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Positive effects of a Musculoskeletal Pain Rehabilitation Program Regardless of Pain Duration or Diagnosis

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Short title: Predictors of outcome one year after a musculoskeletal pain rehabilitation program

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ABSTRACT

Objectives: To investigate how socio-demographic and clinical factors were associated with psychosocial functioning and disability at admission and at a 1-year follow-up.

Design: A cohort pre-post study.

Setting: A University hospital specialized pain rehabilitation unit.

Participants: Five hundred and nine participants with musculoskeletal pain (neck disorders 29%, fibromyalgia 24%, low back pain 24%, myalgia 14% and other pain diagnoses 8%).

Intervention: A 5-week outpatient, group-based, and goal-oriented comprehensive musculoskeletal interdisciplinary pain rehabilitation program based on cognitive behavioral principles.

Main outcome measures: The Multidimensional Pain Inventory (MPI), the Disability Rating Index (DRI), and forms including socio-demographic (sex, age, ethnicity, marital status, educational level and vocational situation) and clinical factors (pain duration and pain diagnoses). Data were analyzed with multivariate logistic regression.

Results: At admission, factors associated with more positive scores on the MPI were being older than 40 years, being at work, being Nordic born, attainment of a higher educational level and a diagnosis of fibromyalgia (compared with a neck disorder) ($P < .05$). Being at work and a diagnosis of fibromyalgia (compared with low back pain) were associated with more positive scores on the DRI ($P < .05$). On the basis of cut points for clinically important change on the MPI, participants rated themselves as most improved on the Affective Distress (52%), Life Control (49%) and Pain Severity (43%) subscales, and on the DRI index improvement rate was 22%. At the 1-year follow-up, neither socio-demographic nor clinical factors were associated with clinically important improvements of the MPI and the DRI, but lower age was related to deteriorations on pain severity.

Conclusions: The lack of an association between socio-demographic and clinical factors and psychosocial functioning and disability at a 1-year follow-up after a musculoskeletal pain rehabilitation program suggests that the program was effective regardless of the participants' initial characteristics, except for age. The changes at the 1-year follow-up indicate that the program influenced the participants' psychosocial functioning more than their perception of disability.

Key words: Demography, disability evaluation, pain, pain clinics, rehabilitation, pain measurement

INTRODUCTION

Approximately 15% of the U.S. population suffers from chronic pain (1), whereas 19% of adults in Europe report moderate-to-severe chronic pain (2), and the prevalence is increasing Americans (3). We have reason to believe that the prevalence for Europeans is similarly increasing, but we have not found resent studies that address this. In 2 recent reviews, researcers stated that reduced quality of life and large economic societal costs are common pain consequences of pain (4), and that structured pain rehabilitation programs lead to improved return-to-work rates (5). In 2009, musculoskeletal problems accounted for 31.2 % of the costs for sick leave in Sweden (6), which is a strong motivator in the search for effective treatment and rehabilitation.

The complexity of pain is illustrated by the many factorsnoted to influence its onset and maintenance. Women seem to be at greater risk than men for developing chronic pain (7), and age, ethnicity, education, previous pain conditions and marital status are other reported risk factors (4, 8-12). Although the evidene for risk factors is inconsistent, socio-demographic and psychosocial factors are important for the understanding of pain-related disability (13-15).

The consequences of chronic pain are often described in terms of psychosocial functioning and disability (4, 16-18). The concept of pain-related psychosocial functioning involves social, psychological and behavioral issues and includes distinct affective dimensions of pain (15). Disability includes impairments, activity limitations and participation restrictions (19). Because of the complexity of chronic pain, rehabilitation programs often are interdisciplinary and include mixed medical interventions.

For the most part, interdisciplinary rehabilitation programs based on cognitive behavioral principles have shown to be effective (20-22). However, some authors recently reported that the evidence should be further analyzed (5, 23). Generally, broad and coordinated pain programs have been found to influence disability, pain severity, and psychosocial functioning in a positive direction (4, 24-26) and leads to increased back to work rates (24, 25, 27).

Interest is growing in the specification of core outcome domains after pain rehabilitation (17, 28), including psychosocial functioning and disability, and factors associated with outcomes are widely discussed. Predictors of outcome generally are studied just once, are chosen from multiple domains (i.e., socio-demographic, physical, and psychological), and often are not combined. No generic set of outcome predictors after interdisciplinary pain rehabilitation has been found (29). When studied one by one, the associations between gender, age, ethnicity, education and outcome vary, and the evidence is conflicting (30-33). Practitioners therefore have identified the need for increased knowledge of the associations between pain diagnoses, patients' characteristics and effectiveness of treatments (34). Studies are needed that focus on both treatment outcomes and patient variables and that identify which subgroups benefit the most from multidisciplinary treatments (21).

