

ORIGINAL REPORT

## IMPROVED WORK ABILITY AND RETURN TO WORK FOLLOWING VOCATIONAL MULTIDISCIPLINARY REHABILITATION OF SUBJECTS ON LONG-TERM SICK LEAVE

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**Objective:** To evaluate a vocational multidisciplinary rehabilitation programme for patients on long-term sick leave with respect to their work ability and return to work.

**Methods:** A multidisciplinary rehabilitation programme was administered to an intervention group of 183 patients on long-term sick leave (mean 12.2 months). Effects of the treatment were compared with a control group ( $n = 96$ ) recruited from the national sickness insurance record of patients on sick leave of 6–12 months duration (mean 11.5 months). Perceived work ability, return to work, background factors and psychosocial aspects of work were assessed on the basis of questionnaires at baseline and after 4 months.

**Results:** Perceived work ability of the intervention group improved significantly after 4 months compared with the control group ( $p < 0.01$ ). In the intervention group, 80% had returned to work compared with 66% in the control group ( $p = 0.06$ ). Return to work after 4 months was predicted by good work ability at baseline, improved work motivation, improved work ability at follow-up and increased rumours of change in the workplace ( $R^2$  26.1–38.6%,  $p < 0.05$ ).

**Conclusion:** This multidisciplinary rehabilitation programme significantly improved perceived work ability compared with treatment as usual.

**Key words:** rehabilitation, work ability, return to work, multidisciplinary, psychological and social factors at work.

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### INTRODUCTION

Musculoskeletal disorders and psychological health problems place a considerable burden on healthcare resources and are a significant cause of long-term sick leave and disability (1, 2). Over the past 3 decades, research on return to work (RTW) has led to advances in understanding of the RTW process and significant determinants for RTW (3). There has been a shift from medically determined models to greater emphasis on the importance of the function of the individual and the workplace, as well as medical, economic and social factors (4). Low levels of education, unskilled work, female gender and high age are related to low RTW in most studies. Work-related factors, such

as negative attitudes towards work, lower job satisfaction and adverse psychosocial working conditions, also influence the employees' decisions to RTW or early retirement (5–7). A positive perception of work ability has predicted shorter duration of sick leave, later retirement and a high rate of RTW (8–11).

Multidisciplinary rehabilitation programmes are supposed to improve health and RTW, particularly in the case of severely disabled patients with chronic back pain (12–14). However, in spite of the increasing use of these resource-demanding rehabilitation programmes, there is limited knowledge about their effects. Few studies evaluating the effects of multidisciplinary rehabilitation programmes have included a follow-up on the work situation through close contact with the workplace, although there is evidence that workplace-based RTW interventions may reduce work disability duration (15).

In this study, a vocational multidisciplinary rehabilitation programme was hypothesized to be superior to treatment as usual, based on knowledge of the importance of multidisciplinary treatment, goal setting, motivational factors and work-related factors for RTW in patients on long-term sick leave (5–7, 12–21). The aim of this study was to evaluate potential effects of a vocational multidisciplinary rehabilitation programme on patients on long-term sick leave with respect to their work ability and RTW. A number of possible predictors for RTW were investigated.

### METHODS

#### Design

A controlled trial was performed at the in-patient Rauland Vocational Rehabilitation Centre in Norway. The outcome variables were assessed in the intervention group at baseline, at the end of the programme and after 4 months. Corresponding variables were assessed for the control group at baseline and after 4 months. The primary outcome variables were work ability and RTW.

#### Patients

A total of 305 patients being offered rehabilitation at the Rauland Vocational Rehabilitation Centre between May and September 2004 received a written invitation to participate in the trial. Thirty of the 305 patients cancelled their rehabilitation. A total of 183 patients completed a questionnaire at baseline. Five of them interrupted the rehabilitation and were therefore excluded. After 4 months, 148 patients in the intervention group completed the questionnaire.

The control group was recruited from the national sickness insurance record. The record was limited to patients on sick leave of 6–12 months duration, 28,898 in total. To avoid bias for gender, age and diagnosis

between the groups, the control group was recruited randomly and stratified according to these variables, based on statistics at the Rauland Vocational Rehabilitation Centre for the period May–September 2003. In these statistics, 63% were women. Fifty-two percent had a musculoskeletal diagnosis as the main diagnosis, 29% psychological, and 19% other/unspecified. The age distribution showed that 33.7% were below 40 years of age, 34% were between 40 and 50 years and 32.3% were more than 50 years old. Recruitment to the control group was carried out after that of the intervention group. If a patient in the intervention group was also selected for the control group ( $n = 1$ ), a new name from the list was chosen at random. In the control group, 104 of 300 patients answered at baseline. Eight of them did not wish to continue in the study, and it proved impossible to contact a further 7 participants. Sixty-eight patients in the control group completed the questionnaire after 4 months. Informed consent was obtained from all participants. The project was approved by the local medical ethics committee and the National Social Science Data Service in Norway.

#### *Rehabilitation programme*

The multidisciplinary rehabilitation programme lasted for 4 weeks, with 6 hour-long sessions 5 days per week. In addition, patients were given the opportunity to participate in spare-time activities in the evenings. The aim of the multidisciplinary rehabilitation programme was to help patients on long-term sick leave to improve their level of functioning so as to regain and improve their work ability. The centre received patients from primary physicians, National Health Insurance offices, labour market agencies and secondary health services (hospitals). The inclusion criteria at the rehabilitation centre were work motivation and that the patients had an intentional goal and a plan to RTW. Relevant medical examinations and treatment were also to have been performed before admittance to the programme. Exclusion criteria were serious psychiatric disorders or undecided applications for disability pension or insurance. Once a week a team consisting of a doctor, a vocational social worker and a secretary considered applications to the programme. The team decided which patients entering the programme. The multidisciplinary rehabilitation programme included physical activity, education, cognitive behavioural modification and workplace-based interventions.

The patients were introduced to the philosophy of the Rauland Vocational Rehabilitation Centre on the first day of arrival. The fundamental concept is that every individual is responsible for his/her own life and the directions he/she chooses, and is thus free to pursue actions in line with his/her own interests and preferences. The thrust of the programme was 2-fold; firstly, to change the direction of the individual's focus from pain and disability to an increased awareness of his/her own inherent resources, potentials and competences and, secondly, to guide patients towards making independent discoveries regarding the relation of body reactions to cognitive, affective and psychological factors in order to help them reconstruct their ability to control pain and to help them find skills within themselves that enable them to change the way in which they cope with pain and disability.

The multidisciplinary rehabilitation team consisted of a physician, a nurse, a physiotherapist, a vocational social worker and a sports pedagogue. The members of the team introduced themselves as counsellors rather than as therapists or specialists. A structured examination/consultation was carried out on each patient by the team. The patients were given feedback from the examinations, including information and relevant explanations. The multidisciplinary rehabilitation programme was given partly in the form of group activities and partly as individual training and follow-up. The physical group activities included various exercises (outdoor activities, water training, horse riding, spinning, gym and stretching, in total 9.5 hours per week), as well as body awareness training and relaxation training (2 hours per week). Confidence, coping and learning were important objectives for all the physical activities offered. The sports pedagogue and physiotherapist led the various group activities.

The members of the multidisciplinary team were also counsellors in cognitive behavioural modification groups (2 hours per week). Their

counselling methods are based on confluent pedagogical theories (22, 23). Confluent education is based on Gestalt psychology and focuses on learning as a subjective process that involves integration of cognitive and affective elements. The modification groups were based on experience and process-oriented learning. The aim of the method is increased awareness, which is essential for a changing process leading towards RTW. The education sessions involved topics such as awareness of relations between body, emotions and mind, work-related issues, exercise, diet and lifestyle. These sessions (1.5 hours per week) involved all categories of professionals in the multidisciplinary team.

The patients also had 5 hours per week available for training of their own choice. Furthermore, patients could choose to contact team members for an individual follow-up during the 4-week programme. Some were followed up with respect to individual exercise programmes and some had follow-up consultations with the team nurse. Telephone conferences with the company health service and/or work supervisor were carried out in certain cases to negotiate possible job modifications. Discussions were held with some patients concerning the possibility of continuing in the same job as previously, or considering whether re-training was an alternative. This was arranged with the Local Health Insurance office where necessary. At the end of the 4-week programme all patients had consultations with the team members, and patients then formulated their own rehabilitation plan. All the elements described above constituted an integrated and interdependent "package", referred to as the multidisciplinary rehabilitation programme.

The control group was free to select any treatment that might improve work ability. After 4 months, 48 of 69 in the control group described treatments. Sixteen patients reported physical activities. Twelve had been to a physiotherapist or chiropractor. Ten had been in contact with a psychologist or psychiatrist. Ten described changes in the work environment. Two were in job training through labour market agencies. Two underwent a surgical operation of the back. One had completed a rehabilitation programme at the Rauland Vocational Rehabilitation Centre, whilst 2 had completed a rehabilitation programme elsewhere. The former was consequently transferred to and analysed in the intervention group. Additional analyses excluding the 3 patients in the control group on rehabilitation programmes did not change the results of the analyses.

#### *Data collection and outcome measures*

Age, gender, marital status, number of children, education, duration of sick leave, occupation, psychological and social factors at work were registered at baseline for both groups. Self-reported data on work motivation (one question answered in a 5-graded scale from low to high), if they had concrete work goals and plans for work (answer yes/no), undecided applications for disability pensions and results of medical examinations were registered at baseline and after 4 months. Work ability, amount of work, work situation/RTW, type of work and contact with local support were also reported at baseline and after 4 months. Work-related activity was defined as: being at work, lighter work, new job, job training or graded work activity. The non-work category was defined as: sick leave, unemployed, disability pension, student or other situations. Work ability was assessed by the Work Ability Index (24), a self-administered questionnaire comprising 7 items: (i) current work ability compared with lifetime best, (ii) work ability in relation to the physical and psychological demands of the job, (iii) number of current diseases diagnosed by a physician, (iv) estimated work impairment due to diseases, (v) sick leave during the past 12 months, (vi) self-rated prognosis of work ability 2 years from now, and (vii) mental resources. A single score could be obtained for each item. Total scores ranged from 7 to 49, with a higher score indicating greater work ability. The Work Ability Index is a reliable (25) and valid (26) standardized measure of perceived work ability.

Psychological and social factors at work were assessed using questions from The General Nordic Questionnaire for Psychological and social factors at work (QPS Nordic, 27). The QPS Nordic consists of multiple-choice questions relating to the following psychological and social factors at work: job demands and control, role expectations,

predictability and mastery of work, social interaction with co-workers and clients, leadership, organizational climate, interaction between work and private life, work centrality, organizational commitment and work motivation. The QPS Nordic has been validated previously (28). In this study, the short version questionnaire was used (QPS Nordic 34+), in which the QPS indexes were not complete as validated earlier. Extra questions on perception of mastery at work from the full version were included, however.

#### Statistical analysis

All data were checked and analysed using the Statistical Package for the Social Sciences (SPSS version 12). Probability values  $< 0.05$  (2-sided) were considered statistically significant. Analyses of patients invited, participants and drop-outs were performed. Descriptive data for the intervention and control group was determined for baseline characteristics. Differences in characteristics at baseline and after 4 months were tested using  $t$ -tests for continuous data and  $\chi^2$  tests for ordinal data. The QPS Nordic results of the intervention and control group were compared using an independent sample  $t$ -test. The QPS Nordic results of the intervention group were also compared with the mean of a reference material (28) using a 1-sample  $t$ -test. The reference material ( $n = 2010$ ) was QPS data collected from workers in several organizations in the Nordic countries to validate the questionnaire, but in this study the material functioned as standard material for the perception of psychological and social factors at work in active workers.

Repeated measurement variance analysis (ANOVA) was used to compare the change in work ability of both groups. Median values were chosen for single questions in the Work Ability Index with missing values to increase the data amount, as described by Vowles et al (29). Otherwise the total score of the Work Ability Index of that patient could not have been ascertained. Effect size was measured using eta squared at Cohen's scale (30). The dichotomized RTW (yes/no) in the intervention group and control group at baseline and after 4 months was analysed by a  $\chi^2$  test with continuity correction. To screen for RTW predictors, a stepwise forward likelihood ratio logistic regression analysis was used, providing a variable odds ratio with 95% confidence limits, according to Pallant (31). After screening 77 variables in a bivariate model, 20 variables with  $p < 0.25$  were included in the analysis, as described by Lund et al. (7).

## RESULTS

#### Baseline comparison of intervention, control and drop-out groups

There were no differences between the intervention and the control groups with respect to age, gender, marital status, number of children, amount of work, work demands or work motivation (Table I). However, the educational level was higher in the intervention group ( $p = 0.02$ ) and more patients in the intervention group had a concrete goal of RTW ( $p < 0.01$ ). More patients in the control group had undecided applications for disability pension ( $p < 0.01$ ). There were few differences between the intervention and control group with respect to the psychological and social factors at the workplace (Table II). The control group had a higher perception of mastery ( $p = 0.03$ ), and higher role clarity at work than the intervention group ( $p = 0.05$ ). The work demands in the intervention group more often interfered with private life than in the control group ( $p = 0.02$ ).

The background data were mostly similar for the participants and the drop-outs. The exceptions were younger patients who dropped out more often from the control group ( $p = 0.01$ ), and mean duration of sick leave, which was 11.5 months (SD 1.2) among participants in the control group and 11.1 months (SD 2.1) among drop-outs ( $p = 0.02$ ). In the intervention group,

Table I. Background variables for intervention and control groups.

Baseline characteristics	Intervention <i>n</i> (%)	Control <i>n</i> (%)
Women	135 (73.8)	72 (75.0)
Education		
10 years or less	26 (14.2)	23 (24.0)
Secondary school	81 (44.3)	43 (44.8)
Higher education	76 (41.5)	30 (31.3)*
Marital status		
Single	20 (11.0)	11 (11.6)
Married	92 (50.5)	56 (58.9)
Cohabitant	28 (15.4)	15 (15.8)
Divorced	32 (17.6)	9 (9.5)
Widow(er)	4 (2.2)	4 (4.2)
Age (years)		
$< 40$	44 (25.4)	25 (27.2)
40–49	68 (39.3)	31 (33.7)
$\geq 50$	61 (35.3)	36 (39.1)
Amount of work		
100%	125 (71.0)	55 (59.8)
Above 70%	21 (11.9)	16 (17.4)
50–70%	23 (13.1)	13 (14.1)
Below 50%	7 (4)	8 (8.7)
Work demands		
Mainly psychological	46 (25.1)	14 (14.6)
Mainly physical	21 (11.5)	10 (10.4)
Both	116 (63.4)	72 (75.0)
Medical examinations accomplished	101 (63.5)	52 (55.9)
Undecided applications for disability pension	23 (13.5)	31 (33.0)**
Goal to work	147 (82.6)	64 (68.1)**
Concrete plans for work	56 (33.1)	39 (42.4)
Work motivation		
Low	11 (6.0)	10 (10.6)
Moderate	25 (13.7)	14 (14.9)
High	146 (80.2)	70 (74.5)

\* $p < 0.05$ , \*\* $p < 0.01$ .

the duration of sick leave was 12.2 months (SD 10.5) among the participants compared with 15.6 months (SD 14.1) among the drop-outs ( $p = 0.03$ ). However, mean duration of sick leave between the participants in the intervention and control group was comparable.

#### Work factors in the intervention group compared with reference material

The intervention group reported low learning demands, low role clarity, frequent role conflicts, low predictability, low perception of mastery of work, low support from co-workers, low empowering leadership, a poor social climate and a low priority given to human resources at their workplace compared with the reference material (Table II). Support from family and friends were higher in the intervention group, but work often interfered with private life and vice versa.

#### Changes in work ability

Significant changes in work ability were observed both in the intervention and the control group (Table III). The total score on the Work Ability Index was similar for the groups at baseline ( $p = 0.77$ ). After 4 months, both groups had significantly improved their work ability, mainly because the proportion

Table II. Questionnaire at baseline on Psychological and Social factors at work. Indexes for the intervention group, control group and reference material. Significant results are given in bold type.

Category	Intervention	Control	Reference	p-value	p-value
	Mean (SD)	Mean (SD)	Mean (SD)	I-C	I-R
Quantitative job demands	3.4 (1.0)	3.3 (1.0)	3.3 (0.7)	0.39	0.38
Learning demands	3.9 (1.0)	2.3 (0.9)	2.6 (0.7)	0.71	< 0.01
Positive challenges	3.9 (1.0)	3.8 (0.9)	3.9 (0.8)	0.80	0.77
Role clarity	3.9 (1.1)	4.2 (0.9)	4.2 (0.8)	<b>0.05</b>	< <b>0.01</b>
Role conflict	2.4 (1.2)	2.4 (1.2)	2.2 (1.0)	0.85	<b>0.04</b>
Control of decisions	2.9 (1.0)	2.9 (1.0)	2.8 (0.8)	0.84	0.12
Control of pace of work	3.0 (1.2)	2.8 (1.2)	2.8 (1.2)	0.45	0.07
Predictability during next month	3.3 (1.3)	3.5 (1.3)	3.6 (1.3)	0.46	<b>0.02</b>
Perception of mastery	3.8 (0.7)	4.0 (0.6)	3.9 (0.5)	<b>0.03</b>	<b>0.02</b>
Support from superior	3.4 (1.2)	3.5 (1.1)	3.5 (1.1)	0.43	0.14
Support from co-workers	3.5 (1.2)	3.7 (1.1)	3.8 (1.0)	0.20	< <b>0.01</b>
Support from friends/relatives	4.3 (0.9)	4.2 (1.0)	2.6 (1.0)	0.46	< <b>0.01</b>
Empowering leadership	2.9 (1.2)	3.0 (1.2)	2.7 (1.0)	0.76	<b>0.03</b>
Social climate	3.3 (1.0)	3.5 (0.9)	3.7 (0.8)	0.27	< <b>0.01</b>
Innovative climate	3.4 (0.9)	3.4 (1.0)	3.4 (0.8)	0.54	0.91
Priority given to human resources	2.6 (1.0)	2.8 (1.1)	2.8 (0.8)	0.31	<b>0.04</b>
Perception of group work	3.7 (0.7)	3.8 (0.8)	3.8 (0.7)	0.29	0.26
Inequalities	1.8 (1.2)	1.8 (1.2)	1.9 (1.1)	0.79	0.45
Work influences private life	3.3 (1.1)	2.9 (1.3)	2.6 (1.1)	<b>0.02</b>	< <b>0.01</b>
Private life influences work	2.2 (1.2)	1.9 (1.0)	1.8 (0.9)	0.09	< <b>0.01</b>

I-C: comparison of the intervention and control group with independent sample *t*-test; I-R: comparison of the intervention group and the reference material with 1 sample *t*-test; SD: standard deviation.

of patients categorized under “low” work ability was significantly lower after 4 months in both groups (*p* < 0.01). The improved work ability was, however, significantly greater in the intervention group than in the control group (*p* < 0.01). The effect size of the improvement of the work ability in the intervention group was large (0.29), but only moderate (0.07) in the control group. The effect size of the difference between the groups with respect to improvement of the work ability was small to moderate (0.03).

The control group had lower scores at baseline on items 5 and 6, but higher on item 7 in the Work Ability Index, compared with the intervention group. The scores on items 1, 2a and 3 in the Work Ability Index improved significantly more in the intervention group than in the control group from baseline to after 4 months. Regardless of group, individuals with a concrete goal of RTW at baseline showed a significant increase in work ability after 4 months (*p* < 0.01). In contrast, patients with undecided applications for disability pension at baseline,

Table III. Work ability at baseline and after 4 months. Significant results are given in bold type.

	Baseline			After 4 months				
	Intervention	Control	BC	Intervention	Control	FU	FU	FU
Work Ability Index	Mean (SD)	Mean (SD)	I-C	Mean (SD)	Mean (SD)	I	C	I-C
Total score	23.0 (5.8)	22.7 (8.1)	0.77	27.1 (6.0)	24.0 (8.9)	< <b>0.01</b>	<b>0.03</b>	< <b>0.01</b>
1. Compared with lifetime best	3.1 (2.3)	3.4 (2.9)	0.33	5.4 (2.1)	4.0 (3.2)	< <b>0.01</b>	< <b>0.01</b>	< <b>0.01</b>
2a. Physical demands	2.5 (1.2)	2.5 (1.3)	0.92	2.8 (1.2)	2.8 (1.4)	< <b>0.01</b>	<b>0.03</b>	0.55
2b. Psychological demands	3.3 (1.5)	3.1 (1.5)	0.23	3.6 (1.4)	3.3 (1.6)	<b>0.03</b>	0.20	0.79
3. Number of diseases	2.9 (1.6)	3.3 (1.7)	0.07	3.3 (1.7)	3.0 (1.5)	<b>0.01</b>	0.13	<b>0.01</b>
4. Work impairment	2.3 (1.3)	2.3 (1.4)	0.73	2.7 (1.4)	2.4 (1.5)	< <b>0.01</b>	0.59	0.14
5. Sick leave last year	1.6 (1.1)	1.2 (0.6)	< <b>0.01</b>	1.5 (1.2)	1.4 (0.8)	0.75	0.11	0.28
6. Prognosis in 2 years	4.8 (1.9)	4.1 (2.2)	< <b>0.01</b>	5.1 (1.8)	4.2 (2.1)	0.29	0.85	0.61
7. Mental resources	2.5 (0.8)	2.8 (0.9)	< <b>0.01</b>	2.6 (0.8)	2.9 (0.9)	0.06	0.20	0.67
Categories	% (n)	% (n)	BC	% (n)	% (n)	FU	FU	FU
Low 7–27	79.2 (145)	71.9 (69)	I-C	58.1 (86)	56.7 (38)	I	C	I-C
Moderate 28–36	20.2 (37)	21.9 (21)	<b>0.04</b>	34.5 (51)	35.8 (24)	< <b>0.01</b>	< <b>0.01</b>	0.88
Good 37–43	0.5 (1)	6.3 (6)		7.4 (11)	7.5 (5)			
Excellent 44–49	0	0		0	0			

BC I-C: independent sample *t*-test comparing intervention and control at baseline; FU I: paired sample *t*-test for change in the intervention group from baseline to follow-up; FU C: paired sample *t*-test for change within the control group from baseline to follow-up; FU I-C: repeated measures ANOVA comparing change between intervention and control group from baseline to follow-up after 4 months.

$\chi^2$  test used on categories for all. SD: standard deviation.

showed significantly decreased work ability after 4 months ( $p < 0.01$ ). Patients with mainly psychological work demands showed higher work ability after 4 months ( $p = 0.01$ ).

*RTW after 4 months*

At baseline, work-related activity was the same in both groups (Table IV). The proportion of patients in the intervention group in work-related activity increased significantly from 53% at baseline to 80% after 4 months ( $p < 0.01$ ). The control group increased from 55% to 66% ( $p = 0.02$ ). The difference between the groups in RTW after 4 months was not significant ( $p = 0.06$   $\chi^2$  continuity correction). During the course of the study the proportion of patients on disability pension in the control group increased from 2% to 15%. A goal of RTW at baseline significantly increased the RTW after 4 months ( $p < 0.01$ ).

*Prediction of RTW*

RTW after 4 months was predicted by good work ability at baseline, improved work motivation, improved work ability at follow-up and increased rumours of change in the workplace (Table V). A model based on all 4 variables was a good predictor of RTW (84.6%). Goodness-of-fit showed that the model predicted RTW significantly better than block 0 ( $p < 0.01$ ,  $\chi^2 = 41.1$ ). Hosmer and Lemeshow goodness-of-fit also supports the model ( $p = 0.69$ ,  $\chi^2 = 5.6$ ). The values in The Cox and Snell  $R^2$  confirm that between 26.1% and 38.6% of the variation is explained by the variables. The odds ratio of Work Ability Index at baseline was 1.22, i.e. the probability of RTW increase of 22% per unit increased from 7 to 49 on the Work Ability Index scale. The change in work motivation is a 5-point scale, and an improvement of one unit during the study increased the probability of RTW by 96%. An improvement of one unit on the 5-point scale on rumours of change in the workplace increased the probability of RTW by 48%.

Table IV. Return to work status at baseline and after 4 months.

Work status	Baseline		After 4 months	
	Intervention, $n=181$ $n$ (%)	Control, $n=96$ $n$ (%)	Intervention, $n=146$ $n$ (%)	Control, $n=68$ $n$ (%)
Return to work	95 (52.5)	53 (55.2)	116 (79.5)	45 (66.2)
At work	29 (15.8)	12 (12.5)	44 (29.7)	17 (25.0)
Adjusted work tasks	16 (8.7)	8 (8.3)	8 (5.4)	7 (10.3)
New tasks	4 (2.2)	2 (2.1)	5 (3.4)	0
New work	1 (0.5)	3 (3.1)	2 (1.4)	2 (2.9)
Active sick leave/ graded sick leave	57 (31.1)	28 (29.2)	42 (28.4)	15 (22.1)
Sickness absence	84 (45.9)	38 (39.6)	24 (16.2)	14 (20.6)
Labour market measure (re-employment)	14 (7.7)	12 (12.4)	31 (20.9)	16 (23.5)
Education	1 (0.5)	3 (3.1)	4 (2.7)	0
Disability pension	11 (6.0)	2 (2.1)	10 (6.8)	10 (14.7)
Unemployed	5 (2.7)	6 (6.2)	4 (2.7)	5 (7.3)
Another situation	1 (0.5)	0	1 (0.7)	1 (1.5)

Table V. Predictors of return to work after 4 months: a logistic regression model ( $n = 136$ ).

Baseline predictors	B	SE	Wald	Df	$p$	Odds ratio (95% CI)
Work Ability Index at baseline	0.20	0.05	17.52	1	<0.01	1.22 (1.11–1.34)
Change in work motivation	0.67	0.32	4.29	1	0.04	1.96 (1.04–3.69)
Change in Work Ability Index	0.13	0.05	6.20	1	0.01	1.14 (1.03–1.25)
Rumours of change in the workplace	0.39	0.19	4.22	1	0.04	1.48 (1.02–2.14)
Constant	-4.46	1.19	14.06	1	<0.01	0.01

B: coefficient; SE: standard error; Wald: ratio of the coefficient to its standard error squared; Df: degrees of freedom; CI: confidence interval.

DISCUSSION

Work ability of the intervention group after 4 months improved significantly compared with the control group. In the intervention group 80% achieved RTW, compared with 66% in the control group. The intervention group reported low learning demands, low role clarity, frequent role conflicts, low predictability, low mastery of work, low support from co-workers, low empowering leadership, a poor social climate and a low priority given to human resources at their workplace compared with the reference material. Support from family and friends was high in the intervention group, but work often interfered with private life and vice versa. Good work ability at baseline, improved work ability at follow-up, improved work motivation at follow-up and increased rumours of change in the workplace all predicted RTW.

One problem in the study was the high proportion of drop-outs. The loss of follow-up in the control group could be caused by the fact that they might have felt difficulty relating to the study. The drop-out proportion may have led to favourable results in both groups, based on the assumption that those who returned to work completed the trial to a greater extent. If this is true, the results in the control group, which had lower participation, were probably more favourable than the intervention group. The drop-out proportion may therefore have diminished the differences between the groups. Since younger patients dropped out more often, the results of the study are less representative for this age group. The difference between the drop-outs and the participants with respect to length of sick leave is a problem in this study, but at this point there were no differences between the groups among the participants.

This study could not be completely randomized, due to referral routines at the Rauland Vocational Rehabilitation Centre and the limited information available from the national sickness insurance record. Instead, the control group was controlled for important baseline characteristics. The strata were based on available patient statistics from the Rauland Vocational Rehabilitation Centre on gender, age and main diagnosis in the period May–September 2003, the year before the intervention period. These statistics have been relatively stable for the last 3 years.

There were no differences between the intervention and control groups with respect to most background characteristics and the psychological and social factors at the workplace. The fact that the intervention group had higher educational levels than the control group does not appear to have biased the results, as education did not have any effect on change in work ability or RTW in this study. The findings of higher perception of mastery of work, higher role clarity and that work demands interfered with private life less frequently in the control group suggest that the control group had better working conditions and fewer barriers to RTW at baseline. The inclusion criteria at the Rauland Vocational Rehabilitation Centre influenced the results in favour of the intervention group. A greater proportion of patients with concrete goals of RTW in the intervention group at baseline had significant influence on RTW and work ability after 4 months. This probably biased the results in favour of higher RTW in the intervention group. The logistic regression model of RTW may also have been biased as a result of interdependent variables. It was difficult to measure whether all patients met the inclusion criteria, because this was based on a subjective consideration of the team that take care of the applications. This especially applies to the inclusion criteria about work motivation, goal and plan of RTW and relevant medical examination.

The improved work ability in the intervention group supports the use of the multidisciplinary rehabilitation programme in this patient group. The complexity of such interventions may improve health along many outcome dimensions, including physical endurance and strength, flexibility, body awareness, self-image and coping skills, as well as pain process understanding (14). Simultaneous changes on multiple levels appear to improve work ability more than treatment as usual. Previously de Boer et al. (32) have found increased work ability compared with a control group immediately after a 6-month occupational health intervention programme for workers at risk of early retirement. Two years after randomization, however, they found no significant difference between the 2 groups. For logistical reasons, the follow-up period in the Rauland study was limited to 4 months, which may be too short. However, work ability in the intervention group shows a clear tendency to improve from the end of the intervention to the assessment 4 months after baseline. Work ability showed a significant change over a short period of time when patient resources and work demands were influenced during the multidisciplinary rehabilitation programme.

