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A COMPREHENSIVE PAIN MANAGEMENT PROGRAMME COMPRISING EDUCATIONAL, COGNITIVE AND BEHAVIOURAL INTERVENTIONS FOR NEUROPATHIC PAIN FOLLOWING SPINAL CORD INJURY

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Objective: **To assess whether a comprehensive multidisciplinary pain management programme could contribute to improvement regarding sleep quality, mood, life satisfaction, health-related quality of life, sense of coherence and pain for patients with a spinal cord injury and neuropathic pain.**

Design: **A prospective intervention study.**

Patients: **Twenty-seven patients with spinal cord injury and neuropathic pain participated in a pain management programme in parallel with 11 patients in a control group.**

Methods: **A comprehensive pain management programme comprising educational, cognitive, and behavioural interventions was created for patients with spinal cord injury and neuropathic pain. The pain management programme consisted of 20 sessions over a 10-week period and included educational sessions, behavioural therapy, relaxation, stretching, light exercise and body awareness training. All patients were followed-up 3, 6 and 12 months after completion of the programme.**

Results: **At the 12-month follow-up, levels of anxiety and depression in the treatment group decreased compared with baseline values, and a tendency towards better quality of sleep was seen. In comparison with the control group, patients in the treatment group improved regarding sense of coherence and depression.**

Conclusion: **This study implies that a multidimensional pain management programme can be a valuable complement in the treatment of spinal cord injured patients with neuropathic pain.**

Key words: spinal cord injury, neuropathic pain, pain management programme, cognitive behavioural therapy.

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INTRODUCTION

Pain has been described as "a homeostatic emotion" (1). Besides being a sensory phenomenon, pain generates autonomic responses and interacts with emotional states. This could explain changes in mood, sleep, arousal and fear that often accompany and interact with long-lasting pain states. In patients with spinal cord injury (SCI) and pain, it has been noted that anxiety and depression are often higher and quality of sleep worse compared with patients with SCI without pain (2). Similar changes have also been described amongst patients with other neuropathic pain conditions as well as in patients with chronic pain syndromes (3, 4). That the psychological states of the patient modulate the perception of pain is well documented in experimental studies (5).

Because pain is a complex entity, multidisciplinary treatment is often needed. The outcome of multidisciplinary treatment has been proven to be superior to that of single-discipline treatment in patients with chronic back pain (6). Flor and collaborators (6) reviewed 65 studies in a meta-analysis and found that multidisciplinary treatment helped to improve pain, mood and return to work and decrease use of the healthcare system.

Cognitive behavioural therapy (CBT) is a common psychological intervention for a variety of chronic pain conditions and focuses on modifying an individual's beliefs, expectations and coping abilities (7). CBT is sometimes the sole treatment, but most often it is part of a comprehensive programme comprising specific cognitive, behavioural and physical components.

Reviews have summarized results regarding the effect of CBT on, for example, chronic pain syndromes and chronic low back pain (8, 9) and concluded that CBT is more effective than waiting-list controls.

In neuropathic pain conditions, few studies have evaluated the use of psychological treatment (4) and to our knowledge only 2 studies have assessed a cognitive behavioural approach in neuropathic pain (10, 11). Based on experience with CBT in other chronic pain conditions and the fact that neuropathic pain is equally accompanied by psychological distress, there is reason to believe that this strategy is also effective in treating patients with neuropathic pain, and it is encouraged by several authors (4, 12). Behavioural treatment programmes have been assessed in SCI populations and found to reduce anxiety and depression (13, 14) and in a pilot study pain intensity also (11). Umlauf (12) stressed the need to use a multidisciplinary treatment programme as early as 1992, and provided a frame-

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work including educational, psychological, social and physical aspects of pain treatment. The fact that psychological factors more than physiological ones (15) seem to be associated with pain in patients with SCI also speaks in favour of the development of behavioural treatment programmes for these patients.

Neuropathic pain following SCI is a challenge for every carer. Due to the few controlled studies evaluating the effects of pharmacological and non-pharmacological treatments in this patient group, guidelines for treating SCI-related pain are based mainly on studies in peripheral neuropathic pain conditions. Since neuropathic pain due to SCI often is a condition refractory to many of the treatments available today and a matter of "trial-and-error", we agree with Vlaeyen & Morley (16), who stated that "it is our moral duty to search for any single step leading to reduction of pain suffering and disability", which is why this study aimed to assess whether a comprehensive multidisciplinary pain management programme could contribute to improvement regarding sleep quality, mood, life satisfaction, health-related quality of life (QoL), sense of coherence and pain for patients with an SCI and neuropathic pain.

