Long-term return to work after a functional restoration program for chronic low-back pain patients: a prospective study

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Received: 18 May 2009 / Revised: 15 January 2010 / Accepted: 22 February 2010 / Published online: 12 March 2010
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Abstract Low-back pain is a major health and socio economic problem. Functional restoration programs (FRP) have been developed to promote the socio-professional reintegration of patients with important work absenteeism. The aim of this study was to determine the long-term effectiveness of FRP in a group of 105 chronic low-back pain patients and to determine the predictive factors of return to work. One hundred-and-five chronic LBP patients with over 1 month of work absenteeism were included in a FRP. Pain, professional status, quality of life, functional disability, psychological impact, and fear and avoidance beliefs were evaluated at baseline, after 1 year and at the end of follow-up. Main effectiveness criterion was return to work. Fifty-five percent of the patients returned to work after mean follow-up time of 3.5 years, compared with 9% of the patients at work at baseline. Quality of life, functional disability, psychological factors, and fear and avoidance beliefs were all significantly improved. Three predictive factors were found: younger age at the onset of low-back pain, practice of sports, and shorter duration of

sick leave at baseline. FRP show positive results in terms of return to work for chronic LBP patients with prolonged work absenteeism. Efforts should be made to propose such programs at an earlier stage of the disease.

Keywords Chronic low-back pain · Functional restoration program · Return to work

Introduction

Back pain is a major public health and socio economic problem in western industrialized countries. In such countries, lifetime prevalence of low-back pain (LBP) ranges from 49 to 70% and annual incidence varies from 15 to 45% [1]. LBP is now the first cause of work loss and absenteeism [2]. Patients suffering from chronic LBP only represent 2–7% of all LBP patients, but they are responsible for 75–85% of total workers absenteeism and for 80% of LBP costs [1–3]. Functional prognosis is poor: the proportion of patients returning to work has been estimated at only 50% after 6 months of absenteeism and almost null after 2 years [4]. Because conventional treatments have failed to reduce the impact of LBP, new therapeutic programs based on the patient's rehabilitation have been developed [5, 6].

Functional restoration programs (FRP) are focused on professional, social, functional, and psychological rehabilitation. Key concepts of these programs are based on an active patient participation and pain acceptance. These programs are multidisciplinary and involve physicians, physiotherapists, ergotherapists, social workers, and psychologists. FRP are costly and often require secondary or tertiary care institutions [7]. One of the main components is intensive physical training. Psychological counseling is

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also provided as well as cognitive and behavioral therapy, and educative sessions.

Most controlled studies report favorable rates of return to work after FRP such as 80–90% at 1 or 2 years [8, 9] in American studies. In European countries such as France, where the national health insurance system is more developed, those rates range from 65 to 70% [10–12]. No consensus exists on the indications of FRP. They are generally proposed to long-term disabled LBP patients with a prolonged sick leave. However, to our knowledge, no study points out to which patients, in terms of low-back pain or sick leave duration, it best applies to. The aim of this study was to evaluate the effectiveness of a FRP for Chronic LBP patients, primary endpoint being return to work, and to evaluate the predictive factors of long-term return to work.

Patients and methods

Patients

Patients were referred to the department of rheumatology of the Pitié Salpêtrière Hospital (Paris). Patients included in the program met the following criteria: non-specific chronic low-back pain lasting over 3 months, not relieved by medical interventions or surgical procedures, no current indication of surgery, working age, professional repercussion of CLBP with over 1 month of work absenteeism due to CLBP within the year preceding inclusion or unemployment due to CLBP, professional plans after FRP, and motivation to complete the program. People with specific low-back pain, cardiac or respiratory abnormalities after exercise stress tests on bicycle ergometers, organic contraindication to physical exercise were not included in the FRP.

