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Differences in outcome of a multidisciplinary treatment between subgroups of chronic low back pain patients defined using two multiaxial assessment instruments: the Multidimensional Pain Inventory and lumbar dynamometry

Miriam MR Vollenbroek-Hutten, Hermie J Hermens Roessingh Research and Development, **Daniël Wever, Michiel Gorter** Rehabilitation Center 'Het Roessingh', **Joost Rinket** Roessingh Dienstengroep and **Maarten J IJzerman** Roessingh Research and Development, Enschede, The Netherlands

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Objective: To investigate the effects of a multidisciplinary back school programme (Roessingh Back Rehabilitation Programme, RRP) compared with usual care, as well as differences in treatment outcome between subgroups defined using two multiaxial assessment instruments: the Multidimensional Pain Inventory (MPI-DLV) and lumbar dynamometry.
Design: Randomized controlled trial.
Setting: Rehabilitation.
Subjects: One hundred and sixty-three patients with chronic, aspecific low back pain.
Intervention: All subjects were randomly assigned either to a multidisciplinary, physically oriented group treatment or to their usual care.
Main outcome measures: The Roland Disability Questionnaire and health-related quality of life (EuroQol, EQ5-D) were measured as primary outcomes before randomization and after eight weeks and six months follow-up.
Result: Only 30–50% of the patients in the RRP group showed improvement and this number is not significantly different from the control group. Subgroup analyses give some first indications that multiaxial measurement instruments can be used to identify subgroups with differences in treatment effects.
Conclusion: The overall effect of a multidisciplinary treatment is disappointing, however multiaxial assessment before admission might be valuable in clinical practice, resulting in more effective treatments for patients with chronic low back pain.

Address for correspondence: Miriam MR Vollenbroek-Hutten, Roessingh Research and Development, Roessinghsbleekweg 33b, 7752 AH Enschede, The Netherlands. e-mail: m.vollenbroek@rrd.nl

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Introduction

Low back pain is a major health and economic problem among populations in Western industrialized countries. In particular, it is a major cause of medical expenses, absenteeism and disability. Whereas 90% of the nonspecific low back pain generally recovers quickly, 10% of patients develop chronic or recurrent complaints (CLBP). These patients with prolonged pain tend to develop a combination of physical, psychological and social disabilities. From this perspective various treatments have been developed, addressing different combinations of physical, psychological, behavioural and educational training.

A number of systematic reviews,[1–5] meta-analyses[6,7] and clinical trials[8–14] have been performed to evaluate these treatments. However, there is still no striking evidence concerning the effects. As the population of chronic back pain patients is very heterogeneous it is hypothesized that the population of people with CLBP may comprise various subgroups, which may explain why single style interventions do not work for all.[15,16]

Results of various studies aiming at the identification of the variables that can be used to characterize the subgroups show that 'a set of general predictors' for treatment outcome of chronic pain may be difficult to find and results are often controversial between studies.[19] However in most of these studies multiple variables each focusing on a single chronic pain-related aspect, for instance a psychological, physical or social aspect, are used in combination.[17,18] Only Talo *et al.*[19] used multiaxial (bio-, psycho-, socio-) and multidimensional assessment instruments (impairments, disabilities and handicaps) and their results are much more consistent. Based on this it is hypothesized that multiaxial/multidimensional assessment of patient functioning is necessary.

Two instruments enabling such multiaxial assessment are currently used in our rehabilitation centre: the Multidimensional Pain Inventory (MPI)[20] and lumbar dynamometry measurements. The MPI integrates information obtained from three axes: physical–medical, psychosocial and behavioural, into a single instrument. Based on the scores, patients can be divided into dysfunctional, interpersonally distressed, average and adaptive coper patients. Talo *et al.*[15] first showed that these different MPI subgroups may have different treatment outcomes.

The second instrument used to subdivide patients is lumbar dynamometry. Lumbar dynamometry using the Isostation B200 (Isotechnologies Inc., Hillborough, NC, USA) provides a three-dimensional assessment of low back muscle condition. Results of such evaluation concern not only physical–medical aspects but also behavioural aspects.[21,22] Based on the lumbar dynamometry measurements patients can be divided into deconditioned patients with consistent test behaviour, patients with normal condition and patients with inconsistent test behaviour. Preliminary results show that these different subgroups have different success rates in a multidisciplinary treatment programme.[23]

The purpose of this study is to investigate the effects of a multidisciplinary back school programme (RRP) compared with usual care as well as subgroup differences defined on the MPI-Dutch language version (MPI-DLV)[24] and Isostation B200 performances.

Methods

Patients

One hundred and sixty-three patients with chronic aspecific low back pain who were admitted to an outpatient multidisciplinary back rehabilitation programme in the period January 1998 to January 2000 by a physician in physical medicine and rehabilitation participated in this study. Inclusion criteria for the rehabilitation programme were: duration of pain longer than three months, age between 18 and 60 years and no back surgery in the past three months. Patients with structural pathology, such as lumbar radicular syndrome, tumour of the spine or severe deformities (spondylolisthesis grade 3), and patients with a medical contraindication for physical training were excluded.