The empirical data of RTW corroborates these results after 4 months. RTW increased significantly in both groups, and substantially more in the intervention group than in the control group. A RTW rate of 80% in the intervention group after 4 months is similar to other studies reporting RTW after multidisciplinary rehabilitation (12, 14, 29). The difference between the intervention and control group was not significant, but close to significance. With limited data available, the test remains conservative. The dichotomous RTW may conceal important differences between the groups. The control group showed an increase in the proportion of patients on disability

pension from 2% to 15%, which was not seen in the intervention group. This is in accordance with findings by de Boer et al. (32), who suggest that an integrated occupational health intervention programme can prevent early departure from working life.

RTW was, to a considerable extent, well predicted by a model based on good work ability at baseline, improved work motivation, improvements in work ability and increased rumours of change in the workplace. Work ability and work motivation have been found to be important predictors of RTW, sick leave and early retirement in other studies (10, 11, 17). Work motivation is likely to be related to having a goal of RTW (20). An early start to the goal-setting process leading to a concrete action plan, accompanied by an occupational follow-up after 4 weeks of multidisciplinary rehabilitation, is likely to increase the probability of the RTW significantly. An integrated action chain and good communication between the RTW stakeholders in the follow-up, as emphasized by Young et al (33), are in accordance with this. The fact that the intervention group reported adverse psychosocial working conditions compared with the reference material supports the importance of workplace factors and workplace interventions for RTW (5–7, 15). Surprisingly rumours of change in the workplace predicted RTW. Maybe this means patients RTW more often if there are signals of change in the work situation.

The multidisciplinary rehabilitation programme clearly improves work ability, but an examination of which elements of the "package" play a significant role has yet to be conducted. Future studies should evaluate the effectiveness of the underlying concepts of the multidisciplinary rehabilitation programme. The need to follow up adverse working conditions in patients on long-term sick leave has been established. Efforts to improve workplace RTW interventions in a multidisciplinary rehabilitation setting should be addressed. The effects of communication between the RTW stakeholders and their interventions in the follow-up of patients on long-term sick leave should also be evaluated. There is a need for a valid, reliable and precise measurement of RTW outcome, including both the duration and frequency of sick leave. Subject randomization to different interventions will remove the effects of the selective inclusion of patients in one group, as seen in this study. Work ability has been shown to be an important predictor of RTW, although the model in this study was incomplete. In the future, determinants of RTW should be evaluated using a holistic model such as the International Classification of Functioning Disability and Health (34). Analyses of subgroups of patients and cost-benefit analyses would also improve future RTW research.

In conclusion, both groups improved their work ability and increased RTW at follow-up. The patients who were offered the multidisciplinary rehabilitation programme improved their work ability significantly more compared with patients who were offered treatment as usual. Perceived work ability showed significant change over a short period of time as a result of patient resources and work demands being influenced by the multidisciplinary rehabilitation programme. RTW after 4 months was 80% in the intervention group compared with 66%

in the control group (not significant). Adverse psychosocial working conditions were reported in the intervention group compared with the reference material. Work ability, change in work ability, change in work motivation and rumours of change in the workplace predicted RTW.

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#### REFERENCES

- Benavides FG, Benach J, Moncada S. Working conditions and sickness absence: a complex relation. *J Epidemiol Community Health*. 2001; 55: 368.
- Ekberg K, Wildhagen I. Long-term sickness absence due to musculoskeletal disorders: the necessary intervention of work conditions. *Scand J Rehabil Med* 1996; 28: 39–47.
- Pransky G, Gatchel R, Linton SJ, Loisel P. Improving return to work research. *J Occup Rehabil* 2005; 15: 453–457.
- Crook J, Milner R, Schultz IZ, Stringer B. Determinants of occupational disability following a low back injury: a critical review of the literature. *J Occup Rehabil* 2002; 12: 277–295.
- Kilbom A. Evidence-based programmes for the prevention of early exit from work. *Exp Aging Res* 1999; 25: 291–299.
- Mein G, Martikainen P, Stansfeld SA, Brunner EJ, Fuhrer R, Marmot MG. Predictors of early retirement in British civil servants. *Age Ageing* 2000; 29: 529–536.
- Lund T, Iversen L, Poulsen KB. Work environment factors, health, lifestyle and marital status as predictors of job change and early retirement in physically heavy occupations. *Am J Ind Med* 2001; 40: 161–169.
- Haldorsen EM, Kronholm K, Skouen JS, Ursin H. Predictors for outcome of a multi-modal cognitive behavioural treatment programme for low back pain patients – a 12-month follow-up study. *Eur J Pain* 1998; 2: 293–307.
- Haldorsen EM, Kronholm K, Skouen JS, Ursin H. Multimodal cognitive behavioural treatment of patients sicklisted for musculoskeletal pain; a randomized controlled study. *Scand J Rheumatol* 1998; 27: 16–25.
- Reiso H, Nygård JF, Brage S, Guldbrandsen P, Tellnes G. Work ability and duration of certified sickness absence. *Scand J Public Health* 2001; 29: 218–225.
- Tuomi K, Huuhtanen P, Nykyri E, Ilmarinen J. Promotion of work ability, the quality of work and retirement. *Occup Med* 2001; 51: 318–324.
- Bendix AF, Bendix T, Vaegter K, Lund C, Frolund L, Holm L. Multidisciplinary intensive treatment for chronic low back pain: a randomized, prospective study. *Cleve Clin J Med* 1996; 63: 62–69.
- Bendix AF, Bendix T, Vaegter K, Lund C, Kirkbak S, Ostfeldt S. Comparison of three intensive programmes for chronic low back pain patients: a prospective, randomized, observer-blinded study with one-year follow-up. *Scand J Rehabil Med* 1997; 29: 81–89.
- Storrø S, Moen J, Svebak S. Effects on sick leave of a multidisciplinary rehabilitation programme for chronic low back pain. *J Rehabil Med* 2004; 8: 66–71.
- Franché RL, Cullen K, Klarke J, Irvin E, Sinclair S, Frank J; The Institute for Work and Health (IWH). Workplace based return to work interventions: a systematic review of the quantitative literature. *J Occup Rehabil* 2005; 15: 607–631.
- Gard G, Sandberg AC. Motivating factors for return to work. *Physiother Res Int* 1998; 3: 100–108.
- Grahn BE, Ekdahl C, Borgquist LA. Motivation as a predictor of changes in quality of life and working ability in multidisciplinary rehabilitation. A two-year follow-up of a prospective controlled study in patients with prolonged musculoskeletal disorders. *Disability Rehabil* 2000; 22: 639–654.
- Grahn BE, Borgquist LA, Ekdahl CS. Motivated patients are more cost-effectively rehabilitated. A two-year prospective controlled study of patients with prolonged musculoskeletal disorders diagnosed in primary care. *Int J Technol Assess Health Care* 2000; 16: 849–863.
- Haldorsen EM, Grasdal AL, Skouen JS, Risa AE, Kronholm K, Ursin H. Is there a right treatment for a particular patient group? Comparison of ordinary treatment, light multidisciplinary treatment and extensive multidisciplinary treatment for long-term sick listed employees with musculoskeletal pain. *Pain* 2002; 95: 49–63.
- Tan V, Cheatle MD, Mackin S, Moberg PJ, Esterhai JL. Goal setting as a predictor of return to work in a population of chronic musculoskeletal pain patients. *International J Neurosci* 1997; 92: 161–170.
- Bonde JP, Rasmussen MS, Hjollund H, Svendsen SW, Kolstad HA, Jensen LD, Wieclaw J. Occupational disorders and return to work: a randomized controlled study. *J Rehabil Med* 2005; 37: 230–235.
- Brown J, editor. Human teaching for human learning. An introduction to confluent education. Highland New York: The Gestalt Journal; 1990.
- Perls F, editor. Gestalt Therapy Verbatim. New York: Gestalt Journal Press; 1969/1988.
- Tuomi K, Ilmarinen J, Jahkola A, Katjarinne L, Tulkki A. Work ability index. Helsinki: Finnish institute of Occupational Health; 1998.
- De Zwarts BC, Frings-Dresen MHW, van Duivenbooden JC. Test-retest reliability of the Work Ability Index Questionnaire. *Occupational Medicine (London)* 2002; 52: 177–181.
- Nygaard CH, Eskelinen L, Suvanto S. Associations between functional capacity and work ability among elderly municipal employees. *Scand J Work Environ Health* 1991; 17: 122–127.
- Lindström K, Elo AL, Skogstad A, Dallner M, Gamberale F, Hottinen V, et al., editors. General Nordic Questionnaire for psychological and social factors at work. User's guide for the QPS Nordic. Nordic Councils of Ministers, Copenhagen, Nord 2000: p. 603.
- Dallner M, Elo A-L, Gamberale F, Hottinen V, Knardahl S, Lindström K, et al., editors. Validation of the General Nordic Questionnaire for psychological and social factors at work. Nordic Council of Ministers, Copenhagen, Nord, 2000: p. 12.
- Vowles KE, Gross RT, Sorrell JT. Predicting status following interdisciplinary treatment for chronic pain. *Eur J Pain* 2004; 8: 351–358.
- Cohen J, editor. Statistical power analysis for the behavioural sciences. Hillsdale, NJ: Erlbaum; 1988.
- Pallant J, editor. SPSS survival manual: a step by step guide to data analysis using SPSS for Windows (Version 12). Maidenhead: Open University Press; 2005.
- De Boer AG, van Beek JC, Durinck J, Verbeek JH, van Dijk FJ. An occupational health programme for workers at risk for early retirement; a randomised controlled trial. *Occup Environ Med* 2004; 61: 924–929.
- Young AE, Wasiak R, Roessler RT, McPherson KM, Anema JR, van Poppel MNM. Return to work outcomes following work disability: Stakeholder motivations, interests and concerns. *J Occup Rehabil* 2005; 15: 543–556.
- World Health Organization (WHO). ICF. International classification of functioning, disability and health. Geneva: WHO; 2001.