Functional restoration program

The program took place in one single department of rheumatology, 6 h/day, 5 days a week, for 4 weeks. Patients were divided by groups of 4–5. The multidisciplinary team included a physician, a psychologist, physiotherapists, an ergonomist, a social worker, and a dietitian. The team and patients met once a week to discuss patients' perception of the program and analyze problems encountered. The functional restoration program was based on physical exercises, relaxation, education, and cognitive behavioral therapy. Three hours per day were devoted to physical exercises which were divided into three periods: warming, stretching, and muscular strengthening. Specific exercises adapted to work circumstances (like maintenance) were taught. Muscular strengthening was based on

isotonic contraction on fitness devices. Education was based on 1-h-long educative session adapted from back school programs 2–3 times a week. These courses were displayed by a rheumatologist or a physiotherapist. Educative booklets were also given to the patients. Pain management was based on cognitive and behavioral therapy displayed by a psychologist through group, individual, and relaxation sessions.

Data collection and follow-up evaluation

At inclusion, the medical, professional, social, psychological and dietary conditions of the patients were assessed by a medical examination and self questionnaires. For the professional evaluation, work status, duration of sick leave, type of work, the involvement in work injury, and the physical difficulty of work were noted. Work was classified as being either sedentary, involving moderate activity or physical by five rheumatologists specialized in chronic LBP. A moderate activity job was determined as a job requiring less than 3 h/day of physical activity, as opposed to a physical job which would require over 3 h of physical activity. Actual and past sports practice was noticed. Psychological evaluation was assessed by the Hospital Anxiety Depression (HAD) self questionnaire [13, 14]. Fear and avoidance beliefs regarding physical and working activities were assessed using the fear and avoidance belief questionnaire (FABQ self questionnaire) [15]. Impact on activities was evaluated by a quality of life index: the French version of the DALLAS pain questionnaire with four aspects: daily and work and leisure activities, social interest and anxiety-depression [16] and a functional index: the Quebec Back Pain Disability Scale [17].

Physical evaluation was based on the pain intensity in the past 48 h using a 10-cm horizontal visual analogic scale; both radicular and back pain were noted. Trunk and pelvic flexibility was measured using Shober MacRae test [18]. Trunk strength was measured by the isometric contraction of the flexors and extensors as described by Biering-Sorensen [19]. Trunk endurance was measured using Shirado's test [20]. This physical evaluation was assessed at inclusion and at 1, 6, and 12 months for trunk flexibility.

A socio professional evaluation and the assessment of the DALLAS, QUEBEC, FABQ, and HAD self-questionnaires were done at 1, 6, and 12 months after the FRP for all patients. The same evaluation was assessed by mail at the end of the follow-up.

Statistical analysis

Results are expressed as the median [Interquartile Range] for continuous variables and *N* (%) for categorical variables. A multivariate logistic regression model was used to

identify a set of independent predictors of return to work after the FRP. In the univariate analysis, the effects of continuous covariates were studied using the student *t* test or the Wilcoxon test when appropriate. Fisher's exact tests were used for categorical variables. For each outcome, factors achieving a *P* value < 0.10 in the marginal analysis were included in the multivariate model. A backward stepwise variable selection procedure was used to remove factors with *P* value > 0.05 in the multivariate model. In some analyses, continuous variables have been categorized. The choice of interval cutpoints was based on existing data where available, or on visual examination of plots of the estimated restricted cubic spline function. Analyses were carried out using R 2.4.0 statistical package [R Development Core Team; R Foundation for Statistical Computing, Vienna, Austria (<http://www.R-project.org>)].

Results

Patient characteristics at baseline

The mean follow-up time after FRP was 3.5 years ranging from 1 to 6 years. Seven patients abandoned the program, three patients died during follow-up, two of cardio vascular events and one of pancreas cancer. Out of the 163 patients

who finished the program, 105 patients answered to the final mailed questionnaire (Fig. 1).

The baseline characteristics of these 105 patients are shown in Table 1.

