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Low Back Pain Patients in Primary Care: Subgroups Based on the Multidimensional Pain Inventory

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Classification of patients into homogeneous subgroups is an important objective in primary care management of low back pain patients. The purpose of this study is to (a) identify and describe cluster profiles based on self-reported multidimensional pain inventory Scale (MPI) scores among subacute and chronic nonspecific low back pain patients; (b) describe characteristics of the clusters in relation to disability, life satisfaction, functional self-efficacy, and exercise self-efficacy; and (c) compare grouping by clusters based on self-reported MPI scores with grouping by symptom duration. Eighty-eight individuals participated. These had a median lower back pain duration of 7 months (range 1 to 144 months). Three clusters were identified; these were labeled interpersonally distressed, adaptive copers, and dysfunctional. The clusters differed significantly in disability and functional self-efficacy scores, but not in life satisfaction and exercise self-efficacy scores. The results of this study in a primary care setting are discussed in relation to previous results in pain clinic settings.

Key words: classification, low back pain, primary care, multidimensional pain inventory, disability, self-efficacy

Low back pain (LBP) affects about 80% of the general population at some point in life, and 25% of adults report back pain in a given year (Skovron, 1992). Most LBP patients are managed in primary care settings (Deyo & Phillips, 1996). Although LBP typically improves considerably within 1 week after onset, less severe pain of-

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ten continues for 1 to 3 months. Long-term follow-ups (1 year or more) show a recurrent course (van den Hoogen, Koes, van Eijk, Bouter, & Deville, 1998; Von Korff & Saunders, 1996), and the proportion of primary care patients with LBP who experience poor recovery may be larger than is generally recognised (Cherkin, Deyo, Street, & Barlow, 1996; Croft, Macfarlane, Papageorgiou, Thomas, & Silman, 1998; Deyo & Phillips, 1996).

Although reliable classification systems based on physical factors are needed for the diagnosis and assessment of individual patients, physical impairment is only moderately related to disability and even less to pain intensity (Waddell, 1987). Therefore, it may be argued that classification systems for LBP patients should include assessment of psychological and behavioural factors as well as physical factors. This may be especially relevant in primary care settings, where patients are not as highly selected as in specialised clinics in secondary and tertiary settings.

Turk and Rudy (1987) developed an empirically derived multivariate classification system, the Multiaxial Assessment of Pain (MAP), which aims at integrating physical, psychosocial, and behavioural data for chronic pain patients. The psychosocial and behavioural components were assessed by the West Haven–Yale Multidimensional Pain Inventory (MPI; Kerns, Turk, & Rudy, 1985). In a classification study that used self-reported MPI scores from 217 chronic pain patients (Turk & Rudy, 1988), the authors identified and replicated three different clusters. The first cluster, dysfunctional, was characterised by higher than average levels of pain severity, life interference, and affective distress. The second cluster, interpersonally distressed, was characterised by low levels of perceived support from others in their environment. The third cluster, adaptive copers, was characterised by lower levels of pain severity, life interference, and affective distress, and greater perceptions of life control. The generality of the classification was investigated in three different samples from a university outpatient pain clinic (Turk & Rudy, 1990b): LBP (n = 200), headache (n = 200), and temporomandibular disorders (TMD; n = 100). The authors reported that 95% of the LBP patients, 92% of headache patients, and 94% of TMD patients could be classified accurately into one of the three patient profile types. Later, the results were replicated in patients with fibromyalgia (Turk, Okifuji, Sinclair, & Starz, 1996).

Clinical utility of the classification system was presented in studies of patients with TMD (Rudy, Turk, Kubinski, & Zaki, 1995) and fibromyalgia (Turk, Okifuji, Sinclair, & Starz, 1998) where patients were shown to respond differently to treatment.

Recently, psychometric data from Dutch (Lousberg et al., 1999) and Swedish (Bergström, Jensen, Linton, & Nygren, 1999) versions of the MPI have been reported. The results support the reliability and validity of the MPI.

The Turk and Rudy approach offers a comprehensive biopsychosocial classification system for LBP patients. Because the system was developed in a tertiary care setting, the validity and clinical utility in primary care settings need to be investigated. One issue of interest would be whether classification by self-reported MPI scores discriminates individuals in important LBP outcome variables such as disability and life satisfaction and in common predictor variables such as functional self-efficacy and self-efficacy related to exercise.

Thus, the purpose of this study is to (a) identify and describe cluster profiles based on self-reported MPI scale scores among subacute and chronic nonspecific LBP patients in a primary care setting; (b) describe characteristics of the clusters in relation to disability, life satisfaction, functional self-efficacy, and exercise self-efficacy; and (c) compare grouping by clusters based on self-reported MPI scale scores with grouping by symptom duration, in this study subacute (4 weeks to 3 months) and chronic (more than 3 months) on the same variables.

METHOD

Setting, Participants, and Procedure

The study was conducted in a Swedish university town with a population of 180,000, and three surrounding rural communities with a total population of 50,000. In the city, public service, administration, and white-collar branches of business dominate. In the rural area, various small industries and farming dominate.

Participants in the study were recruited among persons seeking care at the physical therapy departments within the county council primary health care organisation. About 30% of persons seeking care were self-referred.

The inclusion criteria were age 18 to 65; no signs of trauma; no malignant, infectious, or systemic disease; ability to understand written and spoken Swedish; and a duration of LBP for at least 4 weeks. Thus, both subacute (4 weeks to 3 months) and chronic (more than 3 months) LBP patients were included.

Participants were recruited consecutively from April 1995 through December 1996 (n = 40; Sample 1), and from April 1997 through March 1999 (n = 48; Sample 2). There were no differences in demographic or background data between the two samples. By using two samples, a larger sample size for the classification procedure was obtained. The individuals in Sample 2 participated in a randomised study in which a cognitive–behavioral approach to exercise treatment for LBP patients was compared to exercise only (Johansson, 1999).

The participants had a mean age of 42 years (*SD* 13, range 19–65). The median duration of low back pain was 7 months (25th percentile = 2 months, 75th percentile = 24 months; range 1 to 144 months). About 27% of the participants reported having had LBP for less than 3 months and 67% for more than 3 months. Six individuals (6%) did not report data on duration.

A majority of the participants were women (71%), married or cohabiting (65%), and a large proportion (34%) had university-level education.

Measures

Psychosocial and behavioural aspects of chronic pain. Psychosocial and behavioural aspects of chronic pain were measured by the Swedish version (Carlsson, Bergström, & Jensen, 1994) of the West Haven–Yale MPI (Kerns et al., 1985). The MPI comprises 52 items in nine subscales: (a) reports of pain severity, (b) perceptions of pain interference with life, (c) perceived life control, (d) affective distress, (e) appraisals of the amount of support from significant others, (f) perceived punishing responses from significant others to patient display of pain, (g) perceived solicitous responses from significant others to patient display of pain, (h) perceived distracting responses from significant others to patient display of pain, and (i) the frequency of performing common activities, labeled a general activities scale. The answering format is a seven-grade (0 to 6) scale with various anchors depending on the question. A mean score is computed for each scale. The Swedish version of the MPI has shown satisfactory internal consistency and test–retest reliability (Bergström et al., 1998).

Disability. Disability was measured by the Roland and Morris Disability Questionnaire, which consists of 24 items relevant for patients with back problems (Roland & Morris, 1983). The psychometric properties of the Swedish Roland and Morris Disability Questionnaire were found to be satisfactory, with a test–retest reliability of ICC = .88 (Johansson & Lindberg, 1998).

Perceived satisfaction with key psychosocial life areas. Perceived satisfaction with key psychosocial life areas was measured with the Quality of Life Scale, which is a seven-item inventory that assesses participants' degree of satisfaction with their current level of functioning (Chibnall & Tait, 1990). Test–retest reliability over an average interval of 75 days was acceptable with a reported r of 0.73 (Chibnall & Tait, 1990). The Quality of Life Scale was translated into Swedish by us and tested for internal consistency ($\alpha = 0.87$) and test–retest reliability ($r = 0.79$) in Sample 2 of this study.

Functional self-efficacy. Functional self-efficacy was measured with the Self-Efficacy Scale, which is an eight-item inventory constructed to assess self-efficacy expectations specifically related to various basic physical activities (Estlander, Vanharanta, Moneta, & Kaivanto, 1994; Kaivanto, Estlander, Moneta,

& Vaharanta, 1995). The Self-Efficacy Scale was translated into Swedish by us and tested for internal consistency (α = 0.91) and test–retest reliability (r = 0.77) in Sample 2 of this study.

Exercise self-efficacy. Exercise self-efficacy was measured with the Exercise Self-Efficacy Scale, which is a six-item inventory constructed to assess self-efficacy beliefs specifically related to confidence to exercise in the face of potential barriers: work schedule, physical fatigue, boredom related to exercise, minor injuries, other time demands, and family and home responsibilities (Dzewaltowski, 1989; Yordy & Lent, 1993). The Exercise Self-Efficacy Scale was translated into Swedish by us and tested for internal consistency (α = 0.85) and test–retest reliability (r = 0.64) in Sample 2 of this study.

Data Analysis

To obtain complete data sets, missing values in occasional items were substituted by the scale or subscale mean of the individual. This was done for 2 participants in Sample 1 and for 6 participants in Sample 2.

In the Swedish version of the MPI, participants who live alone are instructed not to respond to the items making up the subscales punishing responses, solicitous responses, and distracting responses. This was the case for 18 individuals in this sample. These missing scores were substituted by the corresponding group means for each subscale.

Exploratory data analysis was performed to identify outliers or skewed distributions in the MPI subscales, disability, life satisfaction, functional self-efficacy, and self-efficacy for exercise measures (Tabachnic & Fidell, 1996). The punishing responses subscale was significantly and positively skewed, and a potential outlier was identified in this subscale.

Cluster analysis (Aldenderfer & Blashfield, 1984) was conducted on the MPI subscale scores for the total sample. The k-means clustering method was used because it addresses how subsets of participants fit together across measures. Briefly, this method seeks to create nonoverlapping clusters by minimising within-group variance and maximising between-group variance (Aldenderfer & Blashfield, 1984). To determine the optimum number of clusters to retain, the C index method (Hubert & Levin, 1976) was used. This method examines the within-cluster distances of different cluster solutions and indicates the solution with the smallest within-cluster distances.

Discriminant function analysis was used to investigate the degree to which cases were correctly classified into clusters. Standard multiple regression analysis was used to predict Roland and Morris disability scores from the MPI subscales where clusters differed the most (excluding pain severity and interference to avoid spurious results due to high correlations between these scale scores and the Roland and Morris disability score).

Differences between clusters in disability scores (total sample), life satisfaction, functional self-efficacy, and self-efficacy for exercise scores (Sample 2) were analysed with analysis of variance.

Differences in disability scores (total sample), life satisfaction, functional self-efficacy, and self-efficacy for exercise scores (Sample 2) between subacute and chronic individuals, and differences in all variables with regard to gender were analysed with Student's *t* test. The level of significance was set at $p < .05$.

RESULTS

The mean MPI subscale scores and standard deviations for the total sample are given in Table 1. The possible range of each subscale score is 0 to 6 points. There were gender differences in the pain severity scale and in the general activity scale.

The *C* index method indicated that a three-cluster solution, among *k*-means solutions from two to four clusters, represented optimal explanations for the profile structure of the patients' reported MPI scores.

The cluster profiles are shown in Figures 1a to 1c. Cluster 1 (34% of the sample, $n = 30$) was characterised by low levels of pain and interference along with low levels of perceived support from others, solicitous responses, and distracting

TABLE 1
Mean Scores and Standard Deviations in the MPI Subscales for the Total Sample[a]

	Men[b]		*Women*[c]	
	M	*SD*	*M*	*SD*
MPI Subscale				
Pain Severity	2.8_a	.9	3.4_b	1.1
Interference	2.8_a	1.1	2.5_a	1.3
Life Control	3.4_a	1.0	3.5_a	1.1
Affective Distress	2.3_a	1.0	2.5_a	1.5
Support	3.5_a	1.5	3.3_a	2.0
Punishing Responses	$.9_a$	1.0	$.8_a$	.9
Solicitous Responses	2.7_a	1.1	2.6_a	1.4
Distracting Responses	2.1_a	1.0	2.0_a	1.0
General Activity	2.6_a	.9	3.1_b	.8

Note. Means in the same row that do not share subscripts differ at $p < .05$ in Student's independent *t* test.

[a]$N = 88$. [b]$n = 26$. [c]$n = 62$.

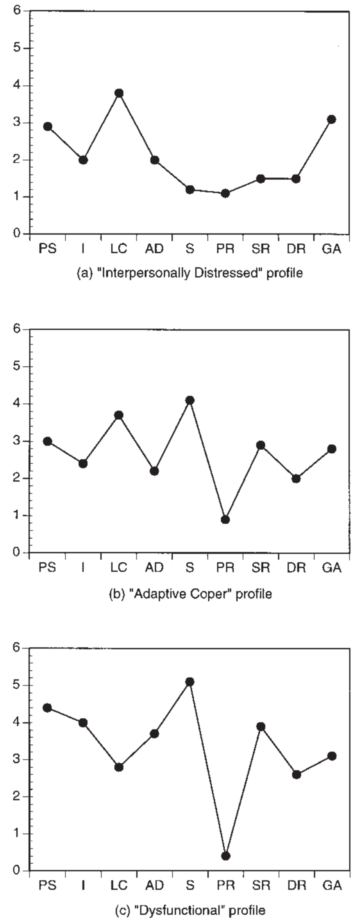

FIGURE 1 Mean MPI scale scores in the three clusters. (a) = "Interpersonally Distressed" cluster (n = 30), (b) = "Adaptive Copers" cluster (n = 39), (c) = "Dysfunctional" cluster (n = 19). PS = pain severity, I = interference, LC = life control, AD = affective distress, S = support, PR = punishing responses, SR = solicitous responses, DR = distracting responses, and GA = general activity level.

responses. This cluster was labeled interpersonally distressed. Cluster 2 (44% of the sample, n = 39) was characterised by low levels of pain severity and interference along with high levels of perceived support and solicitous responses. This cluster was labeled adaptive copers. Cluster 3 (22% of the sample, n = 19) was distinguished by high levels of pain severity and interference along with high levels of perceived support and solicitous responses. This cluster was labeled dysfunctional. Cluster 1 and 2 both displayed high levels of life control and low levels of affective distress, whereas Cluster 3 showed the opposite pattern. All three clusters displayed low levels of punishing responses and midscale levels of general activity.

The discrimination of the model was good (Wilks's $\lambda = 0.11$, approximately $F[18, 154] = 17.8$, $p < .001$). Ninety-eight percent of the cases were correctly classified into one of the three clusters.

There were no significant differences between the clusters regarding the distribution of participants in demographic variables (gender, age, civil status, and education).

For the total sample, there were significant mean differences between clusters in the Roland and Morris disability scores ($F[2, 85] = 10.42$, $p < .001$). To further validate the cluster solution in relation to disability, prediction of Roland and Morris disability scores by the MPI subscales (excluding pain severity and interference) in which the cluster profiles differed the most (i.e., affective distress, support, and solicitous responses) was performed. Entered as independent variables in a multiple regression analysis, the scores for the total sample on these subscales explained 26% of the variance in the Roland and Morris disability scores ($R = 0.51$, $F[3, 84] = 9.83$, $p < .001$). Only affective distress contributed significantly to the prediction of disability scores ($\beta = 1.58$, $t[84] = 3.94$, $p < .01$). Based on the regression equation, Roland and Morris disability scores were predicted from the affective distress, support, and solicitous responses subscale scores of each cluster. The actual scores in each cluster showed the same pattern as the scores predicted from the affective distress, support, and solicitous responses subscale scores (Table 2).

For Sample 2, analyses of variance indicated significant differences between the clusters in the functional self-efficacy scores ($F[2, 45] = 5.28$, $p < .01$), but not in the life satisfaction scores or the exercise self-efficacy scores (Table 3).

TABLE 2
Individual Subscale Scores for Each Cluster in the Affective Distress, Support, and Solicitous Responses Subscales, the Predicted Diability Scores, and the Actual Disability Scores in Each Cluster[a]

	Interpersonally Distressed[b]	*Adaptive Copers*[c]	*Dysfunctional*[d]
MPI subscale			
Affective Distress	2.0	2.2	3.7
Support	1.2	4.1	5.1
Solicitous Responses	1.5	2.9	3.9
Predicted disability score	8.6	10.2	13.4
Actual disability score	8.1	10.0	14.5

[a]$N = 88$. [b]$n = 30$. [c]$n = 39$. [d]$n = 19$.

TABLE 3
Mean Scores in Life Satisfaction, Functional Self-Efficacy, and Exercise Self-Efficacy, and Differences Between Clusters in Sample 2[a]

	Interpersonally Distressed[b]	*Adaptive Copers*[c]	*Dysfunctional*[d]
Quality of Life Scale	35.1_a	34.4_a	30.8_a
Self-Efficacy Scale	45.0_a	41.6_a	30.5_b
Exercise Self-Efficacy Scale	34.5_a	30.5_a	30.6_a

Note. Means in the same row that do not share subscripts differ at $p < .05$ in the Tukey honestly significance difference comparison.
[a]$N = 48$. [b]$n = 15$. [c]$n = 19$. [d]$n = 14$.

There were no significant differences between subacute and chronic patients in disability scores (total sample) or in life satisfaction scores or any of the self-efficacy scores (Sample 2).

DISCUSSION

The results of this study support the presence of subgroups differing in psychosocial and behavioural aspects among LBP patients in a primary care setting. The three clusters identified in this study show clear similarities with the clusters among chronic LBP patients in a pain clinic previously reported by Turk and Rudy (Turk & Rudy, 1988; Turk & Rudy, 1990b) but are also dissimilar in some respects. The main difference seems to be the lower and more differentiated levels of pain severity and life interference in our sample. This, however, seems logical considering the different settings. It is also consistent with earlier results showing that pain levels differ significantly between chronic LBP patients seen in pain clinics and primary care or general practice (Crook, Weir, & Tunks, 1989; Deyo, Bass, Walsh, Schoenfeld, & Ramamurthy, 1988). Those patients who eventually reach pain clinics through a referral filtering process are those who show greater disability and psychosocial problems (Turk & Rudy, 1990a). Another difference is that the general activity mean scale score was 3 in all three clusters, whereas the data of Turk and Rudy (Turk & Rudy, 1990b) indicate mean scale scores ranging from 1.5 to 2 in the general activity scale. This, too, may be explained by the different settings. Following the previous argument (Turk & Rudy, 1990a), those who remain in primary care management should be less disabled and thus more active. Finally, all three clusters displayed low levels of perceived punishing responses. In the original clustering (Turk & Rudy, 1990b), the interpersonally distressed profile is clearly higher in this respect than the other two.

A more specific comparison of the cluster profiles in our sample with those reported by Turk and Rudy (1990b) suggests that it is the interpersonally distressed cluster that deviates the most from the original profile even when different levels of pain severity, interference, and general activity levels have been taken into account. However, the characterising feature of the interpersonally distressed cluster profile (i.e., low levels of perceived support from others, punishing responses, solicitous responses, and distracting responses) indicate a lack of interaction, or communication, with significant others. This feature also distinguishes the interpersonally distressed cluster profile from the other two cluster profiles in our sample.

Ninety-eight percent of the cases were correctly classified into one of the three clusters. Because this was a post hoc prediction based on the discriminant functions of the same group, this should only mean that there were few extreme cases or areas where the classification function was inadequate (Tabachnic & Fidell, 1996).

The clusters differed significantly in the Roland and Morris disability scores. This may partly be due to high intercorrelations between the MPI interference scale scores and the Roland and Morris disability scores. However, the Roland and Morris disability scores predicted from the affective distress, support, and solicitous responses scales showed the same pattern, with the interpersonally distressed cluster displaying the lowest scores and the dysfunctional cluster displaying the highest scores. This may imply a general relation between disability and psychosocial variables.

In Sample 2, the results show that the clusters differed significantly in functional self-efficacy, with the dysfunctional cluster displaying the lowest scores. These individuals may possibly be more vulnerable to worsening of their back pain, considering the combination of low perceived life control, low functional self-efficacy, and high affective distress. Individuals in the interpersonally distressed and adaptive copers clusters both showed lower levels of pain and disability and may be better adjusted considering the higher levels of life control, functional self-efficacy, and low affective distress.

There were no differences between subacute and chronic participants in any of the outcome variables. This is in line with earlier results in primary care indicating that pain intensity, perceived health, and daily functioning do not differ in LBP patients classified as acute, subacute, or chronic (van den Hoogen, Koes, van Eijk, Bouter, & Deville, 1997). Thus, classification based on behavioural and psychosocial factors may be a better predictor of important LBP variables than duration of symptoms.

There are some limitations in this study of importance for the conclusions that can be drawn from the results. The sample was drawn from LBP patients seeking care at county council primary care health organisations and is characterised by being mainly female with a high education level. There are other settings that could be regarded as primary, for example, private practitioners and occupational health services, and where different patterns of duration and degree of problems may be present. Thus, generalisation to other types of primary care settings, and to other areas that are not characterised by university and other public administration, cannot be taken for granted.

The sample also displayed a wide range in LBP duration. However, because correlations with the MPI subscales and the other measures were low, duration of complaints has probably not affected the results.

Means substitution was performed for 18 participants who had missing scores the punishing responses, solicitous responses, and distracting responses subscales due to the instructions regarding significant other in this section of the MPI. The consequence of means substitution is reduced variance, which may make relations between variables less distinct (Tabachnic & Fidell, 1996). Considering the clear differences between the clusters in these subscales, it is unlikely that the results have been seriously affected. Recently, a modification of the MPI, with a clarification of the term significant other has been suggested if the MPI is going to be used for classification purposes (Okifuji, Turk, & Eveleigh, 1999).

To conclude, the results of this study support the presence of subgroups that differ in psychosocial and behavioural aspects among nonspecific LBP patients in a primary care setting. Taken together, these data provide support for the generality of a classification approach developed by Turk and Rudy (Turk & Rudy, 1987, 1988; 1990b, 1992) in pain clinic settings. Although some deviations from the original cluster profiles were found in this primary care sample, these may well be explained by the different settings. Replication in further primary care samples is needed to ensure the validity of the cluster structure found in this study.

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