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Research Article

Effectiveness of a Multidisciplinary Occupational Training Program for Chronic Low Back Pain

A Prospective Cohort Study

ABSTRACT

Koopman FS, Edelaar M, Slikker R, Reynders K, van der Woude LHV, Hoozemans MJM: Effectiveness of a multidisciplinary occupational training program for chronic low back pain: A prospective cohort study. *Am J Phys Med Rehabil* 2004;83:94–103.

Objective: To evaluate the effectiveness of a 12-wk multidisciplinary occupational training program for patients with chronic low back pain and to identify prognostic factors for treatment success.

Design: A total of 51 participants were evaluated at baseline, at discharge, and at 1 yr after conclusion of the program. The evaluation included a physical examination and assessment of functional disability, psychological factors, and coping styles. The main target of the program is full work resumption. The central outcome measures therefore are three variables on return to work.

Results: Analysis of variance for repeated measures revealed significant beneficial changes during the program for all measures except for several coping-style variables. The acquired level of maximum oxygen uptake, trunk flexibility, functional disability, and catastrophizing were maintained at 1-yr follow-up. At 1-yr follow-up, >60% of the participants had fully returned to work, which is an increase of >40% compared with baseline. Regression analyses showed that sex, age, the baseline values of reinterpretation of pain sensations, and functional disability and changes in trunk flexibility scores during the program are important prognostic factors for complete return to work.

Conclusions: Based on the current findings, the program seems to be efficacious in the short term. Future attention must be directed toward maintaining these results, although work resumption rates improved considerably 1 yr after conclusion of the program.

Key Words: Chronic Low Back Pain, Multidisciplinary Training Program, Return to Work, Prognosis

Low back pain (LBP) among the Dutch working population is an important research topic, not the least because of the increasing costs related to LBP and the increasing responsibilities of employers for the health of their employees. The 12-mo prevalence of LBP for the working population is 44.4% for men and 48.2% for women.[1] Chronic LBP (lasting longer than 3 mos) was reported by 16.0% of men and 17.9% of women. LBP tends to disappear spontaneously over time. Recovery rates of about 80–90% within approximately 6 wks have been reported.[2] The total cost of LBP in the Netherlands in 1991 was estimated at 4.3 billion Euros, which is 1.7% of the gross national product.[3] The major part (92%) is spent on indirect costs caused by sickness absence and prolonged disability, whereas the direct medical costs contributed only 7%.

From a meta-analysis on the efficacy of multidisciplinary treatment programs for chronic LBP, Flor and Turk[4] concluded that this kind of treatment is superior to treatments based on a single discipline, such as medical or physical therapy. A systematic review[5] demonstrated that intensive (>100 hrs of therapy) multidisciplinary biopsychosocial rehabilitation with functional restoration produces greater improvements in pain reduction and function than less intensive multidisciplinary or nonmultidisciplinary rehabilitation or usual care programs. There was, however, conflicting evidence regarding the actual vocational outcome of these intensive programs.

Because return to work (RTW) and not pain reduction has become the primary goal in many treatment programs for chronic LBP patients, RTW rates have become an important outcome measure. There seems, however, to be a large variety in research results on RTW rates. A meta-analysis[6] on RTW after a multidisciplinary team approach in chronic pain showed that the proportions of patients working at follow-up varied between 6%[7] and 92%.[8] Different inclusion criteria and varying definitions for RTW and legislation and cultural differences may have influenced these results.[9]

Personal characteristics are identified as important independent variables that are associated with treatment success (e.g., RTW). However, the scientific evidence concerning this relationship is ambiguous.[10] Van der Giezen et al.[11] suggest that this can be explained by differences in study populations. If duration of sickness absence increases, some predictive characteristics can change in strength and nature.[12,13]

Only a few studies have related changes in treatment variables to work resumption. Analysis of prognostic factors that can explain the change in work resumption as a consequence of intervention programs can provide more insight in the working mechanisms of the program in the light of RTW.

The Institute of Vocational Assessment and Education, which is part of the Rehabilitation Center Heliomare (Wijk aan Zee, The Netherlands), developed a multidisciplinary occupational training program for workers who are (partly) on sick leave because of chronic LBP. The main objective of the program is complete RTW. Preliminary research on the efficacy of this training program showed significant improvement in physical fitness during the program.[14] The objective of the current study was to gain insight into the effects of the training program on the short and long term in the treatment variables (efficacy) and in the final outcome measure RTW (effectiveness). In addition, an analysis of prognostic factors for treatment success in terms of complete RTW was conducted.