Drop out analysis

Out of the 163 patients who completed the program, 105 patients answered the final mailed questionnaire and 58 did not: 3 patients died during follow-up and the other 55 patients were lost of sight. Demographic, professional, and medical characteristics of these 55 drop outs were compared to those of the responders (Table 2) showing no major difference between the two groups except for sex (62% of the non responders were males compared with 43% in the responders) and age (mean age 41 years old for the non-responders and 44 years old for the responders). When work status was last collected from the non-responders, 51% (26/51) were at work.

Return to work after FRP (at 1, 6, 12 months and 3.5 years)

Results in terms of return to work are shown in Fig. 2. Return to work was defined as regain or maintenance of any type of work, being partial or full time, usual or

Fig. 1 Flow chart

Table 1 Patient characteristics at baseline

	Mean $\pm$ SD	%	N/total
Age at the onset of LBP (years)	32.9 $\pm$ 9.8		
Length of actual pain episode (months)	22.6 $\pm$ 21.8		
Prior back surgery		33	35/105
Patients at work		8.6	9/105
Patients on sick leave		91.4	96/105
Duration of sick leave (months)	14.8 $\pm$ 19.7		
Type of work			
Sedentary		42	44/105
Moderate activity		40	42/105
Physical		18	19/105
Industrial accident		35.2	37/105
Actual Sports practice		19	16/85
Prior sports practice		57.6	49/85

modified job (some patients had their job adapted), or any new job (due to industrial medicine intervention some patients were regarded) [21]. During follow-up the questions concerning occupational status were “Do you work? What is your work? Is it a full time or part time work? Did you have your job adapted? Were you regraded?” Informations concerning the employer were not asked.

Fifty-eight out of 105 patients returned to work at the end of the follow-up (mean follow-up time of 3.5 years), compared with patients at work at baseline, this difference being statistically significant ($p < 0.001$). Maintenance of work

Fig. 2 Return to work after FRP. ** $p < 0.001$ (compared with baseline)

status was very good as 54/105 patients were at work 1 year after the program and 58/105 at the end of the follow-up.

Most of the patients who returned to work after FRP were on sick leave at baseline (72%), 16% were working and 12% were unemployed. A lot of patients returned to a full-time work (84%); among those 48% were regraded and 26% had their job adapted. A minority of patients (16%) returned to a half time job, in which 40% were regraded and 40% had a job adaptation. Out of the 58 patients who returned to work after the FRP, 59% returned to a sedentary job, 34% to a job requiring a moderate activity, and 7% to a physical job.

Modification of physical activities and physical parameters after FRP

Results in terms of sports practice and physical parameters are resumed in Table 3. At the end of the follow-up 72/105

Table 2 Drop out analysis: characteristics of the responders compared with non-responders

	Responders N = 105 (%)	Non responders N = 55 (%)	p
Male sex	45 (43)	33 (62)	0.02
Type of work			0.08
Sedentary	44 (42)	20 (38)	
Moderate activity	42 (40)	26 (49)	
Physical	19 (18)	6 (11)	
Work status			0.41
Patients at work	9 (9)	3 (6)	
Patients on sick leave	96 (91)	51 (92)	
Prior sports practice	49 (58)	27 (54)	0.68
Actual sport practice	16 (19)	6 (12)	0.30
Age at the onset of LBP (median in months)	34 [25–41]	32 [27–44]	0.37
Age	44 [40–49]	41 [35–47]	0.04
Return to work at end of follow-up	58	26	
Duration of sick leave (months) median	8 [4–14]	10 [5–20]	0.94
VAS lumbar pain (0–100) median	57 [40–72]	58 [42–72]	0.85
VAS radicular pain (0–100) median	40 [9–62]	50 [18–60]	0.40

Table 3 Physical activities and physical parameters at 1, 6, 12 months, and at EFU