To address those issues, the aims of this study were 2-fold, that is, to investigate i) how socio-demographic and clinical factors were associated with psychosocial functioning and disability at admission to a musculoskeletal pain rehabilitation program, and ii) how socio-demographic and clinical factors were associated with changes in psychosocial functioning and disability from admission to a 1-year follow-up after participation in a musculoskeletal pain rehabilitation program. Our hypotheses were that several clinical and socio-demographic variables influence pain-related consequences and that outcome after pain rehabilitation differs for women and men.

MATERIAL AND METHODS

Settings and participants

All participants in this study had taken part in a 5-week (5 days per week, 6 hours per day) outpatient, group-based (9 participants per group) and goal-oriented comprehensive musculoskeletal interdisciplinary pain rehabilitation program based on cognitive behavioral principles. The program was offered at a specialized pain rehabilitation unit in a Swedish University Hospital. The department is accredited by the Commission of Accreditation of Rehabilitation Facilities, and as part of the accreditation, different measurements are administered at admission, at discharge and at a 1-year follow-up and registered in a database. Patients referred to the pain program from 2003 to 2008 were included, and data were retrieved from the database. Most patients were referred from primary health care sources.

Inclusion criteria for the rehabilitation program were as follows: a completed medical examination and screening by a pain rehabilitation team, the presence of chronic pain with a significant impact on everyday life, an age of 18 to 65 years, fluency in Swedish, and the ability to participate in a group. Exclusion criteria were ongoing substance abuse and an acute psychological or psychiatric disorder. According to these criteria, 813 patients were eligible for the study and 509 could be included (Figure 1). Reasons for dropout were missing data at admission because patients refused to fill in forms or incompletely or incorrectly filled in forms, and at the 1-year follow-up because of missing items or the failure of patients to return their forms, despite one reminder.

Figure 1 about here

Participant characteristics

The characteristics of the 509 participants are presented in Table 1. They were mostly women (79%), had a mean age of 40 years, were mostly Nordic born (86%), had an educational level of upper secondary school (62%) and were on full time sick leave from work (64%) before admission. The 3 most frequent pain diagnoses were neck disorders (29%), fibromyalgia (24%) and low back pain (24%). Diagnoses that occurred less frequently were headache or shoulder pain; these diagnoses were grouped together and are referred to as “other diagnoses” (8%).

Table 1 about here

Ethics

The principles of the Declaration of Helsinki were followed, and the study was approved by the Regional Ethical Review Board in Lund, Sweden (No H4 269/2006).

Assessments and outcome measures

All forms and outcome measurements also were reported to the Swedish Quality Registry for Pain Rehabilitation database (35). At admission, forms were used, including socio-demographic factors (gender, age, ethnicity, marital status, educational level and vocational situation) and clinical factors (pain duration and pain diagnoses). Duration of pain was filled in by the participants, and the attending physicians made pain diagnoses according to the *International Classification of Diseases*, 10th revision, and the diagnostic manual of the Swedish Quality Registry for Pain registry. To assess psychosocial functioning and disability the West-Haven Multidimensional Pain Inventory (MPI) [36] and the Disability Rating Index (DRI) [16] were used.

MPI

The MPI is a self-rating questionnaire used to assess psychosocial and behavioral functioning (36). Part one covers specific aspects related to the perception of pain and pain-related consequences with 5 subscales: Pain Severity, Life Interference, Life Control, Affective Distress and Social support. Part two includes 3 subscales covering patients' assessments of behavioral responses to their displays of pain by significant others. Part three assesses the frequency of participation in daily occupations with 4 subscales: household chores, outdoor work, activities away from home, and social activities, which usually are combined to an index of general activity (37, 38). The MPI consists of 61 items and each item ranges from 0 (never) to 6 (very often). The reliability of the MPI has been found to be satisfactory, with alpha values from 0.70 - 0.90, and stable over time, with stability coefficients from 0.62 - 0.91 (36).

A Swedish translation (35) of the original English version (38) was used. The overall reliability and stability of the Swedish version has been shown to be good, except for the 4 subscales of part three, where the authors suggested using only the index for general activity (39). The MPI has been found to be sensitive to change (40, 41). The first 4 subscales of part one (pain severity, life interference, life control and affective distress) and the general activity index were used in this study. The fifth subscale of part one (social support) and the entire part two of the MPI were not used. The validity of the social support subscale has been questioned (42), and part two measures support from significant others, which was not a focus of this study. The MPI was sent home with subjects, and they returned it by mail before admission. At discharge it was administered by a psychologist (data used only for dropout analysis in the present study), and at the 1-year follow-up it was again administered as a mail questionnaire. A reminder to return the form was sent after 1 month.

DRI

The DRI is a self-administered questionnaire in which patients indicate their perceived ability to perform 12 daily physical activities on visual analogue scales ranging from 0 mm (without difficulty) to 100 mm (not possible). The items are arranged in increasing order of physical demand with reference to low back pain. The total sum score ranges from 0 to 1200 mm. The DRI is a robust and useful clinical and research instrument to assess disability caused by impairments of common motor functions and to measure changes in functional status (16, 43). It has been shown to be reliable, with test-retest correlations of 0.83 - 0.95, intrarater reproducibility of 0.98 and internal consistency of the scale of 0.84 (Cronbach α). Construct validity has also been found to be good (16). The sum score on the DRI subscales was used in this study. The DRI was administrated in the same way as the MPI.