METHODS

Subjects. This study included participants with chronic LBP who were admitted to the training program from June 1998 to April 2001. Based on the inclusion criteria of the program, participants were selected by occupational physicians or medical advisors of an insurance company. After this first selection, the researchers checked inclusion and exclusion criteria for participation in the program of each individual. Eligible subjects were asked to sign an informed consent. The inclusion criteria for participation in the program were LBP for >6 mos, age between 20 and 60 yrs, having undergone previous treatments with unsatisfactory results, sufficiently motivated to participate in the program, some positive expectation for RTW after the program, and finally, the approval of the insurance company and employers to follow the program. The exclusion criteria for participation in the program were: presence of a progressive illness, mental disorder or low intelligence (less than primary school and 3 yrs of secondary education and inability to complete the questionnaires), or inability to travel. A total of 68 participants were initially included to attend the training program.

Treatment. In the training program, several disciplines collaborated in a team approach: an occupational physician, a psychologist, a physical therapist, and a physical education instructor. The program had a duration of 12 wks, with a frequency of three sessions a week, approximately 6 hrs a day. The program was group based. Each session, a group of six to ten patients took part in the program. A major part of the program consisted of physical reconditioning and was based on the Graded Activity principle,[15] following an operant conditioning approach,[16] and on graded exposure,[17] following a classical conditioning approach. The objective of physical reconditioning was to reverse the process of deconditioning.[18] This was achieved by means of different treatment modalities (i.e., physical fitness training, functional

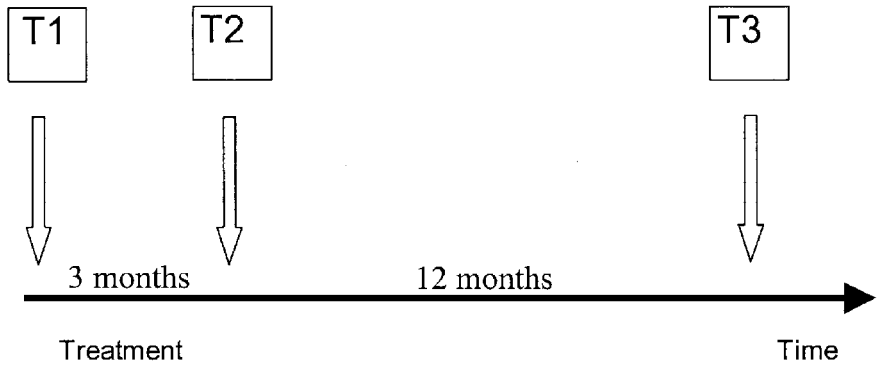

Figure 1: Study design. *T1*, baseline measurement; *T2*, measurement at discharge from the program; and *T3*, measurement at 12-mo follow-up.

training, recreation, hydro training, and stretching). Besides physical reconditioning, attention was paid to group and individual counseling. The main objective of group counseling was reduction of fear and the coping with pain. The method used to achieve this was cognitive therapy.[19,20] Once a week, the participant had an individual counseling session in which progress was monitored and questions with regard to the program were answered. Relaxation training was carried out two times a week and was aimed at pain reduction and pain control by means of physical and cognitive relaxation. Partners were invited to join the participant in a partner program, which consisted of three meetings.

Procedure. The measurement strategy was designed to gain insight into the efficacy (i.e., the supposed change in variables that are trained during the program) and effectiveness (i.e., the actual desired RTW) of the training program. Participants were examined at the beginning of the program (T1), at discharge from the program after 12 wks (T2), and at the 12-mo follow-up (T3) (Fig. 1).

At baseline, the duration of sickness absence, the duration of complaints, and job satisfaction were assessed. Job satisfaction was measured with a subscale of the Work Experience and Judgment Scale.[21] The other variables were assessed at T1, T2, and T3. At these moments, several aspects of physical fitness were measured. The strength of the trunk flexors and extensors were determined by means of an isokinetic test (Biodex System 2, Shirley, New York). Outcome measures were total work (measured in newton per meter) for flexion and extension at a movement speed of 30 degrees/sec. A submaximal cycle ergometer test[22] was applied to predict the age and sex-specific maximum oxygen uptake ($o_2$max, measured in liters per minute). Trunk flexibility (measured in centimeters) was assessed by use of a sit-and-reach test,[23] and the levels of functional status were measured with the Dutch version of the Quebec Back Pain Disability Scale.[24]

