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Prognostic Factors for Pain Relief and Functional Improvement in Chronic Pain After Inpatient Rehabilitation

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Objective: To determine the factors associated with pain relief and improved physical functioning in chronic pain patients during outpatient management in the first 5 months immediately after a standardized inpatient pain management program.

Methods: Prospective cohort study using standardized questionnaires on sociodemographic data, disease outcome, psychosocial factors, change in behavior, and outpatient therapies on discharge from inpatient rehabilitation and during the 5-month follow-up at home (observation period). Stepwise forward multivariate linear regression analysis examined the correlation of these factors with change in pain severity and change in physical functioning.

Results: The study included 80.1% female patients, 90.0% had at least 1 comorbidity and 62.9% had chronic pain for ≥ 5 years. On average, pain intensity and depression worsened slightly during the observation period, but the other outcomes remained almost stable. Relief from anxiety (20.7% explained variance) and low baseline depression (5.5%) were the most important predictors for pain relief. Relief from anxiety (13.3%) and low baseline depression (7.1%) were most strongly associated with functional improvement.

Conclusions: This study found a strong association of change in pain severity and physical functioning with change in baseline level of affective health and coping during the first outpatient management period after inpatient rehabilitation. As a consequence, it may be possible to improve the treatment of chronic pain by therapy of mood and coping.

Key Words: chronic pain, pain severity, physical functioning, depression, anxiety

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Chronic pain is a major health care problem in Europe. Nineteen percent of adult Europeans report chronic pain of moderate to severe intensity and are seriously affected with regard to the quality of their social and working lives.[1] Fifty percent of chronic pain patients also report depression in contrast to 2% to 9% of the general population.[2] Patients with this comorbidity have more severe pain outcomes than those with chronic pain alone.[3] Thirty-nine percent of the patients who consulted a general practitioner with a new episode of low back pain reported persistent disabling pain at follow-up 3 months later.[4]

The most helpful factors to predict persistent disabling low back pain are maladaptive pain-coping behaviors, presence of nonorganic signs, high functional impairment, low general health status, and the presence of psychiatric comorbidities.[5] Low levels of fear avoidance and low baseline functional impairment were the most useful items for predicting recovery at 1 year. One of the most accepted models for the development of chronic low back pain is the model of fear avoidance.[6] Pain catastrophizing leads to the fear of movement, which is followed by an avoidance behavior like inactivity, reduced mobility, increased disability, and, furthermore, anxiety and depression. Consequently, reduction of fear and avoidance by informing about the nonserious nature of pain led to a better outcome with respect to pain intensity and physical functioning.[6]

Chronic pain patients show high variation of symptom patterns and therefore need individually adapted and specific therapies. Treatment of depression improved mental health and reduced the effects of pain on work among patients with chronic pain and depression.[3] In our previous study, which included data from some of the patients being reexamined in the present study, we concluded at the end of the study that patients who participated in the specialized inpatient interdisciplinary program reported greater improvement on pain, social functioning, trend for improvement in catastrophizing, and ability to decrease pain compared with the group receiving standard inpatient rehabilitation.[7] However, at the 6-month follow-up, the standard rehabilitation group showed greater improvements on physical function, social function, anxiety, and life control when compared with the interdisciplinary pain program.

Consistently, other studies showed the superiority of interdisciplinary pain programs when compared with control groups.[8,9] Multidisciplinary treatment of fibromyalgia delivered greater improvements compared with single therapies.[10] However, we could not find any studies that examined the effect of outpatient therapies given immediately after inpatient treatment.