Rehabilitation program

The program was based on cognitive behavioral principles. It included education about pain and its consequences, with a focus on self-management strategies. The interdisciplinary teams comprised a physician, an occupational therapist, a physiotherapist, a psychologist and a social worker. All team members had lengthy experience with teamwork and pain rehabilitation, including knowledge of each discipline’s tools and cognitive behavioral therapy techniques. Other health-care professionals (eg. nurses and a psychotherapist) assisted the teams and the participants during the program.

After the initial team assessment, when consensus was reached between the eligible patient and the team regarding the need for structured interdisciplinary pain rehabilitation, the patient was recommended to participate in the program. Before admission, the participants received information about the program and goal-setting. The program lasted for 21 days, plus 2 days of follow-up at 2 months after discharge. During the first week, each participant defined his or her individual goals, and an individual rehabilitation plan was formulated. The program covered several areas aiming at increasing the participants' strategies for pain management, activity level and participation in society. The interventions consisted of a number of interventions: lectures, group discussions and practical training, lasting from ½ - 1½ hour. The first and last week included individual meetings with each participant. All other interventions were group-based (9 participants). The practical training with occupational therapists and some physiotherapist interventions were performed in smaller groups (4 or 5 participants). The lectures concerned pain physiology, medication, stress (a topic covered by physicians), body anatomy (a topic covered by the physiotherapist), socioeconomic issues (a topic covered by the social worker), ergonomics and time-use adaptations (a topic covered by the occupational therapist).

The psychologists were responsible for group discussions focused on cognitive evaluations, communication training, behavioral home-tasks, and stress management skills. The physiotherapists were responsible for body awareness, relaxation, warm-water pool and physical exercises, and the occupational therapists were responsible for occupational performance in everyday activities, problem-solving strategies relevant to compensatory strategies, and analyzing and discussing everyday occupations to enhance or adjust performance.

Electromyography biofeedback training was used to enhance muscle-relaxation techniques and to improve occupational performance. When appropriate, visits were made to the participant's workplace to analyze occupational behavior and the working conditions on site, in collaboration with the participant, the employer and the occupational health department. Significant others were invited for half a day to participate in education and discussions about relevant issues (the whole team was involved in these sessions). After the practical training sessions the participants were encouraged to write down strategies they had used so they could apply their learned skills to the next sessions. The percentage of time for each part of the 5-week program was 55% in physiotherapy and occupational therapy interventions, 10% lectures and 20% group discussions lead by the psychologists, and 15% when the entire team was involved together with the participants in meetings, rehabilitation planning, discussions and information, and team-based lectures.

Each team had weekly assessments and planning meetings. At the final team meeting, a discharge plan was written for each participant. Various key persons were invited to participate, such as significant others, representatives from the social insurance authority and employers. The discharge plan included recommendations for further strategies to improve the participants' activity level and participation in society. Progress and unsuccessful events were re-evaluated during the 2-day follow-up meeting, 8 weeks after discharge.

Dropout analysis

No significant differences were found between the participants (n = 509) and the non-participants (n = 304) regarding socio-demographic factors, pain duration or pain diagnoses, or at discharge between the participants and the nonparticipants with regard to change scores on the MPI and the DRI index.

Statistics

The Mann-Whitney *U*-test, the Independent *t*-test and the Kruskal-Wallis test were used to analyze independent variables. The Wilcoxon's test was used to analyze dependent variables. The effect size for change scores (from admission to the 1-year follow-up) was analyzed; 0.2 was considered small, 0.5 was considered medium, and 0.8 was considered large (44). The reliability of the scales within this sample was measured with Cronbach α. The reliability of the MPI was α 0.8 (part one) and α 0.8 (part three), and for the DRI the α was 0.9; satisfactory is regarded as between 0.7-0.9 (45).

On the MPI a minimal important change (MIC), which assessed the least change needed for clinical importance, has been defined as at least 0.6 points (28). For changes in the DRI, we found no MIC values reported in the literature. Therefore, after analysis of different change scores in the DRI, changes larger than 10% were considered as MIC. The MIC levels were used to dichotomize groups for both improvement and deterioration in the MPI and the DRI. The limits for deteriorated group were set for change scores less than -0.6 on the MPI and less than –10% on the DRI.