PATIENTS AND METHODS

Patients

Patients with an SCI and neuropathic pain who were registered at the Spinalis SCI Unit in Stockholm, Sweden were asked to volunteer to participate in a multidisciplinary pain management programme after advertising for patients in the Spinal Unit and on our Internet website. Inclusion criteria for participation were an SCI that had occurred more than 12 months ago and neuropathic pain for the last 6 months or more (i.e. chronic pain). Patients were also required to be able to speak Swedish without difficulty, and patients with associated brain injuries were excluded. All patients gave written informed consent. Twelve persons volunteered to participate in the first treatment group. Due to the low number of volunteers, it was not possible to carry out 2 parallel groups of treatment regimens, making randomization impossible. Patients who were reported to suffer from neuropathic pain in their last annual assessment (data retrieved from the computer files) qualified for participation as controls and were matched for gender and age with the participants in the first treatment group. The first 12 patients were consecutively chosen and, in a postal survey, asked to participate in the control group. Eleven patients volunteered. One year later, another 7 patients were recruited to the treatment programme and after 2 years an additional 8 patients. In total, 27 patients completed the pain management programme. The mean age of the patients in the treatment group was 53.2 years (SD 12.6) and of those in the control group 49.9 years (SD 12.3). The mean time post-injury was 9.9 years (SD 12.8) in the treatment group and 15.8 years (SD 9.3) in the control group. For more details of patient characteristics, see Table I.

Pain management programme

The pain management programme was developed for patients with an SCI and neuropathic pain and consisted of a 10-week treatment programme. Participants came twice weekly for 10 weeks; in total 20 sessions. The pain management programme consisted of 4 parts based on a written treatment protocol:

- Educational sessions on *pain physiology* and *pain pharmacology*. These included information about SCI-related anatomy and physiology, pain physiology, pain classification, endogenous pain inhibiting systems, pain pharmacology, and non-pharmacological treatments such as sensory stimulation techniques, surgical procedures, and behavioural treatment of pain. The sessions focused on the mechanisms and treatment of SCI-related *neuropathic* pain.
- *Behavioural therapy* sessions based on a CBT approach focusing on coping with life-long pain and an SCI and containing training in cognitive and behavioural pain management strategies. The sessions included training in mindfulness, attention-diverting strategies, cognitive reappraisal, social skills training, pacing of activities, homework assignments, goal setting, and meeting with a role model.
- *Relaxation techniques, stretching* and *light exercise*.
- *Body awareness training*.

All patients in the treatment group were given a file containing information from all sessions, both theoretical and practical, as well as suggestions on reading matter, websites, pain-related associations, and so on. During the treatment regime, patients could choose one or more books from a small library containing literature in Swedish on different aspects of pain. Reading at least one of these books was mandatory in the homework assignments given to the patients.

Each treatment week consisted of 1.5 hours of education, 1.5 hours of CBT, 1 hour of relaxation/stretching and 1 hour of body awareness training. Patients completed the questionnaires before entering the programme (first visit) and at the last (20th) session. Thereafter, all patients participating in the pain management programme were followed-up in a refresher session at 3, 6 and 12 months after completion of the programme. Patients in the control group were assessed in the clinic at the first visit and followed-up by post.

During the 10-week pain management programme period and the first 10-week control period, the patients were asked to refrain from starting, stopping and changing pain treatments. They continued with all ongoing long-lasting treatments.

The study was approved by the ethics committee of Karolinska Institutet in Stockholm, Sweden (KI D-nr 00-233).

Instruments

The pain protocol included drawing a pain chart and rating the following: pain intensity, pain unpleasantness, quality of sleep, mood, health-related quality of life (QoL), life satisfaction, and sense of coherence (SOC). All variables were recorded on all occasions (before starting the programme/entering the control group; after completion of the programme/10 weeks and 3, 6 and 12 months after completion of the trial) except for SOC, which was rated twice (before starting the pain management programme or entering the control group and at the 12-month follow-up). Patients in the treatment group were interviewed at the 3-, 6- and 12-month follow-up in semi-structured interviews. These patients also completed a questionnaire on satisfaction with the programme at the 10-week evaluation.

Pain intensity and pain unpleasantness

Pain intensity and pain unpleasantness were assessed using the Borg CR10 scale (17), a combined numerical and verbal rating scale. The mildest, the general, and the worst pain intensities as well as pain unpleasantness (the affective component of pain) were recorded. Pain intensity was also measured with a Pain Matcher® (18) where patients matched the magnitude of their present pain against an electrical stimulus produced by the apparatus.

Quality of sleep

Quality of sleep was rated in a sleep questionnaire created by Åkerstedt (19). This questionnaire consists of 10 items on sleep quality that are rated on an ordered categorical scale: never, rarely, sometimes, most often, and always. The categories are numbered from 1 to 5. The outcome on the 10 categories are summarized in order to obtain a global value.