Design

The effects were investigated using a randomized single-blind controlled trial with a follow-up period of six months.

Protocol

The research flowchart is presented in Figure 1. After admission to the back rehabilitation programme, all patients were invited by the same specialist in physical medicine and rehabilitation (physician) to consider inclusion in the trial, to check whether he or she met the inclusion criteria and to sign an informed consent form. Once they had signed the informed consent form, patients were invited for the baseline measurements. The number of patients who refused to participate was very small; below 5%.

After the baseline measurements, patients were put in to either the control group or the treatment group using the minimization method as described by Pocock.[25] Randomization was balanced for: gender, low back muscle function as estimated by dynamometry during the baseline measurement and the presence or absence of problems with current work status. To enable an adequate assignment procedure a computer programme was used. Randomization was performed by a person not involved in either the treatment or this study. Patients could not be blinded for the group they

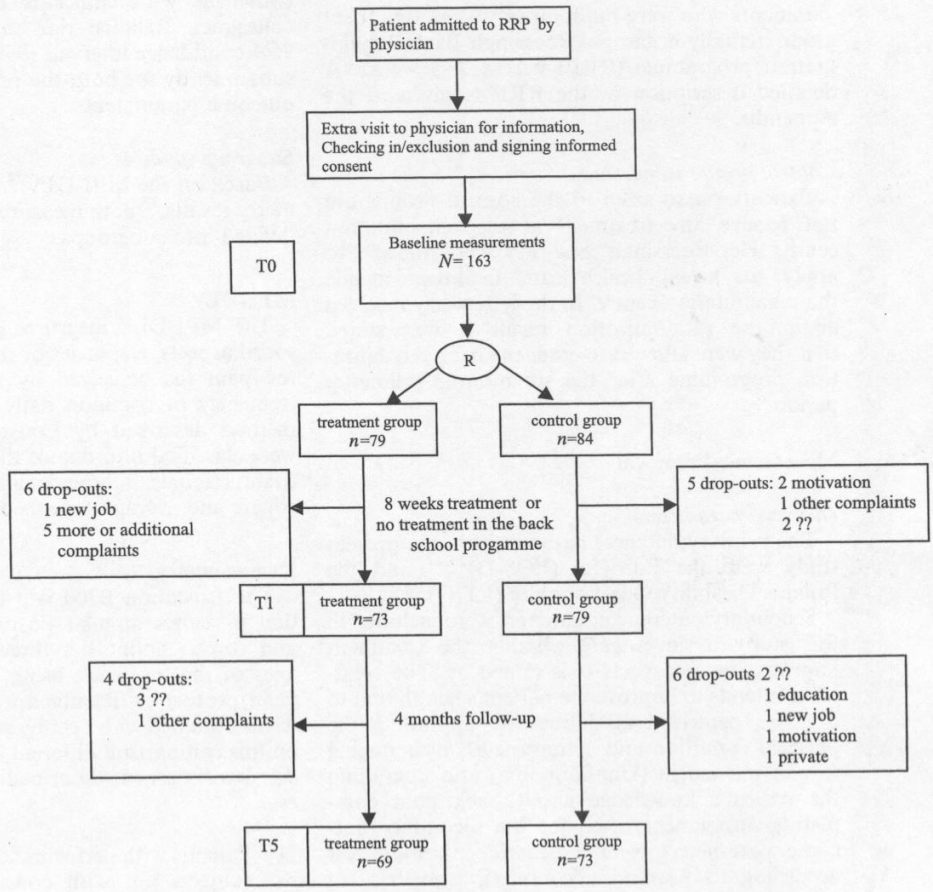

Figure 1 Follow-up scheme and drop-outs with reasons if known.

were randomized to, neither could the therapist who conducted the general physical condition measurements. The researchers conducted all other measurements, and they were blinded for the group to which the patients were randomized. Measurements were performed before randomization (T0), in the week after treatment or eight weeks after T0 (T1) and six months after T0 (T5). Besides this, medical treatments other than the RRP programme were assessed at T1 and every subsequent month until T5 by a questionnaire sent home.

Treatments

Intervention

Patients who were randomized to the treatment group actually began the Roessingh Back Rehabilitation programme (RRP) within 2–3 weeks. A detailed description of the RRP is given in the Appendix.

Control group: usual care

Patients randomized to the control groups did not receive any treatment at the rehabilitation centre 'Het Roessingh' but they were allowed to apply for usual health care facilities outside the rehabilitation centre. In the letter they received about the randomization result it was stated that they were allowed to enter the back rehabilitation programme after the six months follow-up period.