Univariate and multivariate analyses were performed whith logistic regression (enter method). The Nagelkerke test and the Hosmer - Lemeshow test (for which a good fit is $P > .05$) were used to test the estimate for fit. To define predictor variables used for the multivariate analyses, a *P* value smaller than .3 in the univariate analyses was set as limit. In the logistic regression analyses, socio-demographic and clinical factors were used as predictor variables. Scores at admission and change scores of the MPI and DRI subscales were used as criterion variables. For dichotomizing the criterion variables, the median score at admission and the MIC score for change scores was used. Associations for both improvements and deteriorations were calculated. Participants were grouped into socio-demographic and clinical subgroups as defined in Table I, and age and pain duration were dichotomized above or below the mean versus the median score. Educational level included 3 groups; the zero level was set for secondary school. The diagnoses included 5 groups, and the zero level was set for a diagnosis of fibromyalgia. All predictor variables used in the logistic regression were tested for multicollinearity. The SPSS for Windows version 17.0 was used for all statistical analyses. A *P*-value that was smaller than .05 was considered as significant.

RESULTS

Associations at Admission

The medians on the 5 subscales of the MPI varied between 2.4 and 4.8 (Table 2). The participants described themselves as most affected on the subscales of Life Interference and Pain severity.

Table 2 about here

Table 3 addresses the univariate analyses, testing how socio-demographic and clinical factors were associated with psychosocial functioning and disability. The socio-demographic and clinical factors with a *P*-value of less than 0.3 were entered in the multivariate regression analyses (Table 4). Median scores and interquartile range at admission are described for the interpretation of odds ratios (Table 4). The Hosmer and Lemeshow index was greater than 0.05 in all analyses. Participants with higher levels of education, those who were currently working upon admission to the rehabilitation program, and those who were Nordic born were significantly more likely to have scores above the median on several of the MPI subscales.

On a group level, the diagnoses were not significantly associated with scores of the MPI or the DRI index at admission. However, when looking at diagnoses per se, participants with fibromyalgia versus neck disorder were significantly more likely to have scores above the median on the MPI subscale General Activity Index. A strong association was present ($P < 0.001$), indicating that participants with a university education were more likely to have lower scores on the MPI subscale of Pain Severity (odds ratio 5.3, 95% confidence interval 2.8-10.1). Participants who were currently working upon admission to the program and participants with fibromyalgia versus low back pain were more likely to have scores in positive direction on the DRI index (Table 4).

Table 3 about here

Table 4 about here

Associations at 1-Year Follow-Up

The effect sizes for changes on the MPI subscales Pain Severity (effect size of 0.5), Affective Distress (effect size of 0.5) and Life Control (effect size of 0.6) were medium, whereas the effect sizes for the MPI subscales of Life Interference (effect size of 0.3) and General Activity Level (effect size 0.2) and for the DRI index (effect size of 0.1) were small.

The change scores of the 5 subscales of the MPI and of the DRI index at the 1-year follow-up are presented in Table 5. Significant changes between admission and 1-year follow-up were found on all subscales. Most changes on the 5 MPI subscales were in a positive direction, whereas the change on the DRI index was mostly in a negative direction. The greatest proportion of improved change scores were found on the MPI subscales (above the MIC); Affective Distress (52%), Life Control (49%) and Pain Severity (43%), while only 21% improved on the DRI index.

Table 5 about here

The univariate logistic analyses revealed no significant associations between socio-demographic and clinical factors and group category based on a positive versus negative MIC on the MPI subscales and the DRI index, with the exception that age-groups had a significant association ($P = 0.038$) with belonging to the group with a negative MIC on Pain Severity (Table 6). A multivariate analysis testing for associations with improvements and deteriorations was then conducted using the variables with a significance value of $P <$

0.3. No significant association was found for changes on any of the MPI subscales or on the DRI index.

Table 6 about here

DISCUSSION

Our main objectives were to investigate how socio-demographic and clinical factors were associated with psychosocial functioning and disability at admission and at a 1-year follow-up after participation in a musculoskeletal pain rehabilitation program. At admission to the program, age greater than 40 years, being at work, being Nordic born, and attainment of a greater educational level were associated with scores on the MPI in a positive direction, and having a neck disorder (compared with a fibromyalgia diagnosis) was associated with scores in a negative direction ($P < .05$). Being engaged in work and having a diagnosis of fibromyalgia (versus low back pain) were associated with scores in a positive direction on the DRI index. On the based of MIC, 52% of the participants were improved on the MPI Affective Distress subscale, 49% were improved on the Life Control subscale, and 43% were improved on the Pain Severity subscale. Only 30% improved above MIC on the Life Interference subscale, 24% on the General Activity Index, and 21% on the DRI index. At the 1-year follow-up, no variable was associated with a positive MIC of the MPI and the DRI index. Age-group was the only variable associated with change scores (deterioration). Younger participants (ie, younger than 40 years) had increased risk for deterioration on the MPI Pain Severity subscale.