Quality of life

Health-related QoL was rated using the Nottingham Health Profile (NHP) part I. The NHP–I consists of 38 items (20) where a sum score is obtained. The questions can be divided into 6 subdomains (emotional reaction, energy, sleep, physical mobility,

Table I. *Patient characteristics of the 38 individuals included in the study. One of the 38 patients with a non-traumatic injury was born with a myelomeningocele*

Sex	Age at the time of study (years)	Level of lesion	Years since injury	ASIA grade	T/NT	Type of pain	Pain duration (years)
Treatment group							
M	48	L/S	4	D	T	NP	4–5
M	45	Th	4	D	NT	Mix	4–5
F	40	C	2	D	T	NP	1–2
F	79	C	3	D	T	Mix	2–4
F	48	C	3	D	T	NP	2–4
F	53	L/S	1	D	T	Mix	0.5–1
F	36	C	3	A	NT	NP	2–4
M	42	L/S	7	C	NT	NP	>5
M	84	C	3	D	T	NP	2–4
F	65	C	5	D	NT	NP	2–4
F	61	Th	15	A	T	NP	>5
M	53	C	8	D	T	NP	>5
F	54	C	2	D	NT	Mix	1–2
F	57	Th	23	C	NT	Mix	>5
F	56	L/S	24	E	T	Mix	>5
M	59	Th	30	A	T	NP	>5
F	58	Th	58	A	NT	Mix	>5
M	73	C	4	D	T	NP	2–4
F	40	C	6	D	NT	Mix	>5
M	49	C	5	D	NT	NP	>5
F	47	C	6	D	NT	NP	>5
F	30	C	1	D	NT	NP	2–4
F	37	C	5	D	NT	NP	>5
F	58	L/S	7	D	T	Mix	>5
M	50	C	2	D	T	Mix	2–4
F	55	Th	8	D	NT	Mix	>5
F	59	L/S	29	C	T	Mix	>5
Control group							
F	59	Th	26	A	T	NP	>5
M	44	C	3	D	T	Mix	2–4
M	47	Th	22	A	T	NP	>5
F	41	Th	17	A	T	NP	>5
M	54	Th	8	D	NT	Mix	>5
M	36	Th	16	A	T	Mix	>5
F	37	Th	20	D	T	Mix	>5
F	54	Th	32	A	T	Mix	>5
M	78	C	6	D	T	NP	>5
F	42	C	19	A	T	Mix	>5
F	57	C	5	D	T	NP	>5

C = cervical; Th = thoracic; L/S = lumbar/sacral; T = traumatic; NT = non-traumatic; NP = neuropathic pain; Mix = mixed pain (neuropathic and nociceptive pain); ASIA grade = American Spinal Injury Association Impairment Grade (A–E).

pain and social isolation) and sum scores can be calculated for each domain. In this study we chose to report the scores for all subdomains except physical mobility (supported by Post et al., 21). Most patients found these questions difficult to answer due to their physical disability.

Life satisfaction was rated on the LiSat-9 (22), which is a patient self-rating, life satisfaction instrument consisting of the global item "life as a whole" and 8 domain-specific items: vocational situation, financial situation, leisure, contact friends, sexual life, activities of daily living (ADL), family life, and partnership relationship. These 9 different variables are rated on an ordinal scale from 1 to 6, where 1 represents "very dissatisfying" and 6 "very satisfying". Analyses were performed on the global item (LiSat 1) and for the individual median based on all the LiSat items (LiSat md).

Mood

For rating mood, the Hospital Anxiety and Depression (HAD) scale was used (23). This instrument consists of 7 questions on anxiety and seven on depression. Each item has outcome values ranging from 0 to 3. When calculating mood from the HAD scale, patients are classified as sufferers from anxiety, depression, or both based on the sum score: "cases" from 11 to 21 points, "doubtful cases" from 8 to 10 points, and "non-cases" from 0 to 7 points.

Sense of coherence

The SOC instrument (24) was developed to measure the factors associated with successful coping with stressors. The SOC is an instrument comprising 29 items. Outcomes for each question range from 1 to 7, and the sum score from 29 to 203. The higher the score, the stronger the SOC. The questions can be divided into 3 subdomains: comprehensibility (11 items), manageability (10 items) and meaningfulness (8 items). In this study, the sum score as well as the separate subscores were calculated.

Use of the healthcare system

For patients in the treatment and the control groups, use of the healthcare offered at the Spinalis SCI Unit was assessed during a 1

year-period before the programme started and compared to a 1-year period following the 12-month evaluation. Visits to physicians, nurses, occupational and physical therapists as well as to social workers and psychiatrists were recorded. Telephone calls and yearly health examinations were disregarded.