Measurement protocol

Outcome parameters

The primary outcome parameters in the present study were the EuroQol (EQ5-D)[26,27] and the Roland Disability Questionnaire (RDQ).[28,29]

Secondary outcome parameters were included in this study to investigate whether the treatment improves those aspects it is aimed at. The treatment intends to improve the patient's health and to decrease perceived disabilities by upgrading the physical condition and activity level, by reducing fear of movement (kinesiophobia) and upgrading the patient's knowledge about back pain complaints. Instruments used for the secondary outcome parameters were a generic condition test according to Astrand (Vo_2 max), isometric leg strength test (leg strength) to assess physical condition, the Tampa Scale[30] for assessing kinesiophobia and the SCL-90 total score[31,32] for assessing psychological dysfunctioning.

Data analysis

Main effect of treatment on disabilities and health status

For both the treatment and control group the number of patients showing an improvement was calculated. The cut-off points used to classify a patient as improved or not were preferably based on available literature. When no literature is available, cut-off points were arbitrarily chosen in consensus with clinicians or other experienced colleagues. Relative risk ratios (RR) and their 95% confidence intervals (95% CI) were calculated subsequently for both the primary and secondary outcome parameters.

Subgroup analysis

Based on the MPI-DLV[24] and lumbar dynamometry results,[33] both measured at T0, patients were divided into subgroups.

MPI-DLV

The MPI-DLV measures pain-relevant psychosocial aspects, responses of the patient's partner to the pain (as perceived by the patient) and the frequency of common daily activities. Using the method described by Lousberg *et al.*[24] patients were classified into one of the following subtypes: dysfunctionals, interpersonally distressed, adaptive copers and average described.

Dynamometry

The Isostation B200 is a triaxial dynamometer that measures angular position, angular velocity and torque about the three primary movement axes of the low back using a standard measurement protocol.[23] Results are compared with standards obtained with healthy subjects[34,35] and based on this comparison different subgroups of patients can be discerned, described in detail by Hutten *et al.*[22,23]:

1) Patients with performances lower than healthy subjects but with consistent test behaviour (expected performance).

2) Patients with performances comparable to those of healthy subjects and consistent test behaviour (normal performance).
3) and 4) Patients with inconsistent test behaviour, meaning that their performance is not maximal and that the assessment is (probably) not valid. Dependent on the number of inconsistencies this is called greyzone or submaximal performance.

To investigate how these subgroups benefit from treatment, mean differences in RDQ_{T1-T0} between the treatment and control group were calculated for each subgroup separately and represented graphically. It was also investigated whether within the dynamometry subgroups (showing effects on the RDQ directly after treatment) treatment effects were different for the different MPI-DLV groups and whether within the MPI-DLV subgroups (showing effects on the RDQ_{T1-T0}, treatment) effects were different for the different dynamometry groups.

For all analyses an intention-to-treat analysis, including patients with protocol deviations, was performed and results were considered statistically significant if $p \leq 0.05$. All analyses were performed using SPSS version 10.0

Results

Subjects and loss to follow-up

Of the 163 patients who were included in the trial 21 patients were lost during follow-up (13%). Ultimately 142 patients were available for data analysis, of whom 69 received treatment and 73 usual care. There was no difference in loss to follow-up between the groups: 10 patients of the treatment group and 11 of the control group were lost. Figure 1 shows the times at which the patients were lost and for what reasons, if known.

Baseline characteristics

To get insight into the population of patients treated in the back rehabilitation programme and thus participating in this study, baseline characteristics are reported in Table 1.

For the patients participating in this trial the average level of kinesiophobia is high[36] whereas the average level of psychological dysfunctioning is low.[37] About 30% of those patients have a (partly) paid job, about 55% suffer from absenteeism due to sick leave or a disability pension and 15% of the patients have no paid job. The mean medical consumption in the six months before starting the trial is low with the exception of physical therapy, but these visits are mainly attributed to only a few patients. There were no differences in any of these baseline characteristics between the treatment and control group implying that randomization appeared to be successful.

Table 1 Baseline characteristics (mean (SD)) of the treatment and control groups

	Treatment group	Control group
Weight (kg)	82.12 (15.7)	83.5 (15.4)
Height (cm)	175.7 (9.1)	176.7 (9.2)
Age (years)	38.5 (9.8)	39.5 (9.9)
Duration of complaints (months) (median[a])	72	48
Number of visits to physiotherapist in six months before participation	15 (20)	11 (16)
Leg strength (Nm)	2405 (1252)	2779 (1424)
Vo_2-max (ml/min per kg)	33.6 (11.7)	34.6 (10)
SCL-90, total score	140.4 (38.7)	136.3 (34.5)
RDQ	13.1 (4.4)	12.7 (4.5)
Tampa scale	39.5 (7.0)	38.6 (7.1)

[a] The median value for duration of complaints is reported as

Compliance

Because the treatment increases in intensity and has a constructive character with regard to knowledge transfer over the seven weeks it is emphasized repeatedly to the patients that they are not allowed to be absent for more than 10% of the time. In the present study the physician in physical medicine and rehabilitation filled in a protocol deviation form at two months follow-up where information about attendance could be written down. For five patients in the treatment group remarks were made concerning absence for unknown reasons (2), due to flu (1), work (1) and death in the close family (1).

Co-interventions

Results of the questionnaire sent home monthly show that the mean number of visits to specialists, general practitioners, manual therapists or other forms of therapy is about 0.1 (SD <1) and thereby negligible. The mean number of visits to the physiotherapist is slightly higher (mean (SD) about 0.5 (3)) but also considered negligible.

Main effect of treatment

The mean RDQ and EQ5-D_{index} at each measurement session for the treatment and control group (Table 2) show that the scores at admission are equal when considering the total treatment and control group. At eight weeks follow-up, patients of the treatment group experience on average a lower disability level and a better health-related quality of life than the control group. The improvements in the treatment group at six months follow-up are slightly higher than at T1, however the control group also shows improvements at this time.

Relative risk ratios (RR) and 95% confidence intervals (95% CI) presented in Table 3 and Figure 2 show that, dependent on the outcome measure and follow-up time, 35–48% of the patients in the treatment group improve compared with 23–44% in the control group. Neither RDQ nor EQ5-D_{index} show significant differences between groups.

To investigate whether the RRP significantly increases physical condition, reduces fear of movement and lowers the level of psychological dysfunction, relative risk ratios and 95% confidence intervals are calculated for the differences T1–T0. The results are presented in Table 4 and Figure 3.

On these parameters 40–50% of the patients in the treatment group compared with 13–36% of the control group show an improvement. Figure 3 shows that the 95% CI values for the relative risks are above 1 for all parameters, except for the psychological dysfunction. This means that patients in the treatment group have significantly more chance of showing clinically relevant changes on physical condition parameters and kinesiophobia during the multidisciplinary treatment compared with patients in the control group.

Subgroup analysis

MPI-DLV subgroups

Patients included in the trial are not merely 'dysfunctional' and 'average' patients. At admission (Table 2) differences exist between the four subgroups in RDQ and EQ5-D_{index}. In particular, the adaptive copers are least disabled and experience the highest quality of life, whereas the dysfunctional and interpersonally distressed patients have the poorest health profiles.

Figure 4a shows the differences in RDQ_{T1-T0} between the treatment and control group for the total patient group as well as for each MPI-DLV group separately. This figure shows more improvement (negative values of 2 represent an improvement) in the treatment than in the control group for the dysfunctional, interpersonally distressed and average patients, together 73% of the population, and no differences for the adaptive copers. Figure 4a also shows that within the MPI-DLV subgroups showing effects (dysfunctional, interpersonally distressed and average patients), patients with grey zone and expected performance on dynamometry show differences in favour of the treatment group. In summary, this means that dysfunctional, interpersonally distressed and average patients who also have a grey zone or expected dynamometry performances (together 47% of the total population) show benefit from this kind of treatment. The groups are too small, however, to perform a statistical analysis.

For the RDQ_{T5-T0} none of the MPI-DLV subgroups show an improvement greater than the cut-off point of 2, so no subgroup analysis has been done for this parameter.

Dynamometry subgroups

Initially about 55% of the patients had a deconditioned trunk muscle condition, 14% of the patients had normal muscle condition, 13–18% of the patients were not able to perform maximally and about 6–12% of the patients had grey zone performance. At admission (Table 2) some differences existed in RDQ between the dynamometry groups and to a lesser extent for the EQ5-D_{index}. Patients with grey zone performance in the treatment group seem to have more disabilities than the other three groups, whereas the submaximal patients in the control

Table 2 Mean (SD) Roland scores and health-related quality of life at each measurement session for the treatment and control group when taking the total patient group but also for each MPI-DLV and lumbar dynamometry group separately