Nordic born participants reported better psychosocial functioning than did non-Nordic born participants on all 5 subscales of the MPI. Several authors have shown that minority groups are more negatively affected than majority groups with regard to the impact of a pain condition (31, 46-49). However, the more negative scores of non-Nordic born participants should be interpreted with some caution because they could conceal differences in how different ethnic groups report health and pain. To the best of our knowledge, the MPI or the DRI have not been inter-culturally validated and therefore may not fully answer these questions. Despite this situation, ethnicity was the individual variable with strongest associations with the MPI scores.

Participants who were currently working upon admission reported better life control, less affective distress and Interference in everyday life, and less disability (DRI) than did participants on sick-leave. Associations between work and health in Western societies are well-documented (9, 50, 51). To be on sick-leave leads to inactivity, less control over life, and lower social status (52), which are likely to have negative effects on both psychosocial functioning and health. Also, the reversed is possible; that is, having better psychosocial function leads to a better ability to manage work.

Participants with higher educational levels reported less pain and affective distress and more life control than those with lower levels of education. Educational level has been linked to higher social status, which in turn has a clear impact on health (52). With regard to persons with chronic pain, the evidence is not conclusive. To the best of our knowledge, the strong significant association ($P < 0.001$) between educational level and scores on the subscales of the MPI in the present study has not been reported previously. This result indicates that in a clinical practice, the link between social status and health (52) might take the shape of a limit between educational level (social status) and better psychological functioning (health).

Very few associations between diagnoses and functioning were found (only 2 subscales). Participants with a neck disorder had a lower activity level as compared to those with a diagnosis of fibromyalgia. Participants with low back pain disorders scored as more disabled than did participants with fibromyalgia. The general lack of importance regarding diagnosis for psychosocial functioning supports the general (and clinically accepted) contention that the emphasis should be on the consequences of the pain rather than on diagnosis (28). However, diagnoses seem to influence disability and activity levels.

Age was associated with affective distress; older participants reported less affective distress than did the younger ones. Associations between age and chronic pain are documented in the literature (4, 10, 11). Mostly, the prevalence of chronic pain has been found to increase with age, but the opposite has been reported (4). Younger participants might be more emotionally disrupted by pain than older ones, perhaps because health-related problems are less expected by younger people.

Neither socio-demographic nor clinical characteristics seemed to affect outcomes, besides age, having some relevance for patient deteriorations. This is in agreement with other investigators who have shown that socio-demographic factors cannot predict change after the completion of pain rehabilitation programs (29). However, the results are far from conclusive. Improvements should perhaps be measured more individually because tertiary pain rehabilitation programs mostly focus on the participants' individual rehabilitation plans, needs and resources.

A main finding in our study was that improvements were rather found in psychosocial functioning rather than in behavioral functioning or disability (the MPI subscales of Life Interference and Activity Level and the DRI). Lack of improvements on the DRI index has also been reported previously (53), raising concerns about whether programs are focusing enough on promoting activity level and occupational functioning.

Another of our major findings was reduced pain severity among the participants. Pain is a complex experience involving emotional, cognitive and sensory elements. The pain levels of patients with chronic pain are not static, and as a result psychosocial functioning and disability can be intertwined with and vary with the pain. Measures that describe individuals by "snapshots" can be misleading (54). Minimal important change set at 0.6 on the MPI subscales is, however, arbitrarily based on the scale's standard deviation (28). The clinical importance of the magnitude of the effect sizes is debated, and the change necessary to meet the individual participant's needs is not known (55).

Limitations

The limitations of this study include the measurements, the design and the dropout rate. The goal-oriented and individualized rehabilitation plan used in the program was possibly not captured by the instruments used. Most of the pre-defined activity items in the MPI index of General Activity Level and in the DRI index were probably relevant for all participants, but some might not be relevant for all. In addition, measures may exclude relevant activities and are not necessarily validated as meaningful to assess patient's individual judgments on recovery (56).

The absence of a control group and comparative treatment means that we cannot conclude that the observed outcomes were the result of the actual intervention. Using waiting list control subjects, which would have been an alternative, was not feasible because all patients must be offered adequate medical interventions within 2 months according to Swedish legislations. Besides, waiting list control subjects are not without problems because patients waiting for treatments can be seeking health care elsewhere.

The participants were unselected, constituting a heterogenic group, which somewhat limits the generalization of the results. This unselected status also could be a strength, because the participants are representative of those being treated at tertiary pain centers.

Dropouts can be a source of uncertainty. However, no differences existed between the dropouts and the participants at the 1-year follow-up, nor were any differences found between the participants and the non-participants with regard to change scores on the MPI and the DRI index at discharge.

CONCLUSIONS

A musculoskeletal interdisciplinary pain rehabilitation program can lead to positive changes. The changes at the 1-year follow-up indicated that psychosocial functioning improved more than disability. People that are more disabled at admission may need a stronger focus on increased activity level during the program. Finally, the effect of the pain rehabilitation was not prejudiced by pain duration or pain diagnoses, and the program seemed to be effective regardless of the participants' initial status.

