfaction among subjects with different levels of education. The results could also be influenced by gender differences in response rates, as only 40% of eligible women, compared with 64% of eligible men, responded and were included in the analysis. Although ordinal scales commonly may not meet the requirement of interval scaling necessary for creating a sum score, sum scores were used for the well-validated ASES and HSCL scales, without further evaluation (41). Because the design of this study was cross-sectional, causal relationships cannot be determined. One strength of the current study is its ability to present life satisfaction scores in different ways to allow the results to be comparable with other studies and to increase the possibility that the analysis will reveal significant associations.

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