	Roland score						EQ5-D_{index}					
	Treatment			Control			Treatment			Control		
	T0	T1	T5	T0	T1	T5	T0	T1	T5	T0	T1	T5
All	13 (4) $n=79$	11 (5) $n=72$	10 (5) $n=68$	13 (4) $n=83$	13 (5) $n=79$	11 (5) $n=72$	0.53 (0.27) $n=77$	0.57 (0.28) $n=73$	0.63 (0.26) $n=69$	0.56 (0.26) $n=83$	0.53 (0.30) $n=77$	0.62 (0.26) $n=71$
Dysfunctionals	15 (4) $n=22$	11 (5) $n=21$	10 (6) $n=20$	15 (4) $n=21$	15 (5) $n=20$	13 (6) $n=18$	0.42 (0.31) $n=21$	0.56 (0.32) $n=21$	0.56 (0.35) $n=21$	0.48 (0.30) $n=21$	0.34 (0.34) $n=19$	0.55 (0.32) $n=18$
Interpersonally distressed	16 (4) $n=9$	13 (3) $n=8$	11 (3) $n=7$	15 (3) $n=12$	14 (5) $n=11$	11 (5) $n=11$	0.51 (0.23) $n=9$	0.53 (0.17) $n=8$	0.68 (0.08) $n=7$	0.56 (0.20) $n=12$	0.53 (0.27) $n=11$	0.67 (0.13) $n=11$
Adaptive copers	9 (4) $n=11$	9 (5) $n=10$	9 (5) $n=11$	10 (5) $n=21$	9 (4) $n=20$	8 (5) $n=18$	0.71 (0.16) $n=11$	0.63 (0.28) $n=11$	0.66 (0.25) $n=11$	0.67 (0.19) $n=21$	0.74 (0.09) $n=20$	0.73 (0.12) $n=18$
Average	12 (3) $n=29$	12 (5) $n=27$	10 (4) $n=24$	12 (4) $n=25$	14 (4) $n=24$	12 (4) $n=21$	0.57 (0.21) $n=29$	0.55 (0.28) $n=27$	0.69 (0.13) $n=24$	0.49 (0.28) $n=25$	0.50 (0.29) $n=23$	0.59 (0.24) $n=21$
Normal	12 (5) $n=11$	11(5) $n=11$	11 (4) $n=9$	10 (5) $n=13$	10 (4) $n=12$	8 (6) $n=10$	0.58 (0.29) $n=10$	0.64 (0.21) $n=11$	0.68 (0.21) $n=9$	0.57 (0.25) $n=13$	0.67 (0.16) $n=12$	0.69 (0.14) $n=10$
Expect	12 (4) $n=44$	10 (5) $n=40$	9 (5) $n=41$	13 (5) $n=48$	13 (5) $n=46$	11 (5) $n=42$	0.54 (0.27) $n=43$	0.61 (0.27) $n=41$	0.66 (0.23) $n=41$	0.60 (0.23) $n=48$	0.49 (0.33) $n=44$	0.68 (0.17) $n=41$
Grey zone	17(2) $n=9$	13(5) $n=8$	12(6) $n=6$	14 (4) $n=6$	16(3) $n=6$	13 (6) $n=6$	0.52 (0.26) $n=9$	0.54 (0.28) $n=8$	0.52 (0.36) $n=8$	0.50 (0.34) $n=6$	0.48 (0.19) $n=6$	0.49 (0.51) $n=6$
Submaximal	14 (4) $n=14$	12 (5) $n=11$	11 (6) $n=11$	16 (3) $n=12$	15(4) $n=12$	13 (5) $n=12$	0.46 (0.30) $n=14$	0.43 (0.31) $n=12$	0.54 (0.35) $n=11$	0.42 (0.31) $n=12$	0.47 (0.32) $n=12$	0.43 (0.33) $n=12$

Table 3 Number of patients, both absolute and percentage, showing an improvement on the primary outcome parameters both at T1 and T5

		Improved/total (%)	
		Treatment	Control
T1	EQ5-D_{index}	29/71 (41%)	24/77 (31%)
	RDQ	25/72 (35%)	18/79 (23%)
T5	EQ5-D_{index}	32/67 (48%)	31/71 (44%)
	RDQ	28/68 (41%)	30/72 (42%)

group seems, to have the highest disability level and the lowest health-related quality of life.

Figure 4b presents the mean differences in RDQ_{T1-T0} between the treatment and control group for the total patient group as well as for dynamometry groups separately. This figure shows improvements in the treatment group compared with the control group for the grey zone patients and expected patients, together 66% of the population. Within this group showing improvement (grey zones and expected) it is the dysfunctional, average and interpersonally distressed patients who show differences in favour of the treatment group. In summary, using this sequence of instruments, again dysfunctional, interpersonally distressed and average patients who also have a grey zone or expected dynamometry performances derive benefits from this kind of treatment. This group together forms 51% of the total population. Again, the groups are too small to perform statistical analysis.

For the RDQ_{T5-T0} only the grey zone patients show an improvement greater than the cut-off point of 2. However this subgroup is too small to be able to perform subgroup analysis.

Discussion

The aim of this study was to investigate the effects of a multidisciplinary back school programme (RRP) compared with usual care as well as subgroup differences defined on the MPI-Dutch language version (MPI-DLV)[24] and Isostation B200 performances.

Mean scores on disabilities and health-related quality of life show an improvement, however, only for 30–50% of the patients and there are no significant differences with respect to the control group. The percentage of patients showing an improvement is comparable to those found in other studies[14] but indicates that the overall treatment effects on primary outcome parameters

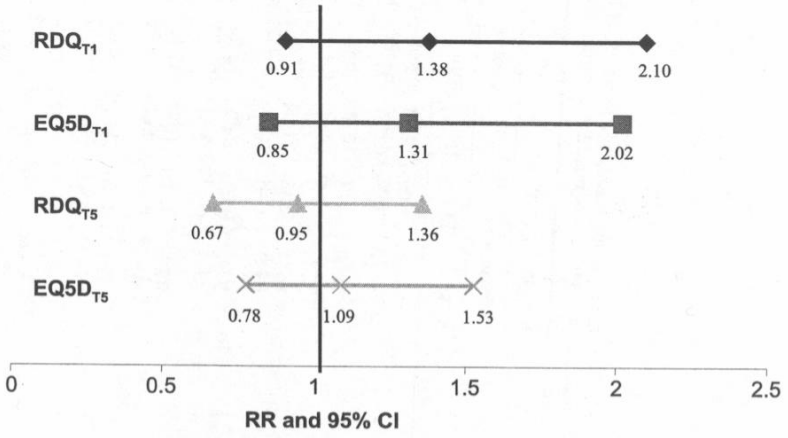

Figure 2 Relative risk and 95% confidence intervals for the primary outcome parameters at eight weeks and six months follow-up. RDQ: Two points were chosen as improvement. Deyo *et al.*[38] reported that the minimum change that is of clinical importance is between 2 and 3 points. EQ5-D_{index}: Six per cent increase was chosen as improvement. This cut-off point is translated from research concerning the SF-36 showing that approximately 6% was the best cut off point for differentiating between improved and nonimproved patients.[39]

Table 4 Number of patients, both absolute and percentage, showing an improvement on the secondary outcome parameters at T1

	Improved/total (%)	
	Treatment	Control
Psychological aspects	29/71 (41%)	26/79 (33%)
Kinesiophobia	32/70 (46%)	22/78 (28%)
Vo_2 max	26/65 (40%)	9/70 (13%)
Leg strength	33/66 (50%)	16/70 (23%)
Trunk muscle condition	36/67 (54%)	27/74 (36%)

found in the present study could be regarded as disappointing. It must be noted that the control group of the present study was a 'waiting list group' who were free to seek treatment abroad and who were promised rehabilitation treatment after six months. Although the treatments abroad were negligible, this could have influenced the results of this group.

In contrast to the results on primary outcome parameters, obvious differences between the treatment and control group are found for the secondary outcome parameters; physical condition and kinesiophobia. These results are in accordance with the expectations because the theoretical model behind the treatment assumes that most of the patients with chronic low back pain develop a deconditioning syndrome, with the consequence that performance of physical activities leads easily to pain, kinesiophobia and physical discomfort, which in turn makes avoidance more likely.[31]

Thus, in spite of the fact that the treatment intervenes with the expected aspects, the multidisciplinary treatment does not result in changes on disability level and health status, which is the aim of most rehabilitation programmes. Vlaeyen *et al.*[13] found comparable discrepancies between outcome parameters in their study. They reported that although coping and control increased in the operant treatment groups with cognitive coping skills training including relaxation, compared with the operant treatment group with group discussion and passively listening to music, this did not lead to higher quality of life. Deyo[38] mentioned in his review article concerning functional status measurements that a similar discrepancy is often found between physical measurements and more human activities.

Various explanations could be responsible for this discrepancy. First, the model used as the starting point in the rehabilitation programme does not involve all aspects related to patients' problems, their disabilities and health status. Secondly, it could be possible, as also mentioned

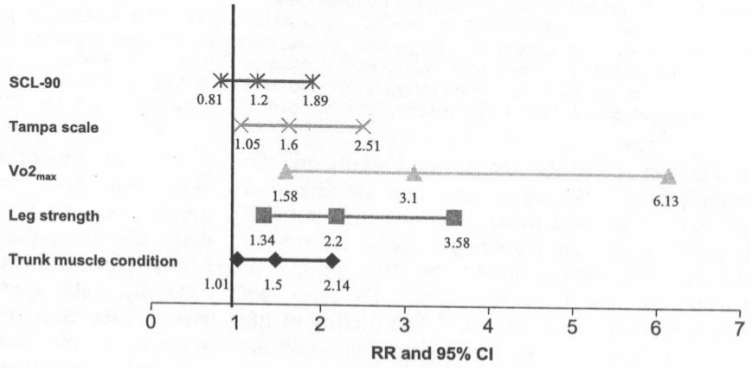

Figure 3 Relative risk and 95% confidence intervals for the different secondary outcome parameters at eight weeks follow-up. Ten per cent was arbitrarily chosen in consensus with clinicians for kinesiophobia and psychological aspects as improvement. Trunk muscle condition: When at least four or more of the six maximum isometric strength or maximum velocity parameters measured with lumbar dynamometry show an increase of 20% or more the patients is considered to be improved. This criteria is the same as used by physiotherapists in clinical practice.[22] An increase of 20% or more is arbitrarily chosen in consensus with clinicians for leg strength and Vo_2 max as cut-off point.

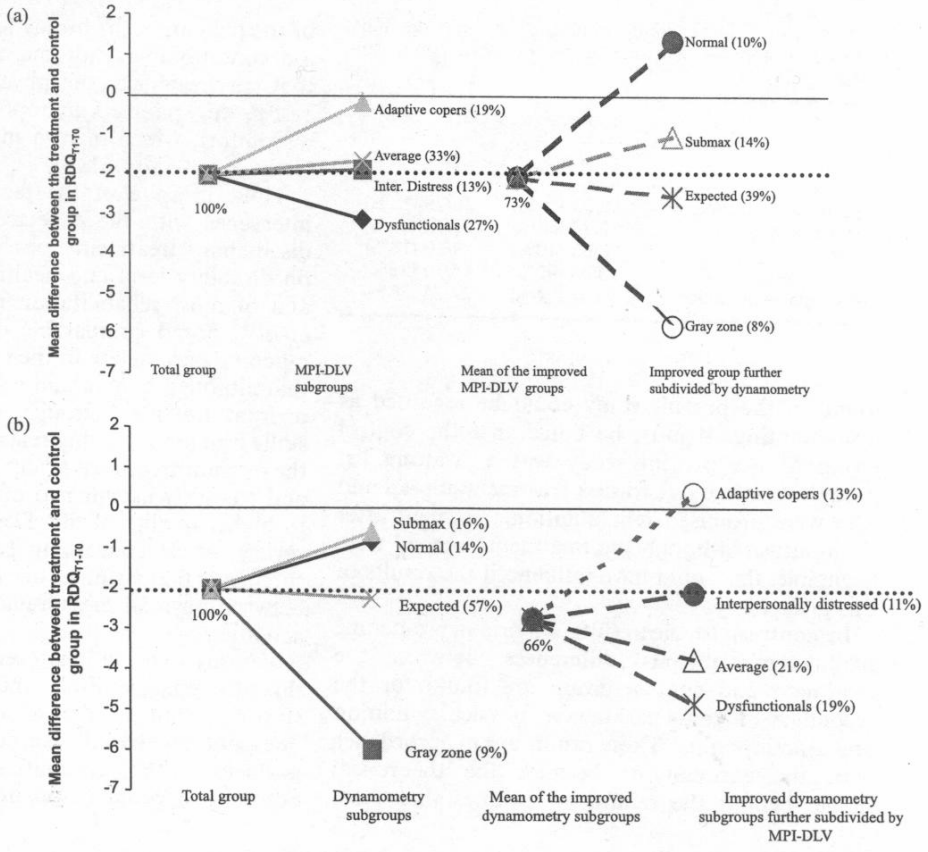

Figure 4 (a) Mean difference between the treatment and control group in RDQ at eight weeks follow-up (RDQ_{T1-T0}) for the total patient group as well as for each MPI-DLV group separately and for the MPI-DLV groups showing improvements when further subdivided by dynamometry. The percentages represent the population size as percentage of the total population. (b) Mean difference between the treatment and control group in RDQ at eight weeks follow-up (RDQ_{T1-T0}) for the total patient group as well as for each dynamometry group separately and for the dynamometry groups showing improvements when further subdivided by MPI-DLV. The percentages represent the population size as percentage of the total population.

by Vlaeyen *et al.*,[13] the learned skills in the rehabilitation programme are too specific and cannot be translated to daily life. A third possibility for the disappointing overall results on primary outcome parameters might be the choice of instruments, which are less responsive than secondary outcome instruments.[38] The quality of life instrument (EQ5-D) used in the present study for instance has primarily been designed to compare health status measurements across countries.[26] It consists of five questions and based on these questions a single index for health-related quality of life[26] is determined.

This instrument might be too insensitive for measurements in rehabilitation settings for two possible reasons. First, the five questions (mobility, daily activities, pain, mood, self-care) are only partly relevant for a chronic pain population and secondly, each question has only three answer possibilities on an ordinal scale (not, moderate or very) which means that treatment must have very large effect to allow a switch to another category.

In contrast to the disappointing results of the whole patient group, results of the subgroup analysis give some first indications that differences between subgroups of patients might exist and can

be defined using the MPI-DLV and lumbar dynamometry.

Using the MPI-DLV, differences in effects between the treatment and control group are found for the dysfunctionals, the interpersonally distressed and average patients whereas no differences are found for the adaptive copers. These results are as expected and in accordance to those of Talo *et al.*[15] who also showed that patients with poor functional profiles (interpersonally distressed and dysfunctional patients) may gain a lot from rehabilitation.

Mean scores on outcome parameters for the adaptive copers show that there is an improvement for this patient group directly after rehabilitation, however this improvement is about the same as that found in the control group, without extensive rehabilitation. Besides this, the disability level and health status levels of the adaptive copers before entering the rehabilitation programme are better than the levels found for the dysfunctionals, interpersonally distressed or average patients after the rehabilitation programme. These results indicate that this patient group is probably 'too good' for an extensive rehabilitation programme.

Using lumbar dynamometry, differences between the treatment and control groups seem to exist for patients with grey zone and patients with expected performances but not for patients with normal and submaximal performances. For patients with expected performance this difference is in accordance with our hypothesis, however the positive results found for the grey zone patients was not hypothesized. Patients with grey zone performance show a deconditioning but there is doubt whether their performance is maximal or not. This makes this patient group elusive and predictions difficult. The lack of treatment effects for patients with normal or inconsistent test behaviour are also in accordance with our hypothesis. For patients with inconsistent test behaviour it is expected, based on the fact that these patients have more psychological problems than the other patient groups,[23] that they need more than a multidisciplinary treatment programme mostly aimed at physical aspects. For patients with normal performance, a reconditioning programme is expected to be inappropriate because deconditioning is not present in this patient group.

Combining both instruments to look at subgroup differences reveals interesting results. Starting with the MPI-DLV, 73% of the patients show positive treatment effects (average, interpersonally distressed and dysfunctionals). By adding the lumbar dynamometry this percentage reduces to 47% of the population, as only expected and grey zone patients reveal positive effects. Starting with lumbar dynamometry and the same patient groups, patients with grey zone or expected performance on dynamometry and classified as dysfunctional, average or interpersonally distressed using the MPI-DLV are identified as showing positive effects of treatment. However the additional value of the MPI-DLV over the dynamometry is only 13%. So the subgroups identified as appropriate for treatment seem to be independent of the sequence of instruments used. In contrast, the additional value of dynamometry over MPI-DLV alone is larger (24%) than the additional value of MPI-DLV over dynamometry (13%).

It must be noted that the differences in treatment effects between subgroups could not be tested statistically with these numbers of subjects. However, the differences are considered worth mentioning and considered to be of clinical relevance. To give an indication of the number of subjects needed, a power analysis (alpha 0.95 and power 0.80) showed that to indicate the differences between MPI-DLV subgroups as significant about 60 and 80 patients are needed in the subgroups

Clinical messages

- The overall effects of multidisciplinary treatment for patients with chronic low back pain is disappointing. Positive effects are found for only 30–50% of the patients.
- Effects on impairment level are not naturally followed by effects on disability and handicap level.
- The use of objective criteria in the clinical decision-making process is important to come to more effective treatment indications and multiaxial assessment instruments might be useful for this purpose.

interpersonally distressed and dysfunctional groups, respectively. Many more subjects are needed in a trial to be able to indicate subgroup differences when dividing them into subgroups using two different instruments.

Overall conclusions

The present study shows that the overall effects of a multidisciplinary treatment programme over usual care are disappointing. Only 30–50% of the patients improve as a result of such treatment and this number is not significantly different from a usual care group. However, subgroups analyses give some first indications that subgroups of patients with and without effects of treatment can be identified using multiaxial measurement instruments. Patients classified as dysfunctional, average or interpersonally distressed using the MPI-DLV and showing a grey zone or an expected performance on the lumbar dynamometry show positive effects of treatment. Based on these results it can be suggested that multiaxial assessment before admission would be valuable in clinical practice producing a more effective treatment indication for patients with chronic low back pain.

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Appendix

The treatment that is investigated (RRP) is based on the Swedish backschool,[40] the Canadian-American programmes[41] and multidimensional pain programmes.[42] The treatment is based on the assumption that a lot of patients with CLBP develop a deconditioning syndrome. Deconditioning is supposed to be a vicious circle consisting of back pain, inactivity due to back pain and fear, lowered physical capacity and overloading. During treatment one tries to influence the patient's health and perceived disabilities by upgrading the physical condition and activity level, by reducing fear of movement and upgrading the knowledge about back pain complaints. The goals are aimed towards with a combination of physiotherapy, sport, education and occupational rehabilitation. Education was aimed at enlarging the patients' background knowledge of back problems becoming chronic, and the way in which physical

training contributes to recovery. Education was also aimed at learning skills to make optimal use of the remaining physical capabilities.

The RRP group treatment is performed according to a standardized protocol, which is a constructive one. Patients are not allowed be absent for more than 10% of the time. An RRP group consists of eight patients and comprises 3 hours of conditional training and sport, 0.5 hours of swimming 1.5 hours of occupational therapy and 4 hours of physiotherapy each week for seven weeks. For those patients with problems at work related to back pain, the possibility exists that after this programme patients receive individual occupational rehabilitation. Treatment takes place under the supervision of a specialist in physical and rehabilitation medicine and is conducted by a team of physiotherapist, occupational therapist, sport therapist and if necessary a psychologist and dietician.