Several personal characteristics were assessed at T1, T2, and T3. Generalized fear and depression were determined with two scales of the Dutch translation of the Symptom Checklist.[25] In addition, the total score on the Symptom Checklist, which expresses psychoneuroticism, was determined. The Dutch version of the Coping Strategy Questionnaire[26] determined whether there was a change in the participant's coping strategies. The questionnaire is divided into eight dimensions, of which two are appraisal processes (catastrophizing and perceived pain control), four dimensions are concerned with active coping strategies (denial of pain, positive self-approach, reinterpretation of pain sensations, and becoming more active), and two dimensions are passive coping strategies (praying and hoping and distracting attention).

The assessment was completed with three measurements on RTW. First, the number of hours a participant was working each week is described. Because this measure includes both full-time and part-time working participants, it is not possible to determine what amount represents full RTW. Therefore, the second measure for RTW was the number of hours worked per week at the time of measurement compared with the number of hours worked per week at appointment (percentage work of initial appointment). This measure is expected to provide more insight into overall work resumption. To complete the description of RTW, a categorical variable is used in which work status is divided into "resumers," "partly resumers," and "nonresumers." Work resumption includes return to the old job without adaptations, return to the old job with temporary or permanent adaptations, return to a new job, and RTW on a therapeutic basis. Finally, an additional assessment on work status was performed 6 mos after discharge of the program in which participants received a short questionnaire (Tquest).

Statistical Analyses. For the analyses of treatment efficacy, parametric statistics (analysis of variance for repeated measurements) were used. The within-subjects factors in these analyses were the three different time measurements (T). When overall time effects were statistically significant, pair-wise comparisons between pretest (T1), posttest (T2), and follow-up (T3) were made with adjustments for multiple comparisons (Bonferroni). In case of an interaction effect between time and sex, treatment effects were determined for men and women separately.

Participants who reported no sickness absence at T1 were excluded from the analyses on prognostic fac-

TABLE 1
Dropout analyses

	Participating in All Three Measurements, $n = 51$	Not Participating in All Three Measurements, $n = 17$	P Value
Sex, % (n)			0.09
Men	58.8 (30)	35.3 (6)	
Women	41.2 (21)	64.7 (11)	
Age, yrs (SD)	41.7 (8.5)	39.9 (10.2)	0.53
Education, % (n)			0.29
Low	51.0 (26)	41.2 (7)	
Intermediate	33.3 (17)	52.9 (9)	
High	15.7 (8)	5.9 (1)	
Duration of complaints, mos (SD)	76.5 (102.6)	58.5 (77.9)	0.56
Absence from work, mos (SD)	12.2 (15.1)	8.5 (6.8)	0.89
Job satisfaction, % (SD)	83.7 (19.6)	67.6 (25.6)	0.01

tors for treatment success. Three steps were taken to determine the effect of baseline variables and variables of change on the probability of a participant working at 1-yr follow-up. The analyses were performed on the baseline variables sex, age, education, duration of complaints, duration of sickness absence, job satisfaction, the baseline values of the treatment variables, and the variables of change, which were formulated as the differences in treatment variables between T1 and T2.

First of all, independent t tests were performed to select variables that significantly distinguished participants working at follow-up from participants not working at follow-up. The selection criterion for this first step was set at $P < 0.20$. The baseline variables sex, age, duration of sickness absence, total work extension, predicted $o_2$max, functional disability, generalized fear, denial of pain, reinterpretation of pain sensation, distracting attention, psychoneuroticism, and changes in the variables trunk flexibility, generalized fear, denial of pain, positive self-approach, reinterpretation of pain sensations, distracting attention, and psycho-neuroticism significantly distinguished participants working at follow-up from participants not working at follow-up.

In the second step, correlation coefficients among the selected variables of step one were calculated to prevent multicollinearity. When a correlation coefficient between two variables of >0.4 was calculated, one of these variables was randomly excluded from further analyses. The baseline variables total work extension and predicted $o_2$max were highly correlated with sex. Total work extension was highly correlated with predicted $o_2$max. Generalized fear correlated highly with psychoneuroticism, and reinterpretation of pain sensations correlated highly with distracting attention. Consequently, only seven baseline variables were eventually included in the final step (i.e., sex, age, duration of sickness absence, functional disability, generalized fear, denial of pain, and reinterpretation of pain sensations). With respect to the variables of change, changes in denial of pain and distracting attention were highly correlated with positive self-approach. Changes in generalized fear were highly correlated with changes in psychoneuroticism. Eventually, four variables of change were selected for the final step (i.e., trunk flexibility, generalized fear, positive self-approach, and reinterpretation of pain sensations).