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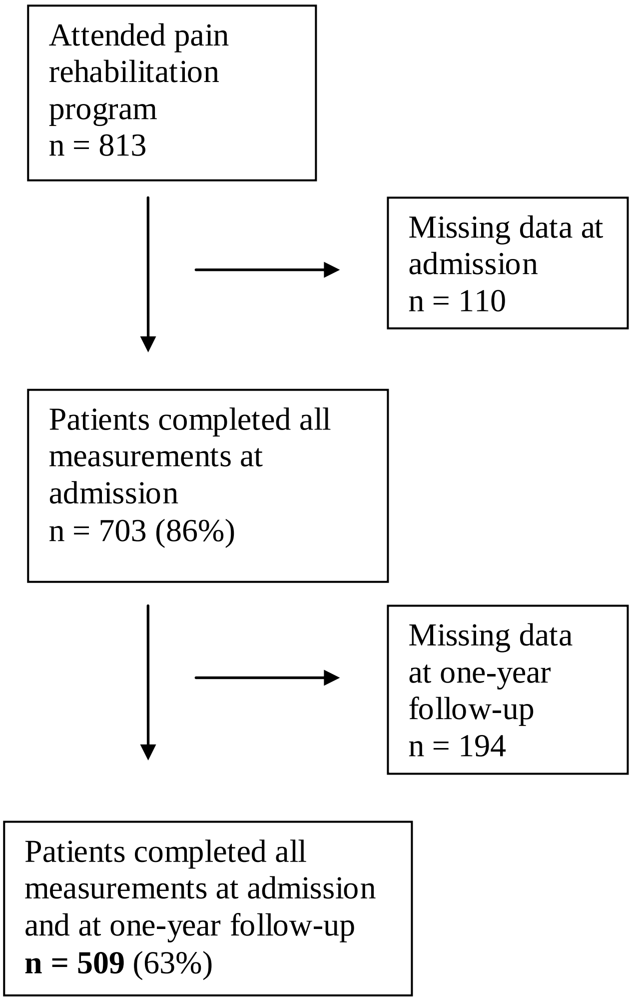

Figure 1. Participant recruitment and follow-up.

Table 1. *Socio-demographic and clinical factors for the participants, N = 509*

Socio-demographic and Clinical factors	Participants	
	n	%
Gender		
Male	107	21
Female	402	79
Age (years)	40[1]	9.6[2]
Ethnicity		
Nordic born	435	86
Not Nordic born	74	14
Marital status		
Married/cohabiting	378	74
Not married/single	131	26
Education		
Secondary school	98	19
Upper secondary school	313	62
University	98	19
Vocational situation		
Not Working at admission or < 25%	325	64
Working ≥ 25% at admission	184	36
Pain duration (years)	4.1[3]	2.3-8.4[4]
Diagnoses		
Neck Disorders	149	29
Fibromyalgia	124	24
Low back pain	122	24
Myalgia or non specific pain	73	14
Other diagnosis[5]	41	8

[1] mean, [2] standard division, [3]median, [4]interquartile range [5]diagnoses less common (< 10 participants per diagnosis).

Table 2. *Median and IQR scores at admission for the 5 subscales of MPI and for the DRI index*, *N = 509*

	Median	IQR
MPI subscales		
Pain severity $^-$	4.7	(4.0 - 5.0)
Life interference $^-$	4.8	(4.1 - 5.3)
Life control $^+$	2.5	(1.8 - 3.3)
Affective distress $^-$	3.7	(3.0 - 4.7)
General activity level $^+$	2.4	(1.8 - 2.9)
DRI Index		
Sum score $^-$	673	(544 - 830)

DRI = Disability Rating Index; IQR = interquartile range; MPI = Multidimensional Pain Inventory; $^+$ = greater scores indicate a positive direction; $^-$ = lower scores indicate a positive direction,

Table 3. *Univariate analyses (logistic regression) of associations between each of the socio-demographic and clinical factors, and levels on scores(above or below median) on the five subscales of the MPI and of the DRI index, at admission, N = 509*

	Socio-demographic and clinical factors, *P* Value							
Subscales[*]	Gender[1]	Age group[2]	Ethnicity[3]	Marital status[4]	Education[5]	Vocational situation[6]	Diagnostic group[7]	Pain duration group[8]
MPI								
Pain Severity	0.28	>0.3	0.058	>0.3	< 0.001	0.041	>0.3	>0.3
Life Interference	0.092	0.16	0.002	>0.3	>0.3	0.005	0.069	>0.3
Life Control	0.15	>0.3	0.038	>0.3	0.011	0.019	>0.3	>0.3
Affective Distress	>0.3	0.010	0.011	0.18	0.074	0.003	>0.3	>0.3
General Activity Level	0.17	0.096	<0.001	0.21	>0.3	0.11	0.13	>0.3
DRI Index Sum score	>0.3	>0.3	0.048	>0.3	0.15	< 0.001	0.13	>0.3

DRI = Disability Rating Index; MPI = Multidimensional Pain Inventory; [*]Tested above/below median score, [1]Men/Women, [2]Above/below mean score, [3]Nordic/non-Nordic born, [4]Married or cohabiting/single, [5]Secondary school or less/ upper secondary school/ university, [6]Not working at admission/working 25% or more at admission, [7]Fibromyalgia/neck disorders /low back pain/myalgia/other diagnoses, [8] Above/below median

Table 4. Multivariate analyses (*logistic regression) for associations between the predictor variables (sociodemographic and clinical factor), and the criterion variables (above median scores on the MPI and on the DRI) at admission, N = 509*

Subscales	**Socio-demographic and Clinical factors**	**Score[1] Median (IQR)**	***P* value**	**OR[2]**	**CI[2]**
Pain Severity Nagelkerke 0.095	Gender		ns		
	Men				
	Women				
	Ethnicity		**0.016**		
	Nordic	4.7 (4.0-5.0)		**1.9**	**1 .1 - 3.2**
	Non-Nordic	5.0 (4.3-5.3)			
	Education		**< 0.001**		
	Secondary school (first)	5.0 (4.3-5.3)			
	Upper Secondary school	4.7 (4.0-5.0)	**0.001**	**2.1**	**1.3 - 3.4**
	University	4.3 (4.0-4.7)	**< 0.001**	**5.3**	**2.8 – 10.1**
	Vocational situation		ns		
	Not working at admission	4.7 (4.3-5.3)			
	Working ≥ 25% at admission	4.3 (4.0-5.0)			
Life interference Nagelkerke 0.070	Gender		ns		
	Men				
	Women				
	Age-group		ns		
	Age <40				
	Age ≥40				
	Ethnicity		**0.005**		
	Nordic	4.7 (4.1-5.3)		**2.2**	**1.3 - 3.7**
	Non-Nordic	5.0 (4.5-5.5)			
	Vocational situation		**0.009**		
	Not working at admission	4.9 (4.3-5.4)		**1.6**	**1.1 - 2.4**
	Working ≥ 25% at admission	4.5 (3.9-5.1)			
	Diagnoses		ns		
	Fibromyalgia (first)				
	Myalgia				
	Neck disorders				
	Low back pain				
	Other diagnoses				
Life Control Nagelkerke 0.054	Gender		ns		
	Men				
	Women				
	Ethnicity		**0.025**		
	Nordic	2.5 (1.8-3.3)		**1.8**	**1.1 - 3.1**
	Non-Nordic	2.3 (1.2-3.0)			
	Marital Status		ns		
	Married/cohabitant				
	Single				
	Education		**0.009**		
	Secondary school (first)	2.3 (1.5-3.0)			
	Upper Secondary school	2.5 (1.8-3.3)	**0.003**	**2.1**	**1.2 – 3.4**
	University	2.6 (1.8-3.3)	**0.016**	**2.1**	**1.1 - 3.8**

	Vocational situation		**0.041**		
	Not working at admission	2.3 (1.5-3.3)		**1.5**	**1.0 - 2.1**
	Working ≥ 25% at admission	2.8 (2.1-3.3)			
Affective Distress Nagelkerke 0.078	**Age-group**		**0.004**		
	Age <40	4.0 (3.0-4.7)		**1.7**	**1.2 - 2.5**
	Age ≥40	3.7 (2.7-4.3)			
	Ethnicity		**0.005**		
	Nordic	3.7 (2.7-4.3)		**2.1**	**1.3 – 3.6**
	Non-Nordic	4.3 (3.7-5.3)			
	Marital Status		ns		
	Married/cohabitant				
	Single				
	Education		**0.042**		
	Secondary school (first)	4.0 (3.0-4.8)			
	Upper Secondary school	3.7 (3.0-4.7)	**0.036**	**1.6**	**1.0 - 2.7**
	University	3.7 (2.9-4.3)	**0.017**	**2.1**	**1.1 - 3.7**
	Vocational situation		**0.006**		
	Not working at admission	4.0 (3.0-4.7)		**1.7**	**1.2 - 2.5**
	Working ≥ 25% at admission	3.7 (2.7-4.3)			
General activity level Nagelkerke 0.067	Gender		ns		
	Men				
	Women				
	Age-group		ns		
	Age <40				
	Age ≥40				
	Ethnicity		**0.001**		
	Nordic	2.4 (1.9-3.0)		**2.5**	**1.4 - 4.3**
	Non-Nordic	1.9 (1.5-2.7)			
	Marital status		ns		
	Married/cohabitant	2.3 (1.8-2.9)			
	Single	2.5 (1.8-3.0)			
	Vocational situation		ns		
	Not working at admission	2.3 (1.7-2.9)			
	Working ≥ 25% at admission	2.5 (1.9-3.1)			
	Diagnoses				
	Fibromyalgia (first)	2.5 (2.0-3.1)	ns		
	Myalgia	2.5 (1.9-3.2)	ns		
	Neck disorders	2.2 (1.7-2.8)	**0.032**	**1.7**[3]	**1.0-2.9**[3]
	Low back pain	2.3 (1.7-3.0)	ns		
	Other diagnoses	2.4 (1.9-2.8)	ns		
DRI index sum score Nagelkerke 0.073	Ethnicity				
	Nordic	665 (535-815)			
	Non-Nordic	753 (598-860)			
	Education		ns		
	Secondary school (first)				
	Upper Secondary school				
	University				
	Vocational situation		**0.001**		
	Not working at admission	705 (590-850)		**1.9**	**1.3-2.8**
	Working ≥ 25% at admission	598 (439-738)			
	Diagnoses				