The purpose of this study was to determine the predictive factors for pain relief and functional improvement in chronic pain patients (back pain and widespread pain) in the period at home immediately after completing a comprehensive inpatient rehabilitation program. These findings should help to optimize outpatient management after discharge. Pain severity and physical function have been considered the most important dimensions of chronic pain syndrome, decisive for managing daily life. They were highly responsive in our previous outcome studies.[11]

MATERIALS AND METHODS

Patients and Interventions

From 1999 to 2007 patients were consecutively referred by general practitioners, rheumatologists, and hospitals to a specialized inpatient interdisciplinary pain program or standard rehabilitation.[7,12] The "Zurzach Interdisciplinary

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Pain (German: Schmerz) Program" comprises medical care including drug therapy, graded activity exercises, single psychotherapy, and different group therapies. The program is very intensive, comprises an average of 6 sessions of different (single and group) therapies per day and lasts 4 weeks. Standard rehabilitation provides approximately the same therapeutic entities without the group therapies and lasts 3 weeks. The main difference was that patients receiving standard rehabilitation required and received far less psychological therapy.

A detailed description and comparison of the 2 interventions were given in our previous report (Angst et al[7]: see Table 1). After discharge, ambulatory care was organized for each patient by the treating physician of the clinic and the general practitioner who continued the management. The management after discharge consisted of consultations at the general practitioner to adapt medication, active and passive physiotherapies, and consultations at the psychologist/psychiatrist. The main medical therapies comprised analgesics such as paracetamol, nonsteroidal anti-inflammatory drugs, opioids, opiates, and metamizol and also antidepressants as tricyclics, selective serotonin reuptake inhibitors, serotonin and norepinephrine reuptake inhibitors, mianserin, and mirtazapine. Interventions are listed in Table 2. In addition, changes in psychological factors have been recorded.

Patients had a history of chronic pain either due to back pain (in most cases, low back pain) or general widespread pain (including fibromyalgia according to American College of Rheumtology (ACR criteria). All had a history of failed outpatient therapy. Patients with severe somatic illness or severe manifestation of psychiatric disorder that prevented them from participating in the treatment program were excluded. Participating patients were able to formulate realistic functional goals and agreed to attend the program regularly. Detailed information about inclusion and exclusion criteria was previously reported.[7,12]

Measures

We assessed outcomes at discharge from the clinic (baseline) and during the 5 months after discharge from inpatient rehabilitation at home (follow-up), using the same self-assessment forms listed below. In addition, various sociodemographic and disease-relevant parameters were recorded from patients' medical records (reports were sent to the referring physicians to inform them about the inpatient rehabilitation program as well as cofactors, comorbidities, and medication on discharge[7,12]; see also Tables 1 and 2).

The standardized self-assessed outcome instruments used in this study has been previously described.[12] The Multidimensional Pain Inventory (MPI) is a comprehensive instrument for the assessment of chronic pain and its consequences in terms of function, mood, and social interaction.[13,14] We used the scales MPI pain severity (3 items) and MPI activity (total score of all 18 activity items). MPI activity measures social and leisure activities and indoor and outdoor activities of daily living. Subgroups with specific symptom patterns can be determined by cluster analysis of the 9 main MPI scales. They may have consequences for disease management.[15,16] The Interpersonally Distressed subgroup perceives a low level of support from the partner and social environment. Adaptive Copers are characterized by relatively low pain intensity and relatively low interference of pain (functional interference). The Dysfunctional subgroup reports high pain severity, low function, high depression, and low life control.

The Short-Form 36 questionnaire (SF-36) comprehensively measures physical, mental, and psychosocial health by means of 36 items.[17,18] We used the SF-36 physical functioning scale (10 items) as a dependent variable as it mainly covers questions on mobility, which is crucial to independence. It also turned out to be more responsive compared with the MPI activity score.[7,11,12]

The Hospital Anxiety and Depression Scale (HADS) provided the 2 scales—depression and anxiety (7 items each)—both of which play an important role in chronic pain syndrome.[19,20] HADS was developed specifically for nonpsychiatric conditions and has a long history of application in medicine. It has been successfully used in large populations and patient surveys.[21,3]

The Coping Strategy Questionnaire (CSQ) assesses cognitive and behavioral strategies to manage chronic pain and their consequences for daily life.[22,23] From this tool, we used the following scales: catastrophizing (6 items), ability to decrease pain (1 item), an ability to control pain (1 item). These 3 scales emerged as the most responsive scores in our outcome study.[12]

