DOES PSYCHOLOGICAL STATUS INFLUENCE RECOVERY IN WORKERS COMPENSATED FOR ACUTE LOW BACK PAIN?

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ABSTRACT

The influence of psychological status on recovery from a first lifetime episode of acute low-back pain was assessed in compensated workers seen in a physiatry clinic. One hundred thirty-four participants of a back school intervention trial were selected and followed for 1 year. The objectives were to determine the evolution of psychological distress, well-being, pain, self-reported disability and spinal flexibility, and to determine the psychological factors associated with return to work and recurrence. Improvement occurred post-treatment in all measures except well-being which did not fluctuate over the year. Additional improvement in functional disability occurred at 6 and 12 months. Using multiple logistic regression, low baseline psychological distress predicted late return to work and high baseline well-being predicted recurrence. A second model for recurrence that was constructed with post-treatment scores on the longitudinal measures had greater predictive power than the model using baseline scores. These results have implications for the management of return to work.

RESUMÉ

On a évalué l'influence des facteurs psychologiques sur la convalescence de travailleurs indemnisés suite à un premier événement de mal de dos. Les 134 participants à l'étude ont été recrutés dans une clinique de physiatrie à l'occasion d'une autre étude qui portait sur les classes de dos. Les objectifs sont: 1) comparer l'évolution de la douleur au dos à celle de l'incapacité au travail, de la détresse psychologique, de la perception de bien-être et de la flexibilité de la colonne; et 2) déterminer si les facteurs psychologiques sont associés à la durée de l'incapacité au travail et aux rechutes. Les patients ont été évalués au début de l'épisode, à la fin des traitements, 6 mois et 12 mois après l'entrée dans l'étude et on a observé une amélioration de tous les indicateurs à l'exception de la perception de bien-être qui est demeurée stable. Des analyses de régression logistiques ont permis de déterminer qu'un score faible sur l'echelle de détresse psychologique est associée à un retour au travail plus tardif et qu'une perception élevée sur l'echelle de bien-être est associée aux rechutes. Ces analyses réalisées avec les scores de fin de traitement ont donné une meilleure valeur prédictive qu'avec les scores à l'entrée de l'étude. Les résultats apportent un nouvel éclairage pour le management des accidentés de dos et leur retour au travail.

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ABBREVIATIONS

CSST	Commission de la santé et de la sécurité du travail
GHQ	General Health Questionnaire
GWBS	General Well-Being Scale
LBP	Low back pain
MMPI	Minnesota Multiphasic Personality Inventory
ODQ	Oswestry Disability Questionnaire
PSI	Psychiatric Symptom Index
QIP	Quebec Institute of Physiatry
RMDQ	Roland-Morris Disability Questionnaire
RTW	Return to work
VAS	Visual Analog Scale

GLOSSARY

Chronic pain:
Pain that persists for at least 3 months; this does not necessarily include absence from work.

Chronic low back work disability:
An inability to work for at least 3 months in any one year period that is due to low back pain. This may result from absenteeism to the original injury that exceeds 3 months or from the development of a recurrent compensated episode of LBP.

Disability:
An intolerance of certain postures including standing and sitting and of activities including walking and running. Tasks are not performed with their usual intensity.

Functional disability:
A self-perceived restriction or lack of ability to perform an activity in a manner or within the range considered normal for a given individual.

Low back work disability (work disability):
A total inability to work of one day or more due to low back pain.

Psychological disturbance:
Within the confines of this study, psychological disturbance refers to either poor well-being, defined as scores below 30 on the General Well-Being Scale (see page 32 of text), or high psychological distress, defined as scores above 12.65 on the Psychiatric Symptom Index (see page 31 of text).

Recurrence:
One of the main study outcomes. In the context of this study, a recurrence refers to an episode of LBP that includes time off work and compensation that occurs after at least a 1-day return to work that develops during the 1-year follow-up.

Return to work:
One of the main study outcomes. In the context of this study, a return to work within 31 days of entering treatment was considered a successful outcome. This was referred to as an early return to work. A late return to work was defined as 32 days or more after entering treatment.

INTRODUCTION

Low back pain (LBP) has become one of the most common and costly industrial problems in Western societies (3,20,37). In Finland, there was a 144% increase in disability pensions due to musculoskeletal disorders between 1969 and 1984 (51). In the United States, the rate of low back work disability between 1960 and 1980 was 14 times the rate of growth of the population (20). In the United Kingdom, back pain accounted for 13% of all days of incapacity during the late 1980's (54). In Norway, LBP is currently the highest single cause of work absence accounting for 13% of all sickness leave of at least 8 weeks duration (50). A similar phenomenon has occurred in Quebec, Canada. Between 1981 and 1988, the estimated overall 1-year incidence of occupational back pain increased from 1.37% to 1.86% (1,3). From approximately 37,000 workers and nearly $170 million in 1981, back-related work disability grew to account for 27.8% of claims and approximately $300 million. By 1993, 30% of all compensation claims were back-related and accounted for more than 39,700 workers at a cost of approximately $427 million (5).

The estimated lifetime prevalence of back pain ranges from 60-80% (38). Individuals are commonly affected during their most productive years of life (52,94) and it is not surprising that back and spinal impairments are the most frequently reported single cause of restricted activity in persons under the age of 45 (52). Although most individuals recover from acute LBP, approximately 2-10% become chronically work-disabled (2,55,82,88,89). This small minority of claimants accounts for an estimated 70 to 80% of the total costs of occupational back pain (2,14,88,89,91). In one industrial setting, 19% of all injury claims were back-related yet they accounted for 41% of the total injury costs (88). In 1993 in Quebec, 12% of workers compensated for back-related

work disability were absent for over 90 days (5). Employees who are absent from work for at least 6 months have only a 20 to 50% chance of returning to work at their pre-injury level of employment (20,52). This probability decreases with the increased amount of time off work, and after a 2-year absence return to fulltime employment is unlikely without the aid of more aggressive, costly, but less available strategies (52) (i.e.; work hardening, pain management, cognitive-behavioral therapy and psychotherapy (90,102)).

The human and economic costs of industrial LBP are staggering. The enormity of the problem has made it a research priority to identify persons at risk of chronic low back work disability. Although a psychological component has long been implicated, it is unclear whether it predisposes an individual to develop low back work disability or whether it is a consequence of pain of longstanding duration. The direction of causality has not been determined due to methodological problems encountered in previous investigations. These have included the following: 1) the psychological measurement instruments used may have been inappropriate for populations of pain patients; 2) investigators lumped together heterogenous groups of patients with episodes of first-time, new, recurrent, acute and chronic LBP; 3) many prediction models were generated from already disabled individuals, confusing the cause of the work disability with its consequences; and 4) prospective studies with low rates of follow-up may have yielded biased results. This secondary analysis is an attempt to account for some of these issues by observing clearly defined first lifetime episodes of acute LBP, at a point in time near the onset of the work disability, using psychological instruments designed for use in the general population, in a longitudinal study that had a high response rate. To date there is a paucity of longitudinal investigations of occupational LBP, therefore, these results will contribute to our understanding of the natural history of the disorder.

The purpose of this analysis is to examine the effect of psychological status on recovery from a first lifetime episode of significant acute LBP in compensated workers seen in a physiatry clinic. The objectives are to describe and compare the 1-year evolution of psychological status, pain, functional disability and spinal flexibility, and to determine the association of psychological factors with return to work and with recurrence.

LITERATURE REVIEW

2.1 Etiology

Low back pain is not a new phenomenon. According to Waddell, the first recording of LBP appears in a surgical text dating back to 1500 BC (96). It has long been recognized that LBP frequently presents without evidence of a physical problem (18,81). The majority of low back disorders receive a nonspecific diagnosis (2). Radiographic evidence of degeneration in the lumbar spine has been associated with sciatica, however, it has not been related to other types of back disorders (16,74). Alternatively, proven back abnormalities do not necessarily result in pain (6,92). In one study, 42% of persons with back pain were found to have physical back abnormalities, yet 34% of those with proven back abnormalities reported no pain (6). In the absence of organic findings, the etiology of back pain remains uncertain and it is widely held to be multifactorial.

2.2 Risk factors

Investigations of the risk factors for LBP and disability differentiate between studies of incidence and studies of disability. The aim of incidence studies is to identify factors that predispose individuals to develop LBP. The predictors of incidence include individual factors such as previous back problems (7,12,22,27,104), younger age (11,13,27,54), older age (86), female gender (27,86), male gender (89), decreased fitness level (104), cigarette smoking (7,36), less education (6,9), use of alcohol (6), short duration of employment (13,27), long duration of employment (6), recent job change (13,27), low intellectual capacity (9), fatherhood/parenthood (36), stressful life events (70), psychological distress (24,61), psychological disturbance (54), hysteria (12,85), hypochondriasis and depression (85), neuroticism (6), type A behaviour (70) and low anxiety (54). Work-related factors include heavy job demands

(6,7,9,16,54,104), stooping, twisting or lifting (6,7,54,104), prolonged standing or sedentary work (104), monotonous work (16), occupation (40), job dissatisfaction (7,9,12,22), dissatisfaction with management (70), and stress at work (16).

The goal of disability studies is to predict persons with acute LBP who are at risk of chronic or persistent pain or chronic disability due to LBP. The demographic factors associated with chronic problems include history of back problems (29), low level of education (29), unemployment (80), employment (86), sedentary work posture (47), low level of activity (69), low socioeconomic status (47), increasing age (86) and female gender (86). Psychological risk factors include increased anxiety (69), depression (47,85), poor self-reported health (29) and increased psychological distress (19,100).

Chronic or persistent problems may result in work disability. In studies that examined the risk factors for work absence due to low back pain, determinants have included age (8,41), low intelligence (8), less education (8,20,29,37), gender (37), pain severity (37), job satisfaction (20), past hospitalizations (20), poor self-rated health (29) and fear-avoidance factors (55). Moreover, in the more recent literature there has been an attempt to quantify work disability and to determine the risk factors for lengthy work absence. Factors associated with lengthy sickness leave due to LBP include occupation (40,79), job dissatisfaction (20,22,37), physically demanding job tasks (40,104), monotonous work and fatigue at the end of the day (37,92), receiving compensation (20,22,37,41,80), the amount of compensation received (2,37), perceived hostility in the workplace from supervisors and co-workers (92), and the initial diagnosis (2,30,40). Long duration of work absence has been associated with history of back pain (22,40,55), younger age (60), older age (2,41,79), increased alcohol use (37), functional disability (22,34), severity of

pain (22,34,37), impaired straight leg raise (37), male gender (22,79), female gender (30), marital status (60), socioeconomic status (41) and site of symptoms (79). Lengthy work absence may also arise from recurrences of low back symptoms that result in additional sickness leave. The risk factors for recurrent episodes involving work absence are not clear, however, because previous investigations were not confined to working populations (11), to sickness leave outcome (93), to uncomplicated work absence (60) or to recurrent episodes following clearly defined initial episodes (4).

The literature on risk factors for occupational LBP is vast and seemingly contradictory at times. The discrepancies are frequently explained by differences in study design and methodology, response rates, the populations studied, the measurement instruments used, the outcomes assessed and the statistical techniques utilized.

2.3 Historical perspective

Early case studies suggested a psychological component in the etiology of LBP. In the 1940's, Sargent (81) found that among military men in the Armed Forces, a history of backache commonly presented in the absence of physical evidence of disease and that episodes of back pain occurred concomitantly with the onset of stress. Brown et al (18) conducted orthopaedic and psychiatric examinations in a sample of 36 patients with back pain of varied duration to determine the role of psychologic factors in back pain disability. Although 20 subjects showed physical evidence of a lesion, 24 had psychological factors that were perceived to significantly contribute to their disabilities. Of 23 patients receiving compensation, 14 presented with psychiatric complications. The most commonly occurring characteristics of persons with back pain were a vague history of the pain, resentment toward the medical profession, dramatic descriptions of symptomatology, difficulty in

localizing and describing the pain, failure of the usual treatments to provide adequate pain relief, and neurotic symptoms such as anxiety, insomnia, irritability, headaches, depression and chronic fatigue. It was suggested that psychological factors complicated the disability in patients presenting with four of these characteristics, but their absence did not mean that psychological factors were not involved. Although the methods of data collection were not standardized and both studies suffered from selection and information biases, these early descriptions of the industrial back problem are consistent with the scientific findings of current research: LBP frequently presents without clinical findings and a psychological component is involved.

2.4 Occupational back pain

Occupational back pain extends beyond the experiences of pain and injury. For it to be recognized, occupational back pain must be reported. Thus the true burden of the disorder is likely to be underestimated because not all work-related injury is reported. In fact, studies derived from Worker's Compensation databases most likely contribute to the underestimation because not all members of the work force are represented (3). Battié suggested in her review of industrial back pain that only 2-5% of injured workers file disability claims (7). Coste et al (22) provided support to these assertions with their study of primary care patients with acute LBP of less than 72 hours duration. Their results showed that only 60% of employed patients actually lost time from work. Similarly, Klaber Moffett (54) conducted a prospective study that confirmed that only a small percentage of student nurses with back pain in fact lost time from work. Participants in both studies kept daily diaries of pain and work absence (22,54). Additional support is furnished by a population-based survey. Croft et al (24) re-surveyed subjects initially LBP-free for 1 month, and found that among fulltime employed respondents, only 19% of those who developed LBP during the following year actually consulted a practitioner.

Other investigators found that few employees were able to describe events associated with the back injury (93,104). For these reasons, non-physical factors such as psychological status and work-related variables are suggested to influence the reporting of occupational back pain. Results from a prospective study by Bigos et al (12) that used multivariate modelling techniques suggested that job task enjoyment, high hysteria scores (on the MMPI) and history of back treatment were most predictive of future reports of occupational back pain. Hysteria was also associated with the development of sciatica in Finnish male blue-collar workers (72). However, it is unclear whether hysteria scores were associated with the development or with the reporting of the problem.

2.5 Psychological factors

The relationship of psychological factors to the course of LBP and disability is controversial. Much of this debate derives from two existing theories regarding the causal link between pain and distress (20,37,39,94). One hypothesis, espoused in the psychiatric literature, proposes a psychogenic etiology of medically unexplained symptoms suggesting that chronic pain is the somatic expression of an underlying depressive disturbance (31,39). Somatizing patients defend against the experience of depression and instead present with a focus on physical symptoms (102). Studies have shown that somatizers presented more often to non-psychiatric physicians (35) where the rate of recognition of psychiatric disorders was very low (53). This low rate of recognition was due to a somatic style of clinical presentation wherein the patient denied having emotional problems (53). The alternate hypothesis suggests that chronic pain causes the psychological distress that is found in LBP patients when they are tested for distress. Psychological distress evolves secondarily to the injury and fluctuates with the success or failure of treatment (97). The results of a recent follow-up survey suggest that LBP can be

predicted by high levels of psychological distress (24), but the low response rate of 64% does not preclude the possibility that persons who developed LBP may have been more likely to respond. The need remains for longitudinal epidemiological research to improve our understanding of the temporal relationships among psychological status, pain and functional disability (16,82,102).

2.6 Acute and chronic pain

Acute and chronic pain are distinctly different phenomenon (90,97,98). Acute pain is associated with tissue damage and nociception. It is characterized by a well-defined time of onset and is accompanied by physical evidence of injury; the pain is commonly proportional to the physical findings. These characteristics, however, are usually not necessarily true of acute LBP and certain other forms of pain episodes such as the common headache. Effective pain relief is usually obtained from medication, physical and/or surgical interventions. Pain is considered chronic when it persists for at least 3 months (22,42) or 6 months (75,82). With the passage of time, chronic pain becomes increasingly dissociated from the initiating physical injury. There is neither a well-defined time of onset nor a response to treatment aimed at the cause of the pain. Success in rehabilitation is more difficult to achieve in chronic pain sufferers (97,102).

2.7 Occupational LBP and psychological factors

2.7.1 Cross-sectional studies

Psychological disturbance is commonly reported in individuals with chronic LBP when they are tested (66). In a cross-sectional study, Harkapaa (45) examined 476 blue-collar workers with chronic or recurrent LBP of 2 years duration and who were either working or on temporary sick leave. Subjects

with more severe LBP reported more psychological distress using the General Health Questionnaire (GHQ)(45).

Feyer et al (34) compared nurses and postal workers with LBP and chronic LBP patients. They found that a greater percentage of patients reported psychological distress. Psychological distress, defined as an elevated score on the GHQ, was reported by 80% of chronic patients, 23% of nurses and 26% of postal workers. Functional disability was found by multiple logistic regression to be the most important predictor of time off work in the working groups. Workers showed a positive linear association between functional disability and severity of pain. By contrast, the patient group had a significant interaction term which showed that psychological disturbance modified the relationship between pain severity and functional disability. The authors suggested this confirmed the association of psychological disturbance with chronicity.

Not surprisingly, surveys have shown that the prevalence and incidence of low back and musculoskeletal pain varies by demographic characteristics. The 1-month prevalence of LBP among patients registered with family or general practice physicians in Manchester, United Kingdom in January 1992 was 39% (24). In a population-based survey in Belgium in 1991, the prevalence of daily LBP among respondents was 37%; the incidence of a current first episode was 11% (86). Previous history of LBP varied by age, gender and occupation: 56% of persons aged 20-34 and 63% of those aged 50-64 reported LBP; 63% of females and 54% of males reported LBP; and 53% of high executives and 65% of housewives reported LBP (86). Results from a sample of 55 year olds estimated a point prevalence of 29% in Malmo, Sweden in 1983 (9). The 1-month prevalence of self-reported muscle pain in Norwegian workers aged 18-70 was 41.7% (96). The gender differential was 54% for

females and 40% for males. Back pain complaint increased with age and differed among occupational groups. In addition, psychological factors such as anxiety, defence and job stress explained a considerable amount of the variance of self-reported muscle pain when examined within occupation. In a 1961 survey of male employees in a Swedish pulp and paper industry, the prevalence of back pain was 25% (6). The prevalence of back pain was greater among those with less education, manual labourers, higher neuroticism, and lower income. Both surveys and cross-sectional studies are, however, hypothesis generating by design and the associations are not indicative of causal relations.

2.7.2 Prospective studies

Prospective investigations provide stronger evidence for a causal link between psychological factors and LBP. Polatin et al (73) developed a predictive model for return to work at 1 year in a group of 326 chronically disabled patients sent to a restoration program. Patients were classified as successful, failed, dropped-out or failed to enter based on their participation and outcome. It was found that longer seniority and lower pre-treatment scores on self-reported depression, measured with the Beck Depression Scale, were predictive of return to work. Additionally, gender differences revealed that women were more depressed than men.

Cats-Baril & Frymoyer (20) developed a prediction model for chronic low back work disability that was tested prospectively in 250 spine clinic patients with a new episode of LBP. The model, based on employment status, work history, occupation, job satisfaction, satisfaction with retirement policies, perception of fault, compensation status, past hospitalizations and educational level, could accurately classify 69% of workers who became work disabled. However, the investigators did not provide a definition for a new episode of

LBP. Lehmann et al (60) used this prediction model in a sample of acute LBP patients with perceived work-related problems and who presented to a spine consultant. These individuals were absent from work for 2 to 6 weeks. The investigators were unable to reproduce any of the original findings of Cats-Baril et al, but suggested that work absence of more than 2 weeks with the perception of a work-related injury placed an individual at increased risk of long-term work disability.

Klaber Moffett (54) found that back pain reports were associated with low trait anxiety, increased neuroticism, an external locus of control and psychological disturbance (measured with the 12-item GHQ). This was a 20-month follow-up investigation of 376 student nurses wherein only 53% of the study population was followed. Although the title of this study claimed it was longitudinal, none of the variables were assessed for change over time.

High hysteria scores have been associated with occupational back pain. Pietri-Taleb et al (72) suggested that hysteria, measured by the Middlesex Hospital Questionnaire, significantly predicted sciatic pain in male blue-collar but not white-collar workers who reported no previous history of sciatica. This conclusion was based on a multivariate model that included linear and quadratic terms for hysteria, and although the odds ratio of 1.34 was significant, the clinical significance is irrelevant. Bigos et al (12) studied 3,020 aircraft workers and found that the degree of emotional distress and workplace perceptions were predictive of back pain reporting. Individuals in the highest risk group had the least job task enjoyment, higher hysteria scores and a history of back treatment. However, there is a possibility of selection bias given the low overall response rate of 54%; responders may have been more hysterical than non-responders.

Croft et al (24) conducted a population survey of back pain prevalence in the United Kingdom in 1992 that included a follow-up questionnaire on only those who in the first survey had reported no back pain during the previous month. High baseline psychologic distress, measured by the GHQ, was associated with an increased risk of future LBP. There were higher risks for LBP when a practitioner was consulted and for LBP that did not include a consultation. Response rate to the initial survey was 59% and 64% to the follow-up survey.

Hasenbring et al (47) found that persistent pain was best predicted by physical findings, social status, and psychological factors such as depression and poor pain coping strategies. The more depressive the mood prior to treatment, the greater the probability of persistent pain after treatment ended. The psychological variables of depression and daily hassles were the best predictors of application for early retirement. Although this investigation had a response rate of 89%, it was a study of 111 hospitalized patients with radicular pain and the findings may not be generalizable to occupational low back pain.

In one prospective study, Lehmann et al found no associations between psychological status and recovery (60). Only marital status was related to return to work: married patients returned to work more quickly than single patients. This was a 6 month follow-up study of 55 patients who were off work for between 2 and 6 weeks in which the response rate was 82%. Whereas 12.7% of the sample returned to work within 1 month of injury, 54.5% returned within 3 months and 16% never returned to work successfully during the follow-up period. The results of this study are questionable due small sample size and the large number of variables tested.

The major problem with most of these prospective studies is the possibility of selection bias due to low response rates. The numerous populations studied and myriad definitions of exposure and outcome - some studies even lacked precise definitions - limit the generalizability of the findings.

2.7.3 Longitudinal studies

Longitudinal studies not only provide the strongest observational evidence of causality, they provide information on the evolution of LBP over time. However, there are few longitudinal investigations and not all of them are confined to occupational LBP.

Coste et al (22) evaluated the evolution of pain and functional disability during the first week post-injury in 103 primary practice patients with acute LBP of less than 72 hours duration. Acute LBP was defined as having no pain during the previous three months and follow-up occurred until day 90. Large decreases in pain and disability were visible each day until day 4 when smaller decreases occurred. Factors associated with work absence were previous chronic episode of LBP, poor job satisfaction, male gender, compensation status, disability status at study entry and pain at entry, however, there were no associations found between return to work and psychiatric diagnosis. The follow-up response rate was 89%. In another study by Coste et al (23) psychiatric disorders were detected in 41.2% of university rheumatology clinic outpatients who reported LBP during the preceding 12 months. The high prevalence of psychiatric disorders may be attributed to the study population (outpatients and not workers), to co-morbidity (rheumatology-related problems and LBP) or to selection bias because university hospitals often serve as referral centres for difficult cases.

Klenerman (55) evaluated the evolution of pain, functional disability and sick leave in 300 patients with a first or new episode of acute LBP of not more than 1 week duration. Patients were classified as no pain, intermittent pain or constant pain based on their responses at the 3 follow-up periods. The constant pain group always reported greater severity of pain, more functional disability and more persons on sick leave. The intermittent pain group had less severity of pain, functional disability and sick leave while the no pain group reported almost no functional disability at 12 months, lower pain scores and zero sick leave at both the 2 and 12 months. The best predictors of chronic LBP and functional disability were values obtained at the 2-month interview on physical measures, psychosocial factors and stress and personality variables. A lack of significant improvement in the first 2 months following the injury was also a good predictor of chronic back pain at 12 months. However, the 54% response rate to the 2 month interview may have biased these results.

Burton et al (19) evaluated the evolution of functional disability, pain, depression and somatization in 252 patients with a new occurrence of LBP seen by an osteopathic group practice. Significant improvement occurred in functional disability, pain and depression at 1 year, although 53% were still considered somewhat disabled at the end of the study. The outcome, chronic functional disability, was assessed with the 1-year score on the Roland-Morris Disability Questionnaire. Psychosocial data accounted for 59% of the variance in the acute cases (LBP of less than 3 weeks) compared to 10% that was explained by clinical information. Although the response rate was an acceptable 74%, this cohort was not confined to workers.

The problems with these longitudinal studies are similar to those of the prospective studies: low response rates, the diversity of the study populations

and the differing definitions of exposure and outcome variables. All of these problems limit the generalizability of the study results.

2.8 Measurement of psychological factors

Although there is general acceptance that psychological factors play a role in the development of chronic pain and disability (39), disagreement exists about whether it is more relevant to measure personality traits or psychological distress. One measurement tool that been used extensively in LBP research to evaluate personality traits is the Minnesota Multiphasic Personality Inventory (MMPI) (7). Using the MMPI, Beals & Hickman (8) found more psychological disturbance in compensated workers with back injuries than in compensated workers with extremity injuries, who in turn had more disturbance than uninjured controls. Workers with recent injuries displayed moderately severe depressive reactions, mild hysterical and hypochondriacal scale elevations while workers with long-term impairment showed mild depression, moderate-severe hysterical and hypochondriacal reactions. The authors claimed this was a change from acute to chronic psychopathology that occurred with the passage of time. This change reduced the likelihood of return to work despite the fact that functional disability remained constant. In this study, all injuries were of at least 3 months duration (considered chronic by some experts) and psychological status was not determined pre-morbidly.

Sivik (85), using the MMPI, compared the personality profiles of 26 patients with acute LBP of less than 2 months duration with 25 controls matched on age, gender and education. LBP patients had significantly higher scores on the hysteria, depression and hypochondriasis subscales. The author concluded these personality factors were present premorbidly, however, previous history of back pain was not assessed in the patient group. Bigos et al (12) found that elevated scores on the hysteria, schizophrenia and LBP subscales of the MMPI

measured prospectively were significantly related to reporting occupational back pain. Murphy & Cornish (69) used the MMPI and the Eysenck Personality Questionnaire (EPQ) in a sample of 48 male veterans with LBP of less than 6 months duration to determine whether those who develop chronic pain are measurably different from those who recover from an acute episode. The results of a stepwise discriminant analysis showed that pre-chronic patients complained of pain over a larger body area, were more anxious during the acute stage and their symptoms were more central than peripheral. The investigators acknowledge that these results may be suspect given the number of variables entered in the analysis, the small sample size and the 71% follow-up rate.

The use of the MMPI in pain studies was questioned by several experts who argued that it was tediously lengthy and objectionable to patients (57,65,66,100), produced a high rate of misclassification (65) and was inappropriate for use with pain patients (39,57,98,102). Other researchers claimed there was an inability to scientifically establish the existence of a back pain personality (66,98,102), and that the MMPI research indicated the existence of a neurotic profile (82). Waddell et al. (100) used the Eysenck Personality Questionnaire to assess personality and the Modified Somatic Perception Questionnaire and the Zung Depression Scale to assess psychological distress in a sample of 200 patients with LBP of at least 3-months duration. Psychological distress explained 22.5% of the variance in functional disability compared to physical impairment (40.3%) and inappropriate signs and symptoms (8.4%). Although it was concluded that personality was unrelated to functional impairment, there was no information provided on how the investigators arrived at this decision. Leavitt (57,58) measured psychological disturbance with the Back Pain Classification Scale, and was able to distinguish between patients with and without psychological

disturbance. Distressed patients used more pain descriptors and more affective descriptors than did patients without disturbance. The debate between personality traits and psychological distress is ongoing, nonetheless, the current trend is away from the MMPI.

2.9 Recurrent episodes

There is a paucity of literature on studies of recurrent episodes of LBP. Biering-Sorensen & Thomsen (11) examined predictors of first-time, persistent and recurrent LBP in a population sample of 30 to 60 year olds in Denmark that included a 1-year follow-up (response rate, 99%). Using multiple logistic regression, they found that first-time LBP in workers was best predicted by younger age, epigastric pain, previous hospitalizations, daily smoking and working far from home. Recurrence and persistent LBP were grouped together and the analyses were generated separately for men and women. The best predictors were mainly somatic complaints. However, psychological status was not examined. In this population, the incidence of recurrent/persistent LBP was 38.6% while the incidence of first-time LBP was 6.3%. Troup et al (93) found that residual leg pain and positive clinical signs on return to work, longer work absence and two or more previous episodes were associated with recurrent problems involving further treatment or work absence in the ensuing 12-months. This was a sample of 802 employees who were examined after an episode of back or sciatic pain where the 1-year incidence of recurrence was 44.3%. Abenhaim et al (4) found a 20% recurrence rate of occupational back pain in Quebec workers listed with the worker's compensation board (CSST). In that study, the three year risk of recurrence was associated with male gender, age under 45 and certain occupations. However, the vague definition of the initial LBP episode may have biased the study results. Lehmann et al attempted to evaluate recurrent injury, but this outcome was confounded by litigation (60). It is clear from

the literature that recurrent LBP is not precisely defined and most often is included with chronic LBP.

2.10 Treatment

Treatment for acute LBP has ranged from programs of complete bed rest and restricted activity to normal activity as tolerated, exercise, and physiotherapy (28,63,89,97). With the exception of prolonged bed rest which has proven to be harmful by producing a severe disuse syndrome (97), the efficacy of these treatments remains equivocal. In fact, the results of two recent clinical trials suggested that continuation of normal activity may be superior to alternative treatments. Indahl et al (50) suggested that a treatment program that included 1) a sound explanation of the back problem, 2) physician assurance that light activity was beneficial to the healing process and 3) guidelines on lifting, was superior to conventional medical care at reducing worker absenteeism. Malmivaara et al (63) conducted a trial on 186 employees with acute LBP comparing programs of bed rest, physical exercise and normal activity. They found that the normal activity group had fewer days of worker absenteeism, lower pain ratