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Prognostic Factors and Treatment-Related Changes Associated with Return to Work in the Multimodal Treatment of Chronic Back Pain

Alexander A. Vendrig[1]

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The goals of the current study were to determine those preprogram (=prognostic) variables and treatment-related changes that predict return to work in the multimodal management of chronic back pain. The outcome measures for 143 patients at 6-month follow-up were analyzed. The program had a duration of 4 weeks, was based largely on the functional restoration approach (Mayer and Gatchel, 1998), and occurred within a workers' compensation framework. Some 87% of the patients successfully returned to work. Three sets of predictor variables were considered: demographic/socioeconomic data, physical measures, and psychological measures. Three prognostic variables proved to be significant negative predictors of return to work: time off work, previous spinal surgery, and a clinically elevated (preprogram) score on the MMPI-2 scale Lassitude–Malaise (Hy3). A repeated-measures MANOVA showed an incomplete return to work to be associated with only limited improvement in self-reported disability and pain report. However, patients who failed to return to work did not differ with regard to improvement in objective physical functioning or psychological distress. It is therefore hypothesized that a change in the perceived disability status is the key element necessary to return patients with chronic back pain to work, although ongoing reinforcement schemes operative in the home/work environment may lead to a relapse in the posttreatment phase.

KEY WORDS: chronic low back pain; treatment outcome; prediction; multidisciplinary treatment; return to work.

[1]Rug AdviesCentra Nederland, Utrechtseweg 92, 3702 AD Zeist, The Netherlands. Fax: +31-30-6917232. e-mail: vendrig@rac-zeist.nl.

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INTRODUCTION

Chronic back pain constitutes a tremendous problem for the health care system due to the associated treatment costs and a problem for society due to the loss of employment opportunities for those affected (Quebec Task Force on Spinal Disorders, 1987). Among the working population, back pain is the most prevalent medical problem and by far the most frequent reason for absenteeism (Fordyce, 1995). Only a small part (7%) of the total costs associated with back pain stems from medical treatment; the largest expense stems from loss of productivity (Tulder *et al.*, 1995). Chronic back pain also affects the quality of a patient's life, as its sufferers typically show increased levels of psychological distress (e.g., Polatin *et al.*, 1993), increased marital distress (e.g., Ahern *et al.*, 1985), and reduced physical and/or social activity (e.g. Linton, 1985).

Not surprisingly, attempts have been made to determine the most effective forms of treatment for chronic back pain. Traditional medical or paramedical forms of treatment such as physical therapy appear to be largely unsuccessful because of the incorrect conceptualization of chronic back pain in terms of anatomical pathology (Nachemson, 1992). In contrast, a multimodal treatment approach to chronic back pain has proved to be quite promising (Flor *et al.*, 1992). Such programs involve a multidimensional conceptualization of chronic back pain, incorporate multiple treatment components, and are clearly aimed at improving the patient's adjustment to pain or the transformation of a passive coping style into a more active coping style and the transformation of pain-contingent behaviors into behaviors more independent of the pain being experienced.

Despite increased evidence for the effectiveness of a multimodal approach to treatment for chronic back pain, many individuals fail to improve (Turk, 1990). Efforts have been made to determine those factors responsible for such treatment failure. Most of the studies in this realm have taken a patient's return to work as the criterion for success, and among the factors found to predict (successful or unsuccessful) return to work are the number of operations, time off work, application for pension payment, and patient's belief—prior to treatment—that he or she would be able to return to work (Aronoff *et al.*, 1987; Guck *et al.*, 1987; Hildebrandt *et al.*, 1997; Lancourt and Kettelhut, 1992). Sandstrom and Essbjornsson (1986) agree that the following simple statement may be the best (negative) predictor of actual return to work: "I am afraid to start working again, because I don't think I will be able to manage it." The aforementioned factors can be considered prognostic, as they are generally measured at a point in time prior to treatment.

Most recently, researchers have also started attending to those treatment-related changes that appear to be clearly associated with successful treatment outcome. Although the improvement of patients following participation in multimodal pain programs has been widely documented, the factors actually responsible for such improvement have yet to be fully understood. A greater understanding of the relevant prognostic factors may also help clinicians identify those patients at risk for a particularly poor treatment outcome. In a study by Pfingsten *et al.* (1997), for example, the relation of treatment-induced changes in several physical and psychosocial variables to return to work was examined and a decrease in subjective disability and depression was found to be predictive of return to work, while neither improvement in physical functioning nor coping strategies were found to be associated with return to work.

The purpose of the present study was therefore to elucidate the prognostic factors and treatment-related changes associated with return to work following multimodal treatment for chronic back pain. As will be seen, multiple outcome measures were assessed along multiple dimensions (demographic and socioeconomic data, physical measures, and psychological measures) in order to mimic the multimodal nature of the treatment process. Based on the aforementioned studies, improvement in objective physical functioning was not expected to be related to return to work, while improvement in self-perceived disability was indeed expected to be associated with a successful return to work.

METHOD

Sample

The sample consisted of 147 consecutive referrals to The Netherlands Back Advice Center (*Rug AdviesCentra Nederland*), which is actually a network of multidisciplinary assessment and intervention centers with the work reintegration of spinal disorder patients as its primary objective. All of the patients in the current study had chronic back pain with a duration of at least 3 months. None of the patients participating in the study had a structural pathology of the spine. Moderate degenerative changes in the intervertebral disc were not regarded as structural pathology. Four subjects (3%) dropped out of treatment for various reasons. In Table I, the characteristics of the sample are presented.

Procedure

All patients were assessed by a team consisting of a clinical psychologist, a physical therapist, an occupational therapist, and an orthopedic surgeon or neurologist, who performed a full orthopedic–neurological examination. During this examination, the patients' responses to the maneuvers described by Waddell *et al.* (1980) were recorded. The Waddell score is a measure of pain behavior or "overreacting." During the Waddell procedure, five categories of pain behavior are

Table I. Description of the Total Sample ($N = 143$)

% males	69
Age (years)	M = 41.6 (SD = 8.5)
Education (%)	
Low/intermediate	81
High/university	19
Pain duration (months)	M = 46.3 (SD = 36.2)
Disability time (months)	M = 13.8 (SD = 8.3)
Number of spinal surgeries (%)	
0	78.3
1	14.0
2	6.3
3	1.4

evaluated. The score is usually dichotomized into 0–2 (low Waddell signs) versus 3–5 (high Waddell signs). About 2 weeks after assessment, the medical specialist and psychologist provided the patient and his or her partner with feedback on the assessment results. The occupational therapist consulted with the employer in arranging for the patient to resume his or her work. After completion of the 4-week treatment program (see below), a follow-up phase of 1 year with four follow-up sessions occurred. At 6-month follow-up, whether the patient had achieved the goal of a complete return to work was determined and the initial (pre-program) variables were reassessed. Complete return to work (regular work) was defined as work identical to that performed before the onset of the back pain or the same workload in terms of number of hours worked per week and identical work demands. Only those patients who fully returned to regular work were considered successful. Those patients who partially returned to work or returned to lighter duties were considered failures with regard to a complete return to work. The outcome criterion "return to work" was thus dichotomized into "complete (100%) return to work" versus "incomplete (<100%) return to work."

Multimodal Treatment Program

The treatment program was a 4-week daily outpatient multimodal program with the aim of restoring a normal pattern of daily functioning, including a complete return to work. Decrease in pain or improvement of pain coping was not the direct aim of the program. The program was and is based on the functional restoration approach (Hazard *et al.*, 1989; Mayer *et al.*, 1987) and follows many of the principles outlined by Fordyce (1976). The key concept underlying the treatment program is that of the "deconditioning syndrome" (Mayer and Gatchel, 1988), which argues that patients with chronic back pain often demonstrate prolonged iatrogenically abetted protectiveness and passivity, mostly induced by fear, which eventually leads to a decrease in spinal mobility, muscle strength, and cardiovascular fitness (Hilderbrandt *et al.*, 1997). Furthermore, chronic back pain is conceptualized as a multifactorial phenomenon, including physical, psychological, and social aspects. In our program, the patients participated in groups of about six. The professionals operated in a closely knit team and consulted daily. All of the clinicians provided group sessions, which included back school, discussion of deep-rooted beliefs about symptoms and disabilities, stress management training, and modification of maladaptive behaviors and emotions. The physical training occurred according to operant learning principles (graded activity) and was aimed at the elimination of inappropriate pain behaviors and the restoration of muscle strength and endurance as well as aerobic fitness. Activities such as squash and swimming were also part of the program.

Instruments

The selection of outcome measures was based largely on the functional restoration approach (Mayer and Gatchel, 1988) and covers those dimensions considered clinically most important within such an approach: physical functioning (both muscular and aerobic fitness), experience of pain, functional disability, and psychological distress (which typically means symptoms of somatic distress, dissatisfaction, and depression in patients with chronic pain) (Main *et al.*, 1992).

Physical Measures

Lumbar Functioning. Lumbar functioning was assessed with the Isostation B200 (Isotechnologies, Inc., Hillsborough, NC). The Isostation B200 is a triaxial dynamometer that measures isometric and dynamic trunk muscle performance. Although the Isostation was developed to assess objectively trunk muscle fitness, studies have shown the Isostation B200 performance of back pain patients, particularly, their flexion and extension, to be affected by pain behaviors (Cooke *et al.*, 1992; Menard *et al.*, 1994). We therefore selected maximal isometric extension and flexion to provide a general measure of lumbar functioning.

Cardiovascular Fitness. This was defined here as maximum aerobic capacity or VO_2-max (ml/kg/min) and assessed using a submaximal cycle ergometer protocol (Pollock and Schmidt, 1980). The prediction of VO_2-max is based on the linear relation between heart rate and work rate. The slope between increased heart rate and work rate is extrapolated to predict maximum aerobic capacity. The correlation between the predicted and the actual VO_2-max is known to be 0.87 (Pollock and Schmidt, 1980).

Psychological Measures

VAS. The Visual Analogue Scale (VAS) is a 10-cm line on which the patient marks the experienced pain intensity. The VAS score can vary from 0 (“no pain”) to 100 (“the worst pain ever experienced”). The patient is asked to estimate the average amount of pain for the last week, including the present day.

Pain Drawing. The Pain Drawing assesses the number of painful body sites. The scoring method described by Parker *et al.* (1995) was applied. The score for the pain drawing can vary from 0 to 45 body parts.

QBPDS. The Dutch translation (Schoppink *et al.*, 1996) of the Quebec Back Pain Disability Scale (QBPDS; Kopec *et al.*, 1995) was used to assess self-reported disability due to back pain symptoms. The test–retest reliability and Cronbach’s alpha for the Dutch adaptation of the QBPDS are 0.90 and 0.95, respectively (Schoppink *et al.*, 1996).

MMPI-2. The Dutch adaptation of the Minnesota Multiphasic Personality Inventory (MMPI-2; Derksen *et al.*, 1993) was used to assess symptoms of somatic distress and depression. The MMPI-2 provides a broad assessment of psychological distress and personality, and it is one of the most frequently used tools for pain assessment. In patients with chronic pain, psychological distress is commonly expressed as a mixture of depressive symptoms (not depressive disorders) and multiple somatic complaints. The MMPI-2 scales of Hs (Hypochondriasis), Hy3 (Lassitude–Malaise), and D (Depression) clearly reflect the symptoms of distress characteristic of chronic pain patients (Vendrig *et al.*, 1998) The average test–retest reliability for these three scales is 0.83, and the average internal consistency is 0.70 (Graham, 1993).

RESULTS

Although the aim of the present study was not to demonstrate the success of the multimodal treatment program employed in the study, it is nonetheless important to consider the success of the program in order to evaluate properly the roles of the various predictor variables. A repeated-measures MANOVA was conducted to determine the improvement from pre-treatment to follow-up. The α level was set at 0.004 due to the conduct of nine concurrent statistical tests. The effect size (η^2), which is a standardized measure of change, was calculated for each measure.

The effect sizes presented in Table II show all of the preprogram-to-follow-up changes in the outcome measures to be highly significant ($P < 0.001$). Both the highest and the lowest effect sizes were obtained for the physical measures;

Table II. Total Sample Effect Sizes (η^2) for Improvement from Pretreatment to Follow-up

	η^2
I. Physical measures	
MIS extension	0.77
MIS flexion	0.75
Cardiovascular fitness (VO_2-max)	0.24
II. Psychological measures	
VAS	0.32
Pain Drawing (No. painful sites)	0.45
Disability (QBPDS)	0.60
Hypochondriasis (MMPI2 Hs)	0.50
Depression (MMPI2 D)	0.35
Lassitude–Malaise (MMPI2 Hy3)	0.56

Note. MIS, maximal isometric strength; QBPDS, Quebec Back Pain Disability Scale; MMPI-2, Minnesota Multiphasic Personality Inventory. $P < 0.001$ for all effect sizes.

MIS extension and MIS flexion showed the greatest effect size, while cardiovascular fitness showed the smallest effect size. The differences in the effect sizes may, at least in part, be a result of the inherent differences in the measures themselves. That is, cardiovascular fitness allows for only limited improvement with training, while muscle performance is relatively easy to improve: many patients showed submaximal muscle performance at pretreatment, for example, simply because of their fear of movement. Any improvement in muscle performance is therefore the result of both a decreased fear of movement and a real increase in "objective" muscle fitness. Pain intensity was reduced from VAS 46 to 26 on average, and disability (QBPDS) was reduced from 34 to 15 on average. Most of the measures showed a 50% improvement or a return to the normative mean values (for the MMPI-2 variables), which indicates significant and thus clinically important change.

Prediction of Return to Work

For six patients, the return to work status could not be established. Of the remaining 137 patients, 120 patients achieved a complete return to work and 17 patients failed to achieve a complete return to work. Thus, the actual return to work percentage in this sample was 87.6%. If the six patients for whom the return to work status could not be established were included as "failures," the return to work percentage dropped to 83.9%.

Prognostic Factors

In Table III, an overview of the scores on the various pretreatment predictor variables is presented for those patients obtaining a complete return to work and those failing to do so. Three sets of variables were considered: (I) demographic and socioeconomic data, (II) physical measures, and (III) psychological measures. When a Bonferroni correction for the comparison of the 16 predictor variables was applied, none of the predictor variables was found to be significant ($P < 0.003$ or $P < 0.05$ divided by 16 predictor variables). Repeated application of the Bonferroni rule may produce an unacceptable increase in type II errors, however, so it was decided to evaluate the predictor variables individually and require a $P < 0.05$.

With regard to the demographic and socioeconomic data, the variables "disability time" ($P = 0.012$) and "number of previous spinal surgeries" ($P = 0.041$) appeared to be significant (negative) predictors of return to work. Those patients who failed to return to work completely were found, on average, to be off work 8 months longer at pretreatment. None of the physical variables predicted return to work. With regard to the psychological variables, two MMPI-2 variables predicted return to work: MMPI-2 Scale Hs ($P = 0.038$) and MMPI-2 Scale Hy3 ($P = 0.020$).

The question now becomes just how large the "relative risks" or "risk ratios" (RR) produced by the identified variables may be. Given a particular medical history (or psychological profile), what is the risk of not achieving a complete return to work? The RR for two variables in particular are considered: previous spinal surgery and MMPI-2 Scale Hy3. (MMPI-2 Scale Hs was considered redundant, as the correlation between Hy3 and Hs was found to be 0.60.) The RR is defined as the percentage of subjects in the population *at risk* for an incomplete return to work (i.e., one or more previous spinal operations) divided by the percentage of the population *not at risk* (i.e., no previous spinal operations). The RR for one previous spinal operation (14%) relative to no previous operations (78%) was found to be 3.0 (25% failures/8% failures). The RR for two or more previous spinal operations (8%) relative to no previous operations (78%) was found to be 3.6 (30% failures/8% failures). To calculate the RR for the Hy3 scale of the MMPI-2, a cutoff value had to be determined. In keeping with the MMPI-2 conventions, which regard scores greater than or equal to 65 as clinically elevated (Graham, 1993), we also adopted a cutoff score of 65. The RR for a Hy3 score greater than or equal to 65 (63%) relative to a score less than 65 (37%) appeared to be 4.0 (24% failures/6% failures). Finally, the possibility of an interaction between "previous spinal surgery" and "MMPI-2 Scale Hy3 scores" was examined by combining the two risk variables. The RRs did not increase, however, which implies that the two risk factors do not interact and should be considered independent of each other.

Table III. Comparison of Baseline Differences for Patients with a Complete Versus an Incomplete Return to Work (RTW)

Baseline measure	Complete RTW ($N = 120$) M	(SD)	Incomplete RTW ($N = 17$) M	(SD)	t (a)[a] or χ (b)	P value
I. Demographic and socioeconomic data						
Age (years)	41.2	(8.2)	42.1	(7.8)	0.40(a)	0.688
Sex (% male)	70.8		58.8		1.01(b)	0.315
Education (% low/intermediate)	82.1		81.3		0.01(b)	0.938
Pain duration (months)	47.5	(37.6)	53.1	(34.7)	0.57(a)	0.569
Disability time (months)	11.9	(11.7)	20.3	(15.6)	2.53(a)	0.012
Number of spinal operations (% ≥1)	18.3		47.1		8.26(b)	0.041
II. Physical measures						
Waddell behavioral signs (% 3–5)	18.1		12.5		0.31(b)	0.580
MIS extension	89.5	(43.8)	80.3	(26.9)	0.29(a)[b]	0.771
MIS flexion	79.4	(43.6)	67.2	(32.6)	0.68(a)[b]	0.495
Cardiovascular fitness (VO_2-max)	29.1	(6.9)	27.5	(6.8)	0.20(a)[b]	0.850
III. Psychological measures						
VAS	44.6	(20.0)	55.2	(26.1)	1.86(a)	0.065
Pain Drawing (No. painful sites)[a]	7.0	(4.8)	7.4	(4.0)	0.38(a)	0.703
Disability (QBPDS)	33.3	(13.3)	34.3	(16.2)	0.27(a)	0.784
Hypochondriasis (MMPI2 Hs)	63.6	(11.0)	69.7	(12.3)	2.09(a)	0.038
Depression (MMPI2 D)	57.1	(11.3)	59.5	(11.7)	0.81(a)	0.419
Lassitude–Malaise (MMPI2 Hy3)	59.8	(10.1)	65.9	(8.1)	2.36(a)	0.020

Note: MIS, maximal isometric strength; VAS, Visual Analogue Scale; QBPDS, Quebec Back Pain Disability Scale; MMPI-2, Minnesota Multiphasic Personality Inventory.

[a]For the calculation of t, the sum of the number of painful sites (0–45) was converted to logit scores. According to Rudy *et al.* (1992), this procedure corrects for the nonlinearities that may exist in simple summated scales.

[b]For the calculation of t, the raw scores were first standardized separately for each sex.

Treatment-Related Changes in Outcome Measures

The pretreatment and follow-up outcome measures for patients with a complete return to work (RTW) and an incomplete RTW are displayed in Table IV. It is interesting to note that those patients who failed to return to work completely already had, on average, somewhat lowered scores on the physical measures and somewhat increased scores on the psychological measures at pretreatment. The follow-up scores for both the physical and the psychological measures were also generally worse for those patients with an incomplete RTW.

A repeated-measures MANOVA was conducted for each set of predictor variables (physical and psychological measures). The dependent variable was RTW. For the physical measures, the MANOVA revealed a significant main effect of Time (pretreatment/follow-up) ($F = 45.60$, $P < 0.001$) and a nonsignificant interaction between Time and Group (complete RTW/incomplete RTW) ($F = 1.16$, $P = 0.331$). For the psychological measures, the MANOVA again revealed a significant main effect of Time ($F = 6.07$, $P < 0.001$) and a significant Time × Group interaction ($F = 2.48$, $P = 0.034$). The results of the univariate ANOVAs for the main effect of Time and the Time × Group interaction are presented in Table IV. Significant Time × Group interaction effects were observed for the variables VAS ($P < 0.01$), Pain Drawing ($P < 0.05$), and Self-Reported Disability ($P < 0.001$). Neither improvement on the physical measures nor the MMPI-2 variables were found to be associated with RTW status. To interpret the improvement in the variables in relation to return to work, it is important to consider the degree of overlap among the variables VAS, Pain Drawing, and Self-Reported Disability. The difference scores for the three variables were therefore correlated with each other. The correlation coefficients show substantial overlap: ΔVAS correlated 0.42 with ΔQBPDS, ΔVAS correlated 0.47 with ΔPain Drawing, and ΔQBPDS correlated 0.44 with ΔPain Drawing. Some underlying construct related to the experience of disability and pain appears to be associated with the return to work of chronic back pain patients.

DISCUSSION

The multidisciplinary or multimodal treatment of chronic pain conditions appears to be the best treatment approach to date (Flor *et al.*, 1992). There is still a considerable lack of information with regard with which patients respond to such treatment and which aspect of the therapy is responsible for the observed treatment success (Hildebrandt *et al.*, 1997). As multimodal treatment programs are often situated within a workers' compensation environment, return to work is one of the major criteria for successful treatment. The goal of the present study was therefore to determine those preprogram (=prognostic) factors and

Table IV. Results of MANOVA (Repeated Measures) Comparing Treatment-Related Changes According to Return-to-Work Status

	Complete RTW ($N = 120$)				Incomplete RTW ($N = 17$)					
	Pretreatment		Follow-up		Pretreatment		Follow-up			
	M	(SD)	M	(SD)	M	(SD)	M	(SD)	F (time)	F (time × group)
I. Physical measures										
MIS extension	89.5	(43.8)	157.3	(43.4)	80.3	(26.9)	140.8	(47.5)	131.23***	1.03
MIS flexion	79.4	(43.6)	124.2	(41.7)	67.2	(32.6)	114.9	(38.1)	123.87***	0.04
Cardiovascular fitness (VO_2-max)	29.1	(6.9)	31.6	(7.1)	27.5	(6.8)	30.4	(7.9)	11.38***	0.01
II. Psychological measures										
VAS	44.6	(20.0)	22.3	(23.8)	55.2	(26.1)	48.0	(25.8)	6.41**	6.92**
Pain Drawing (No. painful sites)[a]	7.0	(4.8)	3.2	(4.1)	7.4	(4.0)	5.7	(4.4)	24.52***	4.82*
Disability (QBPDS)	33.3	(13.3)	12.5	(11.4)	34.3	(16.2)	29.8	(20.3)	46.14***	7.17***
Hypochondriasis (MMPI2 Hs)	63.6	(11.0)	52.5	(9.4)	69.7	(12.3)	59.4	(12.5)	49.06***	0.30
Depression (MMPI2 D)	57.1	(11.3)	50.3	(9.8)	59.5	(11.7)	53.9	(10.3)	17.63***	0.67
Lassitude–Malaise (MMPI2 Hy3)	59.8	(10.1)	49.7	(9.8)	65.9	(8.1)	58.0	(10.3)	47.79***	0.17

Note: MIS, maximal isometric strength; VAS, Visual Analogue Scale; QBPDS, Quebec Back Pain Disability Scale; MMPI-2, Minnesota Multiphasic Personality Inventory. $*P < 0.05$; $**P < 0.01$; $***P < 0.001$.

[a]For the calculation of t, the sum of the number of painful sites (0–45) was converted to logit scores. According to Rudy *et al.* (1992), this procedure corrects for the nonlinearities that can exist in simple summated scales.

treatment-related improvements associated with a successful outcome in terms of return to work.

The results show four variables to be significantly predictive of complete return to work: time off work, a history of spinal surgery, a clinically elevated score on the MMPI-2 Scale Hy3 (Lassitude–Malaise), and, to a lesser degree, a clinically elevated score on the MMPI-2 Score Hs (Hypochondriasis). The predictor variables previous spinal surgery and MMPI-2 Scale Hy3 were independent of each other and indicated a risk of not completely returning to work (i.e., treatment failure). The risk of treatment failure was three to four times greater than for the other subjects studied here. Disability time (time off work) was found to be predictive of return to work. Time off work has also been found by many other researchers to be a significant predictor of poorer treatment outcome (e.g., Bendix *et al.*, 1998; Hildebrandt *et al.*, 1997; Aronoff *et al.*, 1987).

Several explanations have been offered for the negative influence of the duration of the absence from work on return to work. In terms of operant conditioning (Fordyce, 1976), it can be hypothesized that the longer a patient is off work, the greater the opportunity for negative experiences to reinforce the chronic sick role. The patient may adopt the role of being sick to such a degree that a permanent reduction of pain behavior becomes quite hard to establish. In support of this idea is the observation that many "failed" patients show normal therapeutic improvement during treatment and then relapse when returning to the home environment to resume work. The reinforcement schemes operative before treatment may still exist in the home environment. An alternative explanation for the negative influence of the duration of the absence from work may simply lie in the higher probability of encountering problems in the workplace when resuming work after a prolonged absence (Hildebrandt *et al.*, 1997). Such patients may have lost (psychological) contact with their colleagues and treated with considerable skepticism by both their employer and their colleagues.

A history of spinal surgery was also found to be a negative predictor of return to work in the present study, which corroborates the findings of other studies (Fishbain *et al.*, 1993; Guck *et al.*, 1986). The manner in which a spinal history increases the risk of a poor RTW outcome may be similar to the manner in which the duration of the absence increases the risk of a poor RTW outcome. In terms of operant conditioning, that is, a "failed back surgery" can be expected to reinforce pain behavior. It is important to note that "failed back surgery" does not imply a technically unsuccessful operation but, rather, the development of a chronic pain syndrome (Mayer *et al.*, 1998). Along these lines, studies have shown that patients who are distressed before back surgery to respond less favorably to the surgery than other patients (Wing *et al.*, 1973). In other words, some patients may suffer from a chronic pain syndrome in addition to the pathoanatomical substrate. In what becomes a vicious circle and makes these patients particularly immune to treatment, then, is their tendency to attribute their chronic pain to the failure of physical treatment: "My pain problem is really insurmountable since even the operation did not help me." A second possible explanation for the negative influence of previous spinal surgery is that patients with a history of spinal surgery may have greater access to disability pensions. In cases of unpleasant life circumstances (e.g., work stress, divorce), moreover, it may be tempting for such patients to pursue an "escape route" and thereby negatively reinforce their chronic pain condition. It should be stressed that we are speaking of relative risk and that the majority of the patients who had undergone previous spinal surgery were found to achieve a complete return to work. Yet another "medical" explanation for the sometimes negative influence of previous spinal surgery may be the presence of "scar tissue." In conflict with such an explanation, however, is the finding that improved lumbar muscle strength is not related to return to work. In general, moreover, pain, impairment, and disability are not highly correlated (Waddell, 1987).

Among the psychological measures, the MMPI-2 was found to predict a complete versus incomplete return to work. MMPI-2 Scale Hy3 (Lassitude–Malaise) was most impressive in this respect. Unfortunately, we cannot conclude much from this finding, as Hy3 has not been further used to predict treatment outcome in cases of chronic pain. In connection with a wide variety of medical and psychosocial variables, however, Hy3 has been shown to be one of the most powerful predictors of acute back pain report (Bigos *et al.*, 1992; Fordyce, *et al.*, 1992) and the chronification of acute back pain (Gatchel *et al.*, 1995). The present study is thus, to our knowledge, the first to demonstrate the significance of this scale for the prediction of pain treatment outcome (tertiary prediction).

As most of the other MMPI-2 scales, Hy3 has been empirically constructed. This means that we do not know exactly what construct is tapped by this scale. It seems that several of the items constituting Hy3 refer to general feelings of dissatisfaction, malaise, and depressive-like somatic complaints (Graham, 1993). Examples of the MMPI-2 Hy3 items are, "My sleep is fitful and disturbed" (true), "I do not tire quickly" (false), and "I have periods of such great restlessness that I cannot sit long in a chair" (true). In fact, there seems to be some sort of "passivity" underlying this scale. Stated otherwise, there is dissatisfaction without the cognitive awareness of psychic tension that characterizes depression or anxiety disorders. Gatchel *et al.* (1995) have argued that individuals with high Scale 3 scores (Hy3 is a subscale of Scale 3 or Hysteria) are generally self-centered and have a general "malaise" about their condition. Such characteristics may make them more susceptible to passivity and thus simple acceptance of their chronic disability. Less effort is invested in the improvement of their situation and thereby the risk of a poor treatment outcome is heightened. Given the findings of the aforementioned studies and the findings of the present study, moreover, the use of this scale in conjunction with the treatment of chronic back pain should certainly be examined in future research.

The improvement on the outcome variables from preprogram to follow-up was also examined in the present study in relation to a completely successful return to work or not. Such an approach has only recently received attention in the literature. The results of the present study showed only improvements in pain report and self-reported disability to be significant predictors of a complete return to work. Neither the changes in the physical measures nor the changes in the MMPI-2 variables were related to return to work. Other researchers have also found an improvement in physical functioning not to be associated with return to work (Hildebrandt *et al.*, 1997; Robert *et al.*, 1995). In a study by Pfingsten *et al.* (1997), however, an improvement in self-reported disability was found to be the strongest predictor of return to work.

The approach to treatment outcome research adopted in these studies appears to be very promising and may substantially increase our understanding of the treatment process and also help us increase treatment efficiency. There are, nevertheless, some pitfalls associated with the type of outcome research reported here. The choice of outcome criteria may obviously influence the selection of variables as particularly predictive. The more the external measures of treatment outcome and the prognostic measures have in common, the greater the shared variance and likelihood of the prognostic measures showing up as significant predictors of treatment outcome. In the present study, the outcome criterion was "return to work." If the outcome criterion had been "marital satisfaction" (for example), some other variables may have been found to predict treatment outcome. In other words, the present results cannot be generalized to treatment programs utilizing other criteria for successful treatment.

Another limitation of this type of research is that when the predictor variables and outcome measures tap the same underlying construct, the results are not very meaningful. It should be noted that the VAS, Pain Drawing, and QBPDS do not contain items referring to work-related disabilities. It is, nevertheless, possible that those patients who fail to return to work attribute this situation to disability and pain. An increased report of such complaints in such patients can therefore be expected and one cannot simply conclude that significant difference scores reflect the "key" ingredients for successful treatment.

Future research employing different time intervals may increase the meaning of the results obtained here. For example, it would be interesting to relate changes from pretreatment to (immediately) posttreatment to particular outcome criteria (such as return to work) measured at 6-month or 1-year follow-up. Such an analysis may, on the one hand, delineate those therapeutic gains predictive of later outcome and, on the other hand, provide greater insight into the process of relapse—a totally neglected topic in pain research.

Some other limitations on the present study should also be acknowledged. First, our sample was moderately distressed/disabled. The elevations on the MMPI-2 scales, in particular, were only moderate. Just how well the current results generalize to more disturbed chronic pain samples thus remains to be seen. Second, returning to work is an essential part of the treatment program. For this reason, the actual percentage of complete return to work is somewhat higher than in some other treatment programs and studies. Compensation/litigation status was also not an issue and thus not included as a predictor variable. Third, it should be stressed that several variables such as social support, work ethic, and work satisfaction were not measured in the present study but may, nevertheless, influence return to work as well.

In sum, the results of the present study corroborate previous findings and demonstrate that the length of disability, a history of spinal surgery, and an attitude of malaise and passivity increase the risk of poor outcome in terms of complete return to work. Objective physical measures seem to be of little relevance for the prediction of outcome in terms of return to work. Decreased pain report and self-perceived disability are, however, closely related to a successful return to work. The challenge remaining for clinical practice, now, is how to decrease subjective feelings of disability.

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