Analyses

Assessments were performed on discharge from the clinic after the inpatient rehabilitation program and five month later at home. This was the period when the patient was under outpatient management prescribed by the clinic at discharge. The management was continued by the general practitioner. To compare score data, all scales of the questionnaires were transformed into a scale from 0 to 100. Zero was the worst score for the given situation, for example, maximum pain, no function, and maximum depression. A score of 100 denoted no pain, maximum function, and no depression. Descriptive data of all parameters and scores are listed in Tables 1 and 2.

We used stepwise forward multivariate linear regression analysis to determine the predictive factors. The dependent variables were change in pain severity (MPI) and change in physical functioning (SF-36) in the period between discharge from the clinic (baseline) and the 5-month follow-up at home (follow-up). As independent variables we applied the baseline scores of each dependent variable: MPI pain at discharge from the clinic and SF-36 physical function at discharge from the clinic. As psychological factors we examined the influence (ie, the baseline and difference values, respectively) of HADS anxiety, HADS depression, CSQ catastrophizing, CSQ decrease pain, CSQ control pain, and MPI activity. The following therapeutic interventions were assessed: antidepressants (baseline and difference), analgesics (baseline and difference), number of active and passive physiotherapies (during observation period), number of consultations of general practitioner and psychiatrist (during observation period), and sports task (baseline and difference). The sociodemographic independent factor was working capacity (baseline and difference). Steady sociodemographic independent factors were: education, age, sex, living with partner or not, and smoking. To some extent, stable medical independent factors were body mass index, number of comorbidities, diagnosis, MPI subgroups, and intention to be more active (data for the last item were provided 2 months after discharge from inpatient rehabilitation).

Because of the heuristic relationship between pain and function, the SF-36 physical functioning score was left out of the regression of change in pain and, vice versa, MPI

pain severity was left out of the regression of change in function. Otherwise, it is likely that much of the change in function would be explained by the change in pain and the other way round.

TABLE 1. Sociodemographic and Disease-relevant Data at Baseline (n = 291)

	n (%)
Sex, female	233 (80.1)
Education	
Basic school	76 (26.1)
Vocational training	158 (54.3)
College/high school/university	57 (19.5)
Living with partner	225 (77.3)
Smoker	96 (33.0)
Working capacity (h/wk)	
0	113 (38.8)
1-10	27 (9.1)
11-20	38 (13.0)
21-30	65 (22.2)
31-40	25 (8.4)
> 40	22 (7.2)
History of pain (y)	
< 1	20 (6.9)
1- < 2	30 (10.3)
2- < 5	58 (19.9)
5- < 10	62 (21.3)
≥ 10	121 (41.6)
Age (y)	
Mean, SD	50 (12.0)
Minimum, maximum	20 (83.2)
Body Mass Index (kg/m^2)	
Mean, SD	26 (4.8)
Minimum, maximum	16 (49.5)
Comorbidities	
None	29 (10.0)
1	64 (22.0)
2	94 (32.3)
3 or more	104 (35.7)
Diagnosis	
Low back pain	196 (67.4)
Widespread pain	95 (32.6)
MPI subgroup	
Adaptive Coper	106 (36.4)
Dysfunctional	105 (36.1)
Interpersonally Distressed	73 (25.1)
Sport hours per week	
0	130 (44.8)
0-1	57 (19.7)
1-2	58 (20.0)
> 2	45 (15.5)
Intention to be active in future*	
No	69 (23.7)
Physiotherapy	30 (10.3)
Motion in daily life	66 (22.7)
More sports	126 (43.3)
Analgesics (paracetamol, NSAIDs, opioides, opiates, metamizol)	
Yes	147 (50.5)
No	144 (49.5)
Antidepressants (tricyclics, mianserin, mirtazapin, SSRI, SNRI)	
Yes	130 (44.7)
No	161 (55.3)

*These data were provided 2 months after discharge from inpatient rehabilitation.