Finally, two multiple logistic regression analyses (forward stepwise method [likelihood ratio test]) were performed to determine the baseline variables and variable of change, respectively, that best predict complete RTW. The independent variables were the remaining baseline variables in the first regression analyses and the changes in treatment variables in the second regression analyses. The dependent variable was dichotomous: full work resumption (resumers at T3) *vs.* no full work resumption (partly resumers and nonresumers at T3). Odds ratios and 95% confidence intervals were calculated to determine the association between treatment variables and full work resumption. $P < 0.05$ was considered statistically significant. Data were analyzed using SPSS (version 10.0, SPSS, Chicago, IL).

Final Subjects. From the initial 68 participants, four participants (5.9%) dropped out during the program and 13 participants (19.1%) were lost in the follow-up period. The group that completed the program and participated in all three measurements was compared with those who did not with regard to sex, age, education, duration of complaints, duration of sickness absence, and job satisfaction ($P < 0.05$) (Table 1). Participants who completed all three measurements had a significantly higher job satisfaction at T1. No significant differences were found in any of the other variables.

Only the data of the participants who completed the program and participated in all three measurements were used in the analyses. Of those 51 participants, 21 were women. The mean age of the whole group was 41.7 yrs. The educational level showed that 26 participants completed primary and lower secondary education (low), 17 completed upper

secondary or lower tertiary education (intermediate), and only eight participants completed upper tertiary education (high). The mean duration of complaints was 76.5 mos (range, 6 to 545 mos), and the mean duration of sickness absence was 12.2 mos (range, 0 to 77 mos). Mean score on the scale job satisfaction was 83.7% (SD, 19.6%), with higher percentages indicating higher job satisfaction.

RESULTS

Efficacy. Table 2 gives an overview of treatment effects for the short (T2) and long terms (T3). In comparison with baseline scores (T1), participants showed significant improvements on the physical measures of muscular strength, predicted $o_2$max, and flexibility at discharge of the program (T2). The acquired level of predicted $o_2$max and flexibility was still present at the 1-yr follow-up (T3). The interaction effect found for predicted $o_2$max between time and sex indicates that men had a significantly larger increase in predicted $o_2$max during the training compared with women. The interaction effect found for trunk flexibility indicates that men had a significantly larger increase in trunk flexibility during the program than women. Functional disability showed a significant reduction during the program. This reduction was still significant at 1-yr follow-up compared with baseline.

As was the intention of the program, the psychological measures of generalized fear, depression, and psychoneuroticism showed a significant reduction during the program. Finally, for changes in coping styles, different effects were found. Reinterpretation of pain sensations increased significantly during the program, whereas catastrophizing showed a significant reduction during the program, which was still significant after 1 yr. Praying and hoping showed a small but significant reduction from baseline to 1-yr follow-up. No interaction effects between time and sex were found in these measures.

Effectiveness. Table 3 provides an overview of the RTW measures. The results showed that the work resumption rates had the largest improvements in the follow-up period. More than 70% of the total population had returned to work at the 6-mo follow-up and >40% resumed completely. At the 1-yr follow-up, almost 85% had returned to work and >60% had resumed work completely, which is an increase from baseline of >40%.

Prognostic Variables for RTW. The results of the multiple, stepwise, logistic-regression analyses are presented in Table 4. The first regression model, with the significant baseline variables as independent variables, included the factors sex, age, reinterpretation of pain sensations, and functional disability pretreatment. Men, younger participants, participants with lower functional disability, and participants who were using the coping strategy of reinterpretation of pain sensations more often had a higher chance of work resumption at T3. The model correctly classified 79% of the employees who were not working at T3 and 86% of those working at T3. The overall accuracy is 83%.

The only factor that was included in the second model, with the variables of change as independent variables, was trunk flexibility. Participants who showed a large increase in trunk flexibility during the program had a higher chance of work resumption at T3. The model correctly classified 69% of the employees who were not working at T3 and 62% of those working at T3. The overall accuracy of the model is 65%.

DISCUSSION

Efficacy. One purpose of this study was to gain insight into the short- and long-term effects of the multidisciplinary training program on treatment variables. The results demonstrated that the training program seems to be efficacious in the short term, but the long-term results must be improved. Participants showed significant improvements in muscular strength during the training, but these effects could not be maintained at the 1-yr follow-up. It seems that the specific exercises for increasing trunk muscle strength offered during the program are highly efficacious but that participants do not continue these exercises, even less intensively, after conclusion of the program. Also, predicted $o_2$max and trunk flexibility improved significantly during the training, and these effects could be maintained at 1-yr follow-up. Using the classification tables from Åstrand and Rodahl,[22] it can be deduced that the mean $o_2$max of men can be classified as "somewhat low" at T1 and as "average" at T2 and T3. Mean scores on $o_2$max for women can be classified as average on all three measurements. Comparing the scores on trunk flexibility with reference values,[27] it seems that both men and women can be classified as somewhat low at T1 and as average at T2 and T3. In summary, the results suggest that participants maintained their level of physical fitness after discharge from the program.

Self-reported functional disability showed a significant reduction during the program, and this effect could be maintained at 1-yr follow-up. The minimum clinically important difference for the Quebec Back Pain Disability Scale is estimated at 15 points.[28] Reduction in disability scores in this study were 14 points between T1 and T2 and 12 points between T1 and T3. This indicates that in order for the majority of the study population to achieve clinically important improvements with the program, the reduction in functional disability must further increase. This may require a refocus onto functional

TABLE 2

Treatment efficacy: changes in treatment parameters; results of analysis of variance for repeated measurements (n = 51)

	T1	T2	T3	Statistic, *F*	Mean Dif T2–T1	95% CI LB UB	Mean Dif T3–T1	95% CI LB UB	Mean Dif T3–T2	95% CI LB UB
Muscular strength										
Total work flexion, N/m	742.3 (226.2)	843.0 (229.4)	783.5 (261.8)	13.5[a]	100.7[a]	52.1 149.3	41.2, NS	−2.8 85.2	−59.5[b]	−7.3
Total work extension, N/m	1463.6 (573.0)	1751.6 (567.1)	1503.3 (530.9)	20.6[a]	288.1[a]	170.7 405.4	39.7, NS	−93.4 172.8	−248.4[a]	−359.5 −137.2
Cardiovascular fitness										
Predicted O_2max, l/min	2.19 (0.63)	2.54 (0.67)	2.55 (0.68)	25.2[a]	0.36[a]	0.23 0.49	0.37[a]	0.17 0.57	0.01, NS	−0.20 0.22
Men	2.39 (0.64)	2.84 (0.58)	2.71 (0.72)	20.3[a]	0.45[a]	0.27 0.62	0.33[b]	0.01 0.60	−0.12, NS	−0.37 0.13
Women	1.85 (0.45)	2.06 (0.52)	2.29 (0.52)	8.2[c]	0.21[b]	0.01 0.42	0.44[c]	0.10 0.78	0.23, NS	−0.15 0.60
Trunk flexibility, cm	22.0 (11.5)	28.7 (9.8)	27.3 (9.5)	34.3[a]	6.7[a]	4.5 8.9	5.3[a]	3.0 7.7	−1.4, NS	−3.2 0.5
Men	19.2 (12.1)	27.4 (10.7)	26.3 (10.1)	31.9[a]	8.3[a]	5.3 7.2	7.1[a]	3.9 5.2	−1.1, NS	−3.5 1.5
Women	26.7 (8.9)	30.8 (7.8)	29.0 (8.4)	6.5[c]	4.17[c]	1.2 7.2	2.3, NS	−0.6 5.2	−1.8, NS	−5.2 1.5
Functional disability, QBPDS (range, 0–100)	39.4 (13.9)	25.5 (13.6)	27.4 (17.0)	34.0[a]	−13.9[a]	−18.1 −9.6	−12.0[a]	−16.8 −7.1	1.9, NS	−2.5 6.3
Generalized fear, SCL-90 (range, 10–50)	14.4 (3.8)	12.7 (2.1)	13.8 (5.4)	6.85[c]	−1.8[c]	−3.0 −0.6	−0.7, NS	−2.46 1.0	1.1, NS	−0.6 2.8
Depression, SCL-90 (range, 16–80)	24.0 (6.0)	21.2 (5.2)	23.2 (8.1)	7.03[c]	−2.8[c]	−4.7 −0.9	−0.9, NS	−4.0 2.2	2.0, NS	−1.0 5.0
Psychoneuroticism, SCL-90 (range, 90–450)	135.6 (26.5)	119.0 (20.6)	124.2 (39.4)	16.35[a]	−16.6[a]	−23.8 −9.4	−14.1, NS	−25.6 2.8	5.2, NS	−7.4 17.8
Coping styles, CSQ (range, 0–10)										
Catastrophizing	3.20 (1.77)	2.20 (1.60)	1.94 (1.70)	11.1[a]	−1.00[a]	−1.57 −0.43	−1.26[a]	−2.00 −0.53	−0.26, NS	−0.83 0.31
Perceived pain control	4.68 (2.60)	4.78 (2.51)	5.40 (2.63)	1.83, NS	—	—	—	—	—	—
Denial of pain	4.17 (1.97)	4.41 (2.08)	4.54 (2.38)	0.75, NS	—	—	—	—	—	—
Positive self approach	5.61 (1.74)	5.96 (2.02)	5.50 (2.00)	2.14, NS	—	—	—	—	—	—
Reinterpretation of pain sensations	1.98 (1.67)	3.01 (2.29)	2.40 (2.01)	7.61[c]	1.03[a]	0.41 1.66	0.43, NS	−0.23 1.08	−0.61, NS	−1.31 0.01
Praying and hoping	3.54 (1.91)	3.18 (2.25)	2.79 (2.35)	4.52[b]	−0.36, NS	−0.99 0.26	−0.75[b]	−1.42 −0.01	−0.39, NS	−0.96 0.17
Distracting attention	3.27 (2.27)	3.99 (2.36)	3.37 (2.28)	4.03[b]	0.72, NS	−0.01 1.47	0.01, NS	−0.57 0.77	−0.62[b]	−1.23 −0.01
Becoming more active	4.40 (2.08)	4.43 (2.18)	4.16 (2.21)	0.91, NS	—	—	—	—	—	—

T1, baseline; T2, 12 wks after beginning of the program; T3, 1-yr follow-up; Mean Dif, mean difference; CI, confidence interval; LB, lower bound; UB, upper bound; NS, not significant; QBPDS, Quebec Back Pain Disability Scale; CSQ, Coping Strategy Questionnaire; SCL-90, System Checklist 90.

Data are presented as mean (SD).

[a] $P < 0.001$.

[b] $P < 0.05$.

[c] $P < 0.01$.

TABLE 3
Return to work (n = 51)

	T1	T2	Tquest	T3
Hours of work per week, mean (SD)	13.7 (12.9)	17.2 (13.1)	23.5 (14.7)	25.3 (14.2)
Percentage work of appointment, mean (SD)	41.3 (37.3)	51.6 (37.7)	69.0 (41.2)	76.7 (39.6)
Work status, n (%)				
Resumers	9 (17.6)	11 (21.6)	21 (41.2)	31 (60.8)
Partly resumers	25 (49.0)	27 (52.9)	16 (31.4)	12 (23.5)
Nonresumers	17 (33.3)	13 (25.5)	14 (27.5)	8 (15.7)

T1, baseline; T2, 12 wks after beginning of the program; Tquest, 6 mos after discharge; T3, 1-yr follow-up; Percentage work of appointment, number of hours of work per week at measurement/number of hours of work per week at the appointment × 100; Resumers, number of hours of work per week at the time of measurement = number of hours of work per week at the appointment; Partly resumers, number of hours of work per week at the time of measurement is >0 and less than the number of hours of work per week at the appointment; Nonresumers, number of hours of work per week at measurement = 0 hrs.

disability within the intervention program.

The psychological measures showed significant reduction during the program. However, the results of the follow-up period were not consistent, indicating no significant increase in these measures during the follow-up period. On the other hand, the reduction in these measures was not significant between T1 and T3. Compared with the normal population, the results indicate that men score above average on generalized fear at all measurements, "high" on depression and psychoneuroticism at T1 and T3, and above average for depression and psychoneuroticism at T2. Women score above average on generalized fear, depression, and psychoneuroticism at T1 and average at T2 and T3. It seems that the program needs improvement, especially for men, to ensure that the reduction in psychological measures is clearly maintained over a long period of time.

For coping styles, variable effects were found. As hypothesized, reinterpretation of pain sensations showed a significant improvement, and catastrophizing showed a significant reduction during the program. The reduction in catastrophizing could be maintained at 1-yr follow-up. Praying and hoping showed a small but significant reduction from baseline to 1-yr follow-up. Compared with reference values for chronic LBP patients, it can be concluded that the results on coping styles found at T1 are average (decile-score, 5) or somewhat below average (decile-score, 4). The results on coping styles at T2 and T3 vary from decile-score 3 from 6 and from 3 to 7, respectively. It can be concluded that the program is successful in reducing the level of catastrophizing but that attention must be directed at improving the participant's level of perceived pain control.

TABLE 4
Predictors for full work resumption at the 1-yr follow-up: results of a multiple logistic regression analyses (n = 42) with a dichotomous dependent variable, full work resumption (n = 22) vs. no full work resumption (n = 20)

		95% CI for OR			
	OR	LB	UB	Model χ^2	Cases Classified Correctly, %
Predictors (baseline variable)					
Sex				20.2	83
Men	1.00	—	—		
Women	0.10	0.01	0.77		
Age, yrs	0.89	0.80	0.99		
Reinterpretation of pain sensations	2.10	1.07	4.13		
Functional disability	0.94	0.88	1.00		
Predictors (variable of change)					
Trunk flexibility	1.17	1.01	1.34	6.07	65

OR, odds ratio; CI, confidence interval; LB, lower bound; UB, upper bound.

Because the importance of the other coping strategies is unclear,[29] it is not recommended to put more effort into influencing them.

Overall, to improve the program, more attention must be directed at long-term behavioral change. It is expected that by increasing the program duration and intensifying the frequency of meetings during follow-up, the chance of permanent behavior change increases. Furthermore, it is recommended to implement individual specific treatment strategies taking into account the participant's psychosocial characteristics and the participant's "stage of change."

Effectiveness. The additional assessment on work status half a year after discharge from the program (Tquest) was performed because the validity of the work status measure at T2 was questionable. The T2 measurement took place on the last day of the program. It seems logical that because the participants followed an intensive training program, work resumption could only begin from that time on. Almost 85% of the total population had returned to work 1 yr after conclusion of the program, and >60% of them resumed completely. However, approximately 18% of the population had no sickness absence before treatment. Most of these participants had short periods of sickness absence because of LBP complaints. The main purpose of the program for these participants was prevention of relapse. Results showed that those 18% were still working their full amount of hours at the 1-yr follow-up.

Because this study did not have a controlled design, it is not justified to relate conclusions about the changes in treatment variables and RTW rates with the treatment itself. Time effects and confounding variables could have influenced the results. Because the duration of sickness absence and the duration of complaints were generally much longer than the duration of the training program, time effects seemed not to exist. The possibilities of comparing the results of this study with the results of other studies in which participants received no treatment or other forms of treatment were sorted out. A study that has been used as the reference group, by Vendrig and van Akkerveeken[30] examined work resumption of LBP patients in the Netherlands.[31] This reference group counted 107 participants with complete sickness absence at the time of measurement and with a sickness absence duration of 1 yr, which is comparable with the mean duration of sickness absence of 12.2 mos in the current study. Twenty-eight percent of these 107 participants had full work resumption at 1-yr follow-up, compared with 53% (including only the participants who had complete sickness absence pretreatment) in this study. It seems, therefore, that the training program is more effective in terms of work resumption than usual care, although different forms of bias should be taken into account.[30] The participants in this study, for example, were selected on their motivation to participate in the program and were only included when a possibility for reintegration to work after discharge from the program was expected. On the other hand, this group had undergone previous treatments with unsatisfactory results, and they had psychosocial problems besides pain complaints.

A disadvantage of the current study is the fact that only factors of functional capacity and not functional (work) demands were evaluated because this information is also needed to explain why participants do or do not resume their work. Also, work-related interventions, like workplace adaptation, job redesign, change of work place, and therapeutic work resumption and disincentives and incentives like dismissal and benefit withdrawal are not specified. Furthermore, the data on sickness absence and RTW rates were self-reported. It is probably more valid to collect these data from company records. In this manner, insight is given in the course of these data with possible relapses.

Prognostic Variables for RTW. An additional purpose of this study was to identify indicators that would predict treatment success (i.e., complete RTW at 1-yr follow-up). It seems within the above-mentioned limited set of available determinants that sex, age, reinterpretation of pain sensations, and functional disability at T1 are important predictors for complete RTW. In accordance with this study, Cuelenaere et al.[31] concluded that work resumers are younger, more often men, and experience less functional limitation, but most of the participants in their study did not receive multidisciplinary treatment. It can thus not be concluded that participants with these characteristics benefit more from this program because it seems that without a treatment, they also have higher RTW rates. It must be noted that the predictor sex can be replaced by total work extension and predicted $o_2$max and that reinterpretation of pain sensations can be replaced by distracting attention because these measures are highly correlating, and therefore, no statistical distinction can be made between them. The ethical question remains whether it is justified to omit patients from treatment when the screening procedure points out that there is a small chance of treatment success. It is recommended to investigate whether other programs are more suitable or whether the concerned program can be adapted for these patients.

Improvement in trunk flexibility seems to be the only significant variable of change for work resumption. Participants who show larger improvements in flexibility scores have a higher chance of work resumption. Because it is unclear whether this is a direct causal relationship, the question remains whether more attention should be directed at directly improv-

ing trunk flexibility. Because the approach of relating changes in treatment variables with work resumption is relatively new, it was difficult to support the findings of the regression analyses on variables of change with other studies. Hildebrandt et al.[32] and Vendrig[33] found a decrease in subjective disability, depression, and pain report to be predictive of work resumption.

Dropout. The relatively high number of participants lost in follow-up may be explained by the high demand that was put on them. Participants had to come to the rehabilitation center on a weekday between 9 a.m. and 5 p.m., and the screening took approximately 3 hrs. The participants who did not complete the follow-up were contacted by telephone and were asked for their reasons not to participate in the follow-up. The main reason was "no time," "moved out," and "pregnancy." The reasons for dropping out during the program were not directly related to the program. Two participants had a medical contraindication (intestinal and rheumatic complaints) for continuing the program, one participant had psychiatric complaints, and one participant had social problems. Taking these aspects into consideration, and the fact that only for job satisfaction, which is not a prognostic variable for treatment effectiveness, were differences found between the group that completed all measurements and the group that did not, it seems that the dropout did not have a large influence on the results of this study.

CONCLUSION AND RECOMMENDATIONS

This study demonstrated that the program seems to be efficacious in the short term and that future attention must be directed at maintaining these results, although work resumption rates improved considerably 1 yr after conclusion of the program.

A major difficulty in the evaluation of multidisciplinary treatment programs is the combination of and relationships among the different program components. In this study, the program was evaluated in its entirety. No insight is gained into the effectiveness of the individual components, and recommendations for program improvement are therefore hard to give at this stage. An optimal evaluation would be a randomized clinical trial in which the effect of each component individually and in combination with other components is examined. In this manner, also, the working mechanisms of the program's individual components could be investigated because other parts of the program could not have an interfering effect. Further research is needed to gain more insight into the working mechanisms of the program. It is recommended to cooperate with other Dutch centers that offer programs comparable with the training program because, in this manner, larger study groups can be created, preferably in the design of a randomized, controlled trial.

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Book Review

Splinting the Hand and Upper Extremity: Principles and Process by MaryLynn A. Jacobs, MS, OTR/L, CHT, and Noelle M. Austin, MS, PT, CHT. Published by Lippincott Williams & Wilkins, Philadelphia, PA, 2003, 498 pages, $59.95. ISBN: 0-683-30630-8.

This book provides a comprehensive summary of splinting, casting, and taping management for upper extremity diagnoses. The majority of the authors are therapists, although there is a chapter written by a hand surgeon and nurse. The main target audience for this textbook is clearly therapists. However, the information contained in the book is fundamental for those who specialize in the management of the upper extremity and hand. There are four sections in this book. Section 1 reviews splinting fundamentals (including splint classification, anatomic and mechanical principles, and information on tissue healing as it pertains to splinting). Section 2 discusses splint fabrication. Section 3 covers additional optional methods of splinting (casting, taping, and Neoprene and Prefab splints). Section 4 discusses splinting for specific diagnoses and populations.

Overall, this book is well written and has comprehensive photographs and illustrations, which are very useful in the understanding of this topic. Therapists who are involved in splinting patients will find section 2 particularly valuable, as it includes many clinical pearls, as well as a detailed description of the splint fabrication process for a variety of basic and complex splint designs. This book provides excellent coverage of splinting techniques for the hand and upper extremity and should be essential reading for therapists who treat upper extremity and hand disorders. Physicians may find that some of the in-depth design details of splint fabrication are not pertinent to their practice.

Book Rating: ☆☆☆☆

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