	Baseline	M1	M6	M12	EFU
Patients practising sports (%)	16/85 (19%)	77/86 (90%)	55/71 (78%)	48/68 (71%)	72/104 (69%)**
SMRF (cm) Mean $\pm$ SD	5.2 $\pm$ 1.8	5.2 $\pm$ 1.9	5.1 $\pm$ 2.1	5.1 $\pm$ 1.9	NE
SMRE (cm) Mean $\pm$ SD	1.6 $\pm$ 0.9	1.1 $\pm$ 0.7	1.6 $\pm$ 0.6	1.2 $\pm$ 0.8	NE
SORENSEN (s) Mean $\pm$ SD	129 $\pm$ 102	NE	NE	NE	NE
SHIRADO (s) Mean $\pm$ SD	117 $\pm$ 89	NE	NE	NE	NE

SMRF Shoeber Mac Rae flexion's

SMRE Shoeber Mac Rae extension's

** $p < 0.001$ (compared with baseline)

patients had a regular physical activity compared with 16 patients at baseline and this improvement was statistically significant ($p < 0.001$). Results showed an increase in the flexibility and strength of the spine at the end of the program, but these results were not maintained afterwards.

Evolution of pain after FRP

Results concerning pain are displayed in Table 4. At the end of the 4 weeks program, the lumbar pain level was reduced, but this result was not further maintained.

Evolution of self-questionnaire evaluations (quality of life, anxiety and depression, function, fear, and avoidance beliefs)

Psychological factors, quality of life, function, and fear and avoidance beliefs were all significantly improved after the FRP and these positive results were maintained after a

mean follow-up time of 3.5 years. Results of the DALLAS self-questionnaire are displayed in Fig. 3 and those concerning anxiety and depression are shown in Fig. 4. Results concerning FABQ questionnaire and Quebec scale are displayed in Fig. 5.

Predictive factors of long-term return to work after FRP

Results of the univariate analysis

Results of the univariate analysis are displayed in Table 5. Results are expressed as the median [Interquartile Range] for continuous variables and N (%) for categorical variables. Other factors were also studied such as involvement in a work injury, prior back surgery, result of the FABQ physical activity, HAD depression and anxiety, DALLAS and QUEBEC questionnaires, visual analogic scale (VAS)

Table 4 Evolution of pain levels on VAS

	Baseline	W4	M1	M6	M12	EFU
Lumbar pain (0–100) Mean $\pm$ SD	55.5 $\pm$ 23.9	45.3 $\pm$ 30.5*	50.2 $\pm$ 26	51.9 $\pm$ 27	47.1 $\pm$ 28	53.7 $\pm$ 28
Radicular pain (0–100) Mean $\pm$ SD	38.5 $\pm$ 30	33.5 $\pm$ 30.7	35.7 $\pm$ 30	40.3 $\pm$ 30	39.4 $\pm$ 30	37.8 $\pm$ 31

* $p < 0.05$ (compared with baseline)

Fig. 3 Results of the DALLAS self questionnaire after FRP.

ADL activities of daily living.

* $p < 0.05$ (compared with baseline). ** $p < 0.005$

(compared with baseline)

Fig. 4 Results of the HAD self questionnaire after FRP. * $p < 0.01$ (compared with *baseline*)

Fig. 5 Results of the Quebec and FABQ questionnaires after FRP. * $p < 0.05$ (compared with *baseline*) ** $p < 0.005$ (compared with *baseline*)

intensity of radicular pain, and professional status. The p value for those factors was >0.1 (data not shown).

Multivariate analysis

Three independent factors were found to be associated with the return to work after FRP. Those were sports practice at the beginning of the FRP, age at the onset of low-back pain, and the duration of the sick leave. Results of the multivariate analysis are displayed in Table 6.

Patients who still practiced sports when they entered the program returned back to work six times more easily than non-sportive patients. The rate of return to work was higher for patients which symptoms starting at a younger age. Patients who began to suffer from low-back pain before the age of 35 were three times more likely to return to work than the others (OR 2.6 [1.1–5.8]), this being independent from the age of the patients at inclusion.

The longer the patients were on sick leave, the poorest was the effect of the program concerning return to work. For each additional month of sick leave, chances of returning to work decreased by 5%. The end point of

6 months seems to be the most representative, as patients who were out of work for less than 6 months had up to three (OR 2.7 [1.2–6.3]) more chances of returning to work than others.

Discussion

Our results confirm the long-term effectiveness of a FRP in terms of return to work, improvement of physical activities, psychological parameters, and health-related quality of life. A majority of patients (54 patients out of 105) returned to work in the year following the program, and 58 patients were still at work at the end of the follow-up, showing good work maintenance. Without considering the non-responders long-term return to work reaches 55% of the patients. This result must be taken with caution with regard to the percentage of non-responders to our long-term evaluation. Most French [10–12, 22] and international [7–9] studies report better return-to-work rates. In French studies, those range from 65 to 72% [10, 11, 22]. Reasons for this difference could reside in the selection of patients included, especially regarding their professional status. In our study, 26% of the patients were unemployed at baseline but had high expectations to return to work, whereas in other French studies [11, 22] having a job was one of the necessary criteria for inclusion. Considering the actual unemployment problem in western industrialized countries such as France, the large proportion of unemployed patients in our study may explain the lower return-to-work rate we experienced. It also appears that the mean duration of sick leave was more important in our study than in other French studies. For example, in the Bontoux study [11] the mean duration of sick leave was 6 months compared with 15 months in ours. In both these studies, the duration of sick leave was found to be predictive of return to work.

We report a favorable impact of FRP concerning sports practice: 69% of the patients remained sportive 3.5 years after FRP versus 19% at inclusion. These results accord with those of other European studies. In the Bendix study [23] 72% of the patients were still sportive 4 years after FRP.

In our study, pain intensity was neither reduced nor worsened after treatment, showing that this type of intense physical program is well tolerated by chronic painful patients. Some studies report a positive effect regarding pain of FRP [6, 24, 25]. Other studies do not report any pain improvement after FRP [12, 26]. In both our study and Bontoux's [11] pain intensity had no influence on return to work. It is interesting to notice that although pain intensity changes so little, patients do go back to work. Results of self-questionnaires are improved after FRP, especially the

Table 5 Univariate analysis of factors affecting return to work

Variable	No return to work after FRP	Return to work after FRP	<i>P</i>
Age (years)	46 [42–51]	42 [38–47]	0.01
Male sex	24 (47%)	36 (67%)	0.05
Age at the onset of LBP (years)	38 [28–41]	30 [23–38]	0.01
Duration of low back pain (months)	18 [8–40]	10 [4–26]	0.03
Symptoms			0.05
Low back pain	8 (16%)	13 (25%)	
Sciatica	34 (67%)	38 (72%)	
Bilateral sciatica	9 (18%)	2 (4%)	
Sports practice	4 (11%)	12 (26%)	0.09
Type of work			0.05
Sedentary	23 (45%)	29 (54%)	
Moderate activity	14 (28%)	20 (37%)	
Physical	14 (28%)	5 (9%)	
FABQ work	33 [24–38]	25 [19–32]	0.01
FABQ global	48 [38–56]	38 [33–51]	0.05
VAS low-back pain	60 [43–78]	54 [36–68]	0.13
Duration of sick leave (months)	12 [6–23]	6 [2–11]	0.002
Professionally active (working)	1 (2%)	8 (15%)	0.03
Patients feeling capable of returning to work at the end of the program	30 (70%)	42 (86%)	0.08

Table 6 Results of the multivariate analysis

	OR [95% CI]	<i>p</i>
Sports practice		0.05
No	1	
Yes	5.76 [1.03–32.41]	
Age of onset of LBP (per year)	0.94 [0.89–0.99]	0.01
Duration of sick leave (per month)	0.95 [0.92–0.98]	0.005

DALLAS quality of life scores and the FABQ scores showing that FRP mainly modifies false beliefs concerning LBP and probably as a consequence improve quality of life. Although the DALLAS, QUEBEC, FABQ scores are all significantly improved after FRP the clinical significance of this improvement is hard to determine. Concerning anxiety and depression evaluation, a cut-off point of 8 is established on the HAD scale [14], and it is interesting to notice that baseline HAD depression score is over 8 and remains under this cut-off point after treatment.