Statistics

Descriptive statistics, the number of observations, the median and the range (minimum-maximum), were used to present data at baseline.

As described in the manuals for the different instruments, the item responses to the NHP, the quality of sleep questionnaire, the HAD scale and the SOC scale were evaluated using sum scores.

The rank-invariant method introduced by Svensson (25, 26) was used to estimate changes in pain, quality of sleep, mood, health-related QoL, life satisfaction, and SOC from baseline to 12 months after completion of the treatment programme. The method provides estimates to identify and separately measure the level of systematic change by group and random individual changes that cannot be explained by the group change.

Systematic group changes can be explained by the relative change in position (RP). Values of RP range from -1 to 1 and a value close to 0 indicates negligible systematic changes. When RP $\neq 0$, the values at the 12-month evaluation are systematically higher (+) or lower (−).

The jack-knife method was used to estimate standard errors (SE). Estimates of RP were calculated together with the corresponding 95% confidence interval (95% CI).

In addition, the sign test was used to estimate the systematic changes in paired responses; the outcome was compared with the results obtained using the Svensson method. All tests were performed separately for the treatment programme and control regime. Between-group comparisons were also made to estimate the difference in treatment responses measured as the change from baseline to 12 months after completion of the treatment phase with respect to pain, quality of sleep, mood, health-related QoL, life satisfaction and SOC. Between-group differences were estimated by the 95% CI for the difference between RP values.

The correlations between anxiety and SOC and between depression and SOC were estimated using the Spearman rank order correlation coefficient.

The change from baseline to 12 months after completion of treatment period in the use of healthcare resources was evaluated with the Wilcoxon matched pairs test. The corresponding between-group differences were evaluated with the Mann-Whitney U test. All tests were two-sided and a $p < 0.05$ was considered statistically significant.

RESULTS

Treatment group – change from baseline to 12-months

The change from baseline to the 12-month evaluation is illustrated in Fig. 1 as a 95% CI for the RP values. The variables of anxiety and depression decreased systematically from baseline to the 12-month evaluation in the rank-invariant analysis (25, 26) (Fig. 2). A systematic decrease was also observed in sleep (Fig. 3). Pain intensities and pain unpleasantness, health-related QoL, and life satisfaction showed no statistical evidence for systematic changes over time. Using the sign test NHP – Emotional Reaction showed statistical significant change from baseline to 12 months (Table II).

Treatment group vs control group

Differences between treatment regimens concerning systematic changes from baseline to 12 months are illustrated in Fig. 4. The differences between treatment regimens were significant for depression and SOC. For depression, the levels decreased systematically in the treatment group but not in the control group. The opposite was seen regarding SOC where the ratings of the controls decreased over time (Fig. 5). The changes in pain intensity, pain unpleasantness, life satisfaction and health-related QoL were similar for the treatment and the control group. The baseline levels for both the treatment and control groups are shown in Table III.

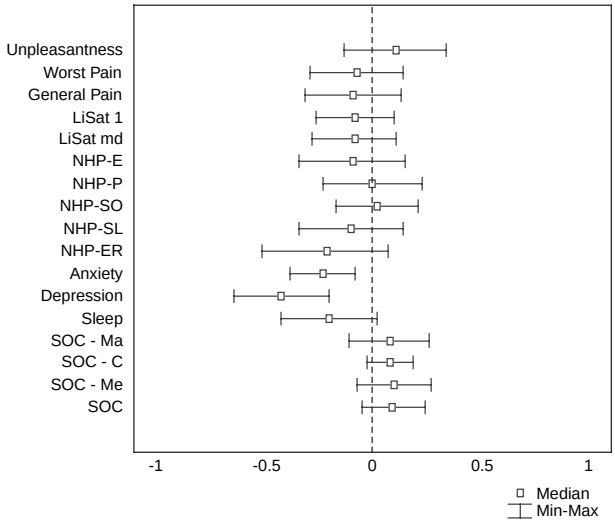

Fig. 1. Treatment group. Systematic changes from baseline to 12 months after the last treatment session, presented with the 95% confidence intervals for the relative change in position (RP). NHP = Nottingham Health Profile; ER = emotional reaction; SL = sleep; E = energy; P = pain; SO = social orientation; LiSat = life satisfaction; LiSat 1 = life satisfaction variable no 1; md = median; SOC = sense of coherence; Ma = manageability; Me = meaningfulness; C = comprehensibility.

Pharmacological treatment

At baseline, 93% of the patients in the treatment group ($n = 25$) used 1 or more analgesics for pain relief: 21 used opiates, 9 TCAs, 8 anti-convulsants, 7 non-steroidal anti-inflammatory drugs (NSAIDs) and 4 baclofen. The use in the control group was less. Seven (64%) used 1 or more drugs; 3 used opiates, 1 TCA, 2 anti-convulsants, 3 NSAIDs and 2 baclofen. At the 12-month evaluation the number of patients using analgesics had decreased to 21 (78%) in the treatment group. In the control group, the number of patients using analgesics was unchanged. The type and number of drugs used were unchanged in the 2 groups.

Consumption of healthcare resources

The median number of visits to healthcare personnel at the spinal unit decreased from 15 to 5 ($p = 0.03$) in the treatment group between the 2 assessment periods (see Methods). The median number of visits to physicians also decreased significantly from 3 to 1 ($p = 0.03$). In the control group, the number of visits to healthcare personnel decreased from 4 to 1 ($p = 0.06$) and the number of visits to physicians from 2 to 0 ($p = 0.02$).

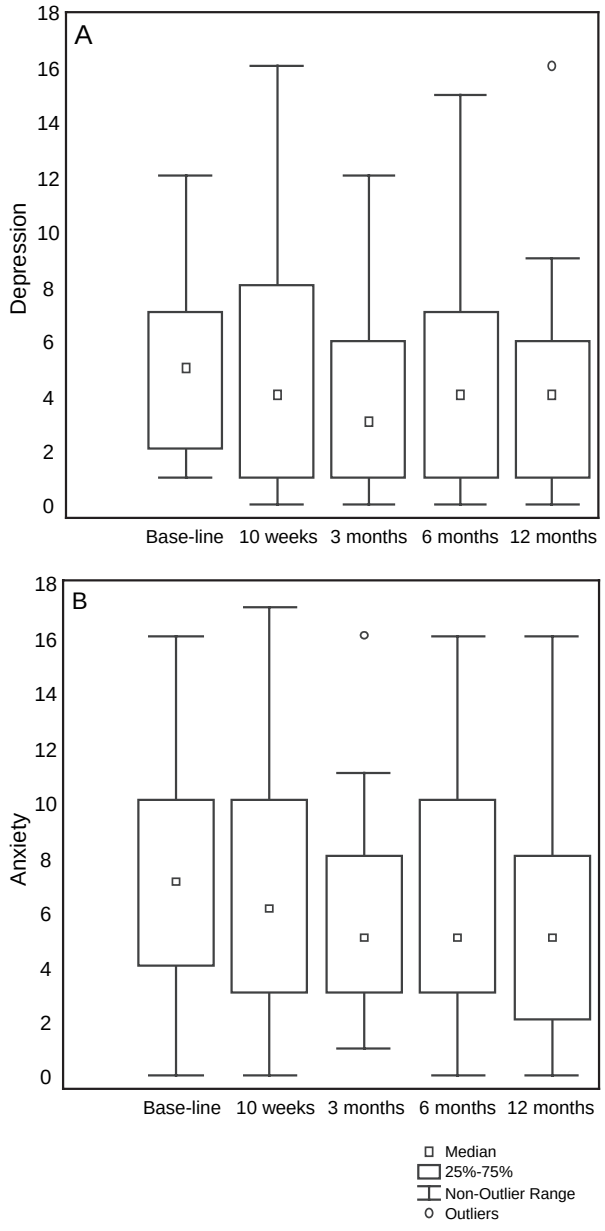

Fig. 2. Box plots of sum scores for (A) anxiety and (B) depression at baseline; after 10 weeks of treatment; and 3, 6 and 12 months after the last treatment session.

Comments from the 12-month evaluation and the semi-structured interviews

Patients were at the 12-month evaluation asked additional evaluating questions in writing. Nine patients (33%) reported that the pain management programme had influenced their pain perception, 10 patients (37%) that their perceived health and QoL was affected, and 13 patients (48%) that their coping with pain had improved.

In the semi-structured interviews, patients were asked what they benefited from the most in the pain management programme, and the 2 most common statements were "to meet others in the same situation" and "to receive increased knowledge about pain mechanisms".

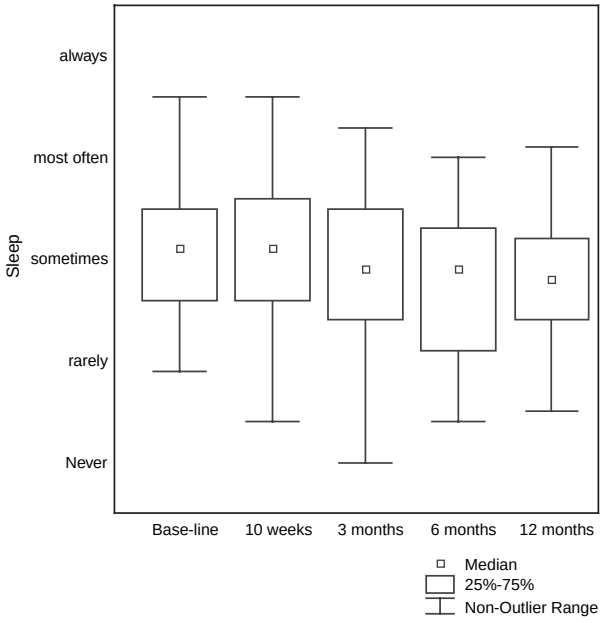

Fig. 3. Box plots of sleep ratings at baseline; after 10 weeks of treatment; and 3, 6 and 12 months after the last treatment session.

Patient satisfaction

At the 10-week evaluation, patients rated overall satisfaction and satisfaction with the 4 programme parts separately. Patients were generally very satisfied with the pain management programme (Table IV). The attendance rate was almost 90%.

Table II. *Summary of Sign test results for pain, sleep, Nottingham Health Profile (NHP), anxiety, depression, life satisfaction and sense of coherence (SOC)*

Factor	No. of non-ties	*p*-level
SOC	25	0.23
SOC – Me	23	0.21
SOC – C	25	0.23
SOC – Ma	25	1.00
Depression	20	0.50
Sleep	24	0.54
Anxiety	20	0.12
NHP-E	17	1.00
NHP-P	20	0.82
NHP-SO	11	0.07
NHP-SL	21	0.19
NHP-ER	20	0.01
LiSat md	18	0.81
LiSat 1	11	1.00
General pain	13	1.00
Worst pain	19	0.65
Unpleasantness	14	0.79

ER = emotional reaction; SL = sleep; E = energy; P = pain; SO = social orientation; LiSat = life satisfaction; LiSat 1 = life satisfaction variable no 1; md = median; Ma = manageability; Me = meaningfulness; C = comprehensibility.

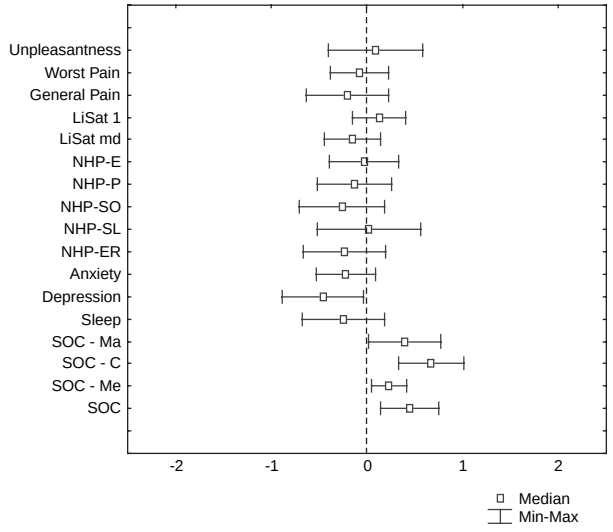

Fig. 4. Treatment group vs controls. Differences between the treatment and control regimens in values of the relative change in position ($RP_{Difference} = RP_{Treatment} - RP_{Control}$) for the change from baseline to 12-month follow-up (95% confidence intervals for the differences in RP are shown). NHP = Nottingham Health Profile; ER = emotional reaction; SL = sleep; E = energy; P = pain; SO = social orientation; LiSat = life satisfaction; LiSat 1 = life satisfaction variable no 1; md = median; SOC = sense of coherence; Ma = manageability; Me = meaningfulness; C = comprehensibility.

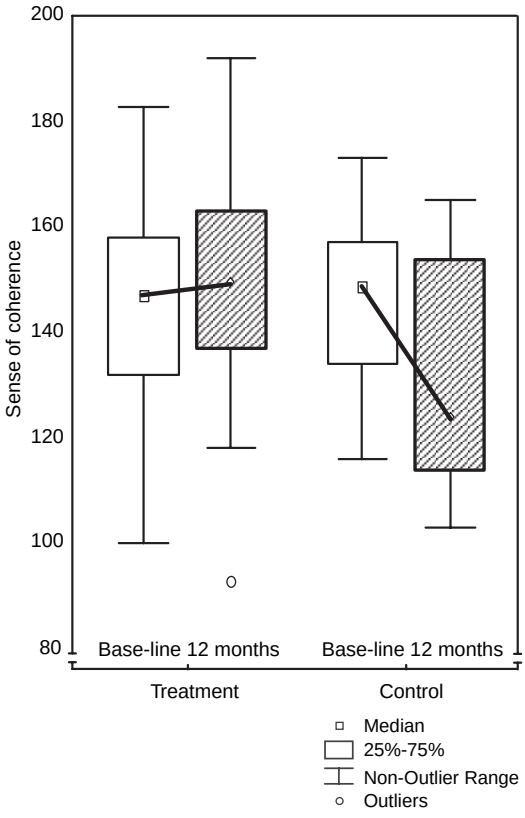

Fig. 5. Box plot for levels of sense of coherence (SOC) in the treatment and control groups measured at baseline and 12 months after the last treatment session.

Eighteen (67%) patients reported that the programme would affect their future perception of pain, 5 (18%) had the opposite opinion, and 4 (15%) were uncertain. All patients stated that they would recommend the programme to others. Most patients thought the length of each session (89%) as well as the length of the total programme (96%) was adequate.

DISCUSSION

Neuropathic pain following an SCI is difficult to treat, and of the few controlled studies in the literature that evaluate pharmacological and non-pharmacological treatment, only some seem helpful. The results of this study suggest that a multidisciplinary pain management programme can be of value for improving mood and quality of sleep in patients with SCI and neuropathic pain.

An important limitation of the study was that, due to the limited availability of patients, it was not randomized. This influences the interpretation of the results. We cannot be sure that the results seen in our study were due to the pain management programme itself. The effects could also be related to therapist attention or increased expectancy produced by participation in a clinical trial. The results obtained were, however, measured at the 12-month follow-up indicating that they were not due to placebo alone. Effects of CBT programmes have been shown to be both short- and long-term (27) in previous studies. We do not believe that the results are due to the effects of time, since patients in our study had suffered from pain for more than 6 months and pain due to SCI rarely improves over time, rather the contrary (28).

Behavioural-oriented programmes have previously reported improvements in levels of anxiety and depression in SCI populations (13, 14). In our study on patients with SCI and neuropathic pain, these parameters also decreased over time. Anxiety and depression have been seen to be correlated with chronic pain in reviews on mood and pain (29, 30). The prevalence of affective disorders is higher in chronic pain patients than in the general population and high pain intensity is a predictor of anxiety (30). It is also common for anxiety and depression to coexist. Anxiety has been found to be associated with a lower quality of sleep (30, 31), as has depression (31, 32). In recent studies on SCI-related pain, impaired mood was found to be predictive for poor quality of sleep (2) and lower levels of life satisfaction (Norrbrink Budh and Österåkerl, Life satisfaction in individuals with spinal cord injury and pain. Submitted). Therefore, lowering a patient's levels of anxiety and depression can be as important as reducing the pain intensity itself. It is tempting to suggest that the improvement in sleep quality was related to the improvements in mood. Even though anxiety and depression was found to be predictive for low levels of *life satisfaction* (Life Satisfaction item no. 1 – life as a whole) in one of our previous studies, the improvements in mood did not affect the scores of global life satisfaction or health-related QoL in this study.

Table III. *Baseline values in the treatment and the control groups for pain, sleep, the Nottingham Health Profile (NHP), anxiety, depression, life satisfaction, sense of coherence (SOC) and the Pain Matcher*

	Treatment			Control		
	n	Median	Range	*n*	Median	Range
General pain	27	5	(3–10)	11	3	(2–5)
Mildest pain	27	3	(0–8)	11	2	(0–5)
Worst pain	27	9	(5–15)	11	7	(3–10)
Unpleasantness	27	6	(3–10)	11	4	(1–10)
Sleep	27	3	(1.9–4.6)	11	2	(1.8–3.7)
NHP	27	40	(11.7–86.8)	10	25	(11.2–50.0)
NHP – ER	27	9	(0–13.4)	11	8	(0–12.7)
NHP – SL	27	19	(0–22.6)	11	17	(0–22.6)
NHP – EN	27	32	(0–38.1)	11	33	(0–39.4)
NHP – P	27	13	(11.1–17.1)	11	13	(9.8–17.1)
NHP – SO	27	0	(0–25.1)	11	0	(0–24.2)
Anxiety	27	7	(0–16)	11	4	(0–13)
Depression	27	5	(1–12)	11	3	(1–11)
LiSat 1	27	4	(1–6)	11	4	(2–6)
LiSat md	27	5	(1–6)	11	4	(3–5)
SOC	27	147	(100–183)	11	149	(116–173)
SOC – Ma	27	49	(21–65)	11	53	(47–67)
SOC – Me	27	43	(26–56)	11	42	(24–55)
SOC – C	27	55	(32–66)	11	52	(44–64)
Pain Matcher	25	16	(8–39)	–	–	–

ER = emotional reaction; SL = sleep; EN = energy; P = pain; SO = social orientation; LiSat = life satisfaction; LiSat 1 = life satisfaction variable no 1; md = median; Ma = manageability; Me = meaningfulness; C = comprehensibility.

The pain management programme did not help reduce pain intensities in our study, as was found in the review on behavioural treatment for chronic low back pain by Ostelo and colleagues (8). The aim of treating pain patients with cognitive behavioural therapy is not primarily to lower the intensity of pain, even though this may be a secondary effect (33). Anxiety and pain activate, in part, the same neural circuits in the brain (30) and therefore a reduction in pain intensity would have been plausible since levels of anxiety decreased. Pain and depression are often related, but it has been suggested that reduced pain intensity will have a greater effect on depression than reduced depression will have on pain intensity (34).

SOC ratings in the treatment group improved compared with the control group. Although the actual increase (median value) in the treatment group was weak (from 147, range 115–183, to 149.5, range 93–192) it was significantly different from that in the control group where the ratings decreased (from 149, range 116–173, to 124, range 103–165). It is not likely that our findings are due to a type I error since the decrease was obvious in the total score as well as in all 3 sub-domains. It is, however, difficult to explain why the control group ratings of SOC decreased when all other parameters were stable in this group. According to Antonovsky (35), who created the instrument, SOC scores are hypothesized to be stable after young adulthood, but in our study, scores for 10 of the 11 patients in the control group decreased. This may highlight the difficulties in living and coping with severe neuropathic pain. It has been argued that SOC scores are associated with levels of anxiety and depression (35, 36), and strong correlations were also found in this study between anxiety and depression and SOC scores, both at admittance (baseline) and at the 12-month evaluation (anxiety and SOC – $r_s = -0.58$ and $r_s = -0.87$, respectively; depression and SOC – $r_s = -0.67$ and $r_s = -0.71$, respectively).

Table IV. *Patient satisfaction rated on a visual analogue scale (0–100). Patient rated their overall satisfaction with the programme as well as with each class. Patients also rated whether the programme fulfilled their expectations of the programme. Results are presented as median values, interquartile ranges (IQR), and ranges*

	n	Median	IQR	Range
Overall satisfaction	28	86	78.5; 97	71–100
Education	28	95	84; 98	0–100
CBT	28	92	84; 99.5	61–100
Relaxation & stretching	27	94	67; 100	30–100
Body awareness	27	66	41; 91	0–100
Expectations	28	83	74; 97.5	42–100

CBT = cognitive behavioural therapy.

We used the sign test to compare the results of the new rank-invariant method for detecting systematic changes over time. That the rank-invariant method was superior to the sign test was revealed in the results of anxiety and depression, where changes were statistically significant by the rank-invariant method but not with the sign test. This was also indicated by the SOC and the sleep questionnaire, where the 95% CIs for the changes within the treatment regimens clearly indicated systematic changes over time, while the sign test did not.

We also evaluated the use of the healthcare system and found that the demand for care at the spinal unit by patients in the treatment group ($n = 20$) substantially decreased, as did the demand for care by those in the control group, but they were

entering the study at lower levels of healthcare use. It is possible that the reductions in use of the healthcare system by both groups can be attributed to the extra care given. Differences in baseline levels could also have affected the outcome. A reduction in the total number of visits from 15 to 5 in the treatment group vs from 4 to 1 in the control group might be of larger clinical and health-economical importance. This warrants further assessment.

In a study by Evans and colleagues on neuropathic pain (10), the effects of CBT versus supportive psychotherapy were assessed in a single-discipline setting. Both groups improved regarding pain, but patients in the CBT group improved in more subdomains. However, compliancy amongst the patients was weak, and almost 50% dropped out during the treatment period. The compliance in our treatment group was much higher. None of our patients dropped out from the treatment programme, and the high attendance strongly suggests that the patients experienced the programme as being meaningful. This was supported by the high scores of satisfaction with the programme. One patient expressed her experience as follows: "Before, I was sitting in the back seat of the car with pain as a driver; now I have moved to the front seat and although pain is right beside me (in the passenger seat), *I* am the driver".

The patients in our study were all out-patients travelling to and from the spinal unit. Since patients registered at the unit live within commuting distance, this was not a problem. Williams et al. (37) found in their study on behavioural treatment that results improved when patients were treated on an in-patient basis. In their in-patient programme, however, patients received longer and more intensive treatment than did out-patients. After completing our study, the design of our pain management programme was changed to one of more intensive character; 5 days a week (for both in- and out-patients), to attract patients from other parts of the country.

Farrar (37) concluded that "the most important clinical intervention neurologists can offer neuropathic pain patients is empathy, hope and ongoing support. The importance of this cannot be overstated." We strongly support this conclusion and suggest that patients with SCI and neuropathic pain can benefit from a multidisciplinary pain management programme.

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