Fibromyalgia (first)	655 (525-804)			
Myalgia	637 (538-828)	ns		
Neck disorders	670 (540-825)	ns		
Low back pain	715 (579-860)	**0.035**	**1.7**[3]	**1.0-3.0**[3]
Other diagnoses	646 (552-795)	ns		

[1] Lower scores on the subscales of pain severity, life interference, affective distress and on the DRI index indicates a more positive score whereas higher scores on the subscales of life control and general activity level indicates a more positive score, [2] odds ratio and confidence interval [3] odds ratios and confidence interval <1 are inverted to aid interpretation

Table 5. *Median change scores, from admission to the 1-year follow-up, on the 5 subscales of the MPI and of the DRI index and percent above an MIC change and below a negative change,* N=509

	Change Scores[1]				
	Admission Follow-up			**MIC %**	
Subscales	**Median**	**IQR**	***P* Value**	**+[2]**	**-[3]**
MPI					
Pain severity	0.3	-0.3 – 1.0	<0.001	43	16
Life interference	0.2	-0.2 – 0.7	<0.001	30	12
Life control	0.5	-0.3 – 1.5	<0.001	49	14
Affective distress	0.7	-0.3 – 1.7	<0.001	52	22
General activity level	0.2	-0.3 – 0.6	<0.001	24	12
DRI Index					
Sum score	-25	-150 – 102	<0.001	21	31

MPI = Multidimensional Pain Inventory; DRI = Disability Rating Index; [1]change scores above 0 indicate a positive estimate, MIC = minimal important change, IQR = interquartile range, [2]Percent changed ≥0.6 (MIC) on MPI subscales and ≥10% (MIC) on DRI index, [3]Percent changed < -0.6 change score on MPI subscales and < -10% on DRI index

Table 6. *Univariate analyses (logistic regression) of associations between each of the sociodemographic and clinical factors, and scores above a positive MIC on the subscales of MPI and of the DRI index and below a negative change on subscales of the MPI and of the DRI index, N = 509*

		Socio-demographic and clinical factors P - value							
Subscales	**MIC[1]**	**Gender[2]**	**Age group[3]**	**Ethnicity[4]**	**Marital status[5]**	**Education[6]**	**Vocational situation[7]**	**Diagnostic group[8]**	**Pain duration group[9]**
MPI									
Pain Severity	>MIC	>0.3	0.21	>0.3	>0.3	>0.3	0.30	>0.3	>0.3
	>-MIC	0.10	**0.038**	>0.3	0.070	0.26	>0.3	>0.3	>0.3
Life Interference	>MIC	0.067	>0.3	>0.3	>0.3	>0.3	>0.3	>0.3	>0.3
	>-MIC	0.16	>0.3	>0.3	>0.3	>0.3	>0.3	>0.3	0.299
Life Control	>MIC	>0.3	>0.3	>0.3	>0.3	>0.3	>0.3	>0.3	>0.3
	>-MIC	0.15	0.11	>0.3	>0.3	>0.3	>0.3	>0.3	>0.3
Affective Distress	>MIC	0.086	>0.3	0.16	0.19	>0.3	>0.3	>0.3	>0.3
	>-MIC	0.10	>0.3	>0.3	>0.3	>0.3	>0.3	>0.3	>0.3
Activity Level	>MIC	>0.3	0.25	>0.3	>0.3	0.29	>0.3	>0.3	>0.3
	>-MIC	>0.3	>0.3	0.28	>0.3	>0.3	>0.3	>0.3	>0.3
DRI sum score	>MIC	>0.3	>0.3	>0.3	>0.3	>0.3	>0.3	>0.3	0.24
	>-MIC	0.20	>0.3	0.23	>0.3	>0.3	0.24	>0.3	>0.3

[1]minimal important change above 0.6 on the MPI subscales and above 10% change on the DRI = >MIC and minimal important change above - 0.6 on the MPI subscales and above – 10% change on the DRI index =>-MIC, [2]men/women, [3]above/below mean, [4]Nordic/non-Nordic born, [5]married or cohabiting/single, [6]secondary school or less/upper secondary school/university, [7]not working at admission/working 25% or more at admission, [8] fibromyalgia/neck disorders/ low back pain/myalgia/other diagnoses, [9]above/below median