This study has some limits; the most important one is that there is no control group. We found four randomised controlled trials (RCTs) in the literature [27–30] on return to work after sick listing due to low-back pain. In these studies, patients were all sick listed for more than 4 weeks due to LBP; functional restoration programs (or back school programs) were compared with usual care in terms of return to work. The percentage of patients at work in the control groups ranged from 40% after 200 days of

follow-up [27], to 65% after 5 years [28]. In the intervention groups, this percentage ranged from 70% at 200 days of follow-up [27] to 92% at 1 year [30]. In all those RCTs, functional restoration programs appear to be more effective than usual care in increasing the rate of return to work for LBP patients.

Another methodological limitation is the lack of a trend analysis when using longitudinal data. Authors agree that a multilevel regression growth curve analysis would have been robust with respect to unequal follow-up intervals, but the data collected did not allow this type of analysis.

Concerning the participation rate of our study, out of the 170 patients who were eligible for FRP, 163 patients fully completed the program (7 withdrawals), 3 patients died during follow-up after FRP, and 105 answered the final mailed questionnaire. The participation rate was 66% (108/163). To improve the participation rate, questionnaires were mailed twice to non-responders, and a telephone call was then made to the last non responders. There are a few reasons for this low-participation rate. First, questionnaires were mailed to patients 1–6 years after the end of the program. Whereas some patients had moved away during this period and despite our efforts to find their new address, many were lost to sight. Second, some patients did not answer the mailed questionnaire, even after a positive telephone contact reminder.

We identified three predictive factors of long-term return to work after FRP: duration of sick leave, age at the

onset of LBP, and sports practice. A number of studies concerning chronic low-back pain patients report a negative impact of sick leaves on return to work with an inverse correlation between the duration of sick leave and return-to-work rates [3, 11, 23, 31]. Six months seemed to be a relevant cut-off point. Patients whose sick leave period rose above 6 months had their chances of returning to work divided by three. These results argue in favor of an earlier and reinforced treatment for chronic and subacute low-back pain patients.

The age at the onset of low-back pain also seems to have an impact on the efficiency of a FRP. Patients whose LBP started before the age of 35 had three more chances of returning to work than others. Thus, more than age when entering the program, it appears that younger age at the beginning of LBP is predictive of a better return-to-work rate. This may be explained by a better coping of younger patients compared with older ones.

Sports practice is also an interesting new prognostic factor. In our study, patients who were still sportive regardless of their LBP problem had up to six more chances of returning to work after FRP. This may also be due to a better coping of these patients who remain active despite the pain. Sports practice seems to have a favorable impact on the prognostic of chronic LBP patients. A study reports better long-term prognostic after FRP in terms of pain and work absenteeism for patients keeping physically active [32].

Conclusion

This prospective study reports 3.5 years follow-up of 105 chronic low-back pain patients after a functional restoration program. Results concerning work attendance and sports practice were very positive with 55% of the patients that had return to work, compared with 9% at baseline, and 69% practicing sports versus 19%. Psychological factors, quality of life, function, and fear and avoidance beliefs were all significantly improved after the FRP. Two positive prognostic factors were extracted from the multivariate analysis: sports practice and young age at the onset of low-back pain with a cut-off point of 35 years. One negative factor was found: the duration of sick leave, with a worse prognostic for patients with more than a 6-month work-absenteeism. This study prompts us to emphasize on an early and active care of chronic low-back pain patients.

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