MPI indicates Multidimensional Pain Inventory; NSAID, nonsteroidal anti-inflammatory drug; SNRI, serotonin and norepinephrine reuptake inhibitor; SSRI, selective serotonin reuptake inhibitors.

For stepwise inclusion, the covariable had to be predictive for the dependent variable by $P < 0.30$ (the P-out). To be retained in the final model, every factor had to be predictive by $P < 0.10$ (the P-in). The final model thereafter provided the predictive influence of each single covariable controlled for the predictive influence of all other covariables.[24,25] The final model should not contain more than n/10 covariables (where, n = number of patients) to result in a finite model and valid data.[26] All analyses were performed using the statistical software package SPSS 18.0 for Windows (SPSS Inc., Chicago, IL).

RESULTS

Patients

The cohort comprised 429 chronic pain patients who were recruited between 1999 and 2007. One hundred twenty-one of them had incomplete data at 5-month follow-up at home. Of the remaining 308 patients, 17 were excluded because the diagnosis was not low back pain or widespread pain. Complete data were available for 291 relevant chronic pain patients.

Table 1 shows the sociodemographic and disease-relevant parameters at discharge from the clinic. Most of the patients were female (80.1%). About one-third had 3 or more comorbidities (35.7%) and only 10.0% had no comorbidity. Most of the patients had a long history of pain, 41.6% had a history of pain for >10 years. Further, 38.8% of the patients did not work at all, whereas only 7.2% worked full time. Besides, 44.8% of the patients did not participate in any sports at all, although another 19.7% indulged in sports activities for <1 hour a week.

Changes in Therapy and Activity Parameters From the Time of Discharge From the Clinic (Baseline) Until 5-month Follow-up at Home

The majority of the patients was given the same amount of analgesic and antidepressant medication throughout the course of outpatient treatment and about one-third required an increased dose of analgesics over the course (Table 2). Approximately one-third were able to increase their level of sports activities. Moreover, 79.7% of patients attended 1 to 10 consultations at a general practitioner and 61.2% did not consult a psychiatrist or psychologist. Patients had an average of 18.7 lessons of active physiotherapy whereby the variance was large (from 0 therapies to 204). They had a mean of 12.1 lessons of passive physiotherapies with a smaller variance.

Changes in Continuous Scores From the Time of Discharge From the Clinic (Baseline) Until 5-month Follow-up at Home

On average, patients reported slight worsening of health and coping in almost all assessed scores, whereas the changes were close to 0 (Table 3). Except in MPI pain severity and HADS depression, the effect sizes were larger (−0.26 and −0.25). CSQ catastrophizing and working capacity improved slightly. The variance of the changes was high for all scores (see SD of change).

Further, 76.3% reported the intention to be more active in the future regarding sports, physiotherapy, or movement in everyday life (Table 1). These data were obtained 2 months after completion of the inpatient rehabilitation program. In contrast, MPI activity slightly deteriorated as shown in Table 3. Even so, 38.2% reported

TABLE 2. Therapies and Change of Activity (Discharge From Clinic Until 5-month Follow-up at Home)

	No. Patients (% of Patients)
Change in sports	
Reduced	46 (15.9)
No change	132 (45.5)
Augmented	111 (38.2)
No. consultations GP during observation period	
0	46 (15.8)
1-5	136 (46.7)
6-10	96 (33.0)
> 10	11 (3.8)
No. consultations psychiatrist/psychologist during observation period	
0	178 (61.2)
1-5	59 (20.3)
6-10	50 (17.2)
> 10	4 (1.4)
Change in analgetics (paracetamol, NSAIDs, opioides, opiates, metamizol)	
Reduced	17 (5.8)
No change	176 (60.5)
Augmented	98 (33.7)
Change in antidepressants (tricyclics, mianserin, mirtazapin, SSRI, SNRI)	
Reduced	52 (17.9)
No change	209 (71.8)
Augmented	30 (10.3)
No. of active physiotherapies during the observation period	
0	102 (35.5)
1-10	50 (17.2)
11-20	44 (15.3)
21-40	55 (19.2)
> 40	36 (11.5)
No. of passive physiotherapies during the observation period	
0	126 (43.3)
1-10	57 (19.6)
11-20	46 (15.8)
21-40	45 (14.3)
> 40	17 (5.3)

GP indicates general practitioner; NSAID: nonsteroidal anti-inflammatory drug; SNRI, serotonin and norepinephrine reuptake inhibitor; SSRI, selective serotonin reuptake inhibitors.

an increased sports quota during the 5-month follow-up at home, and 45.5% reported no change in sports activities (Table 2).

Regression Model of Change in MPI Pain Severity From the Time of Discharge From the Clinic (Baseline) Until 5-month Follow-up at Home

Table 4 shows the relevant parameters of the linear regression model for change in pain severity. The most important variable was the change in HADS anxiety between baseline and follow-up, and it explained 20.7% of the variance. This means that the decrease in anxiety was associated with pain relief. Moreover, 16.9% of the variance was explained by the MPI pain severity score at baseline. In other words, patients with high levels of pain were more likely to experience higher pain relief than those with little pain. HADS depression at baseline explained an additional 5.5%, that is, mild depression at baseline was associated with greater pain relief when compared with high levels of depression. The final model showed a good fit for pain relief and explained 56.1% of the variance.

No significant predictive impact was found with respect to age, living with partner, smoker, sex, comorbidities, diagnosis, the MPI subgroups (Adaptive Coper, Dysfunctional, and Interpersonally Distressed), sports quota at baseline and change (baseline to follow-up), intention to be active, change of analgesics, use of antidepressants, number of consultations of general practitioner and psychiatrist/psychologist, number of active and passive physiotherapies, CSQ control pain, CSQ catastrophizing, CSQ decrease pain, and change in HADS depression.

Regression Model of Change in SF-36 Physical Functioning From the Time of Discharge From the Clinic (Baseline) Until 5-month Follow-up at Home

Table 5 shows the relevant parameters of the linear regression model for change in physical functioning. The most important variable was the change in HADS anxiety that explained 13.3% of the variance. Decrease in anxiety was correlated with better physical functioning. A variance of 10.7% was explained by the SF-36 physical functioning score at baseline. This means that patients with low physical functioning experienced a higher increase. The HADS depression score baseline explained 7.1% of the variance, whereas a low level of depression was correlated with increase of physical function. The final model showed a

TABLE 3. Outcome Scores in the Course of Treatment

	Entry in Clinic		Discharge From Clinic		Entry → Discharge	5 mo Follow-up at Home		Discharge → 5 mo Follow-up
	Mean	SD	Mean	SD	ES	Mean	SD	ES
MPI pain severity	26.0	16.0	38.1	19.0	0.76	33.1	20.4	−0.26
SF-36 physical functioning	41.6	20.6	50.1	22.0	0.41	49.3	23.2	−0.04
MPI activity	39.8	13.0	41.7	15.1	0.15	40.3	14.7	−0.09
CSQ catastrophizing	48.9	19.6	54.8	19.8	0.30	55.0	20.8	0.01
CSQ decrease pain	38.8	19.5	46.2	19.6	0.38	42.5	22.8	−0.19
CSQ control pain	46.3	21.5	53.0	20.2	0.31	51.1	22.9	−0.09
HADS depression	59.5	20.2	66.8	22.0	0.36	61.2	24.0	−0.25
HADS anxiety	53.6	21.3	59.8	21.6	0.29	59.1	22.9	−0.03
Working capacity (h)			15.1	15.5		15.8	15.9	0.05

CSQ indicates coping strategies questionnaire; ES, effect size; HADS, hospital anxiety and depression scale; MPI, multidimensional pain inventory; SF-36, short form 36.

TABLE 4. Regression Model for Change in MPI Pain Severity and Physical Functioning is Excluded as an Independent Variable (56.1% Explained Variance)

Variables		Change R^2	Change F	Regression Coefficient	Significant P	Bivariate Correlation	Partial Correlation
Constant				−6.28	0.09		
HADS anxiety	Difference	0.207	70.6	0.28	< 0.001	0.46	0.28
MPI pain severity	Baseline	0.169	72.6	−0.69	< 0.001	−0.46	−0.60
HADS depression	Baseline	0.055	25.7	0.12	0.028	−0.15	0.14
CSQ catastrophizing	Difference	0.047	24.2	0.33	< 0.001	0.44	0.29
CSQ decrease pain	Difference	0.017	9.1	0.16	< 0.001	0.29	0.23
CSQ decrease pain	Baseline	0.016	8.9	0.12	0.017	−0.13	0.15
CSQ catastrophizing	Baseline	0.013	7.4	0.17	0.01	−0.18	0.16
Antidepressants	Difference	0.011	6.2	−3.77	0.01	−0.09	−0.15
Working capacity	Baseline	0.009	5.4	0.13	0.03	−0.09	0.14
Working capacity	Difference	0.007	3.8	0.20	0.004	0.10	0.18
Education		0.005	3.0	1.58	0.063	0.08	0.12
No. active physiotherapies	From baseline to follow-up	0.005	2.8	−0.05	0.093	−0.05	−0.10

Antidepressant indicates tricyclics, mianserin, mirtazapin; CSQ, coping strategies questionnaire; HADS, hospital anxiety and depression scale; MPI, multidimensional pain inventory.

good fit for functional improvement and explained 41% of the variance.

We found no relevant correlation with education, age, sex, sports, living with a partner, smoking, body mass index, comorbidities, diagnosis (low back pain or widespread pain), MPI subgroups, working capacity, sports (baseline and change), intention to be active, change in analgesics or antidepressant, number of consultations of psychiatrist/psychologist or general practitioner, number of active or passive physiotherapies or CSQ decrease and control pain, difference and baseline value of MPI activity, and difference of CSQ catastrophizing.

DISCUSSION

This study examined the statistically predictive impact of various cofactors on pain relief and improvement of physical function in chronic pain patients immediately after discharge from inpatient rehabilitation until the 5-month follow-up at home. Relief from anxiety with improvement of both outcomes was the most important and consistent cross-sectional association. The second most important cofactor was the baseline level (at discharge from the clinic) of each dependent variable having a prognostic importance; a high level of pain or disability predicted greater improvement in pain and function. One explanation may be the "regression to the mean" effect. In third place was the baseline depression; low depression consistently predicted improvement in pain and function. Further, important predictors were the coping dimensions catastrophizing and ability to decrease pain: better coping predicted pain relief and improved function, although it cannot be determined whether a high level of anxiety, depression and catastrophizing, and a low level of capacity to decrease and control pain is the reason for higher pain severity or whether it is the other way round (chicken-egg problem).

The findings described above accord with a cross-sectional evaluation of chronic pain.[27] A high level of CSQ catastrophizing was positively correlated with high pain intensity, disability, and psychological distress. Other studies have also reported the importance of psychological factors (especially depression, anxiety, and catastrophizing) in the development of pain severity and physical functioning.[3,12,21] Multidisciplinary outpatient treatment (including

TABLE 5. Regression Model for Change in Physical Functioning, and Pain Intensity is Excluded as an Independent Variable (41.0% Explained Variance)

Variables		Change R^2	Change F	Regression Coefficient	Significant P	Correlation of the 0 Order	Partial Correlation
Constant				1.47	0.811		
HADS anxiety	Difference	0.133	41.7	0.22	0.002	0.36	0.19
SF-36 physical functioning	Baseline	0.107	38.0	−0.45	< 0.001	−0.36	−0.51
HADS depression	Baseline	0.071	27.9	0.13	0.042	0.00	0.13
Education		0.026	10.4	2.89	0.002	0.15	0.19
No. consultations at GP		0.019	7.9	−0.49	0.059	−0.12	−0.12
MPI activity	Difference	0.013	5.6	0.28	0.002	0.26	0.19
MPI activity	Baseline	0.014	5.7	0.18	0.014	−0.01	0.15
Age		0.010	4.7	−0.17	0.029	−0.05	−0.13
CSQ castastrophizing	Difference	0.010	4.3	0.19	0.009	0.29	0.16
CSQ catastrophizing	Baseline	0.007	3.0	0.12	0.086	0.05	0.11

CSQ indicates coping strategies questionnaire; GP, general practitioner; HADS, Hospital Anxiety and Depression Scale; MPI, Multidimensional Pain Inventory; SF-36, Short-Form 36.

psychotherapy) of fibromyalgia improved functional capability and reduced symptom severity.[28] Chronic pain patients with comorbid depression derive the maximum benefit from multidisciplinary pain therapy including depression treatment.[3,29] They showed better outcomes in pain intensity and physical functioning compared with depressive chronic pain patients without adequate depression treatment. Similarly, our data showed that increased use of antidepressants correlated with less pain severity.

The present data found no association between the number of outpatient consultations at a psychiatrist or a psychologist with the reduction of pain or disability. Because only 39.8% of the participants made use of psychotherapy, these findings may be biased. It was further surprising that the intention to be more active had no influence on MPI pain severity or SF-36 physical functioning as we would have expected, whereas 38.2% were able to increase their participation in sports. Education had a relevant correlation with physical functioning but not with pain severity. This could mean that patients with better education are more able to cope with chronic pain in terms of sustained function, although the pain level is the same as in those with lower education.

Stratified outcome analysis showed some considerable differences between the MPI cluster subgroups (Dysfunctional, Interpersonally Distressed, and Adaptive Copers) in previous studies.[15,16] The Interpersonally Distressed and Adaptive Copers improved much more than those Dysfunctional in pain severity and also in SF-36 physical functioning, whereas the Dysfunctional subgroup improved more in SF-36 social functioning. A moderate association between depression and pain was only found for the Interpersonally Distressed subgroup of MPI.[21] However, categorization of the participants into the subgroups was not a significant predictor for the amount of change in pain or function in the present analysis.

All participating patients had completed an inpatient interdisciplinary rehabilitation program before the observation period of the present study. After this intervention, most of the outcomes and cofactors showed relatively high improvements.[7,12] This fact may explain the slight deterioration of many variables during outpatient treatment after discharge. It may be possible that in patients with chronic pain, the relationship between affective variables, physical functioning, and pain intensity/severity might change (eg, loosen somewhat) after a successful therapy, for example, by coping instructions. Consequently, this might have an effect on the strength of correlation between these factors. To our knowledge, there is no literature that examined this question. However, both models (Tables 4 and 5) showed high levels of explained variances, meaning that the associations were strong during outpatient management.

Strengths of the study are the relatively large sample size and the quality of the standardized self-assessments. Furthermore, the number of potential confounders that were included in the regression was large. This led to a comprehensive measurement of potential disease-modifying factors that explained a high proportion of the variance in the final models. The limitations of this study were as follows: the regression model resulted in predictive data for the whole group of patients and symptom patterns. However, patients showed high variance, so it may be difficult to quantify predictive data for a single patient. The 28% dropout rate at the 5-month follow-up at home may have led to some selection bias. There is a risk of false responses because much of the data are self-assessed.

In conclusion, anxiety, depression, and catastrophizing play an important role in pain severity and physical functioning during inpatient rehabilitation and also during outpatient treatment immediately after the inpatient pain program until the 5-month follow-up at home. It is important to assess and treat these dimensions of the chronic pain syndrome. As there is no literature examining outpatient therapeutic effects right after a pain program, there is a need for further studies to focus on follow-up assessment during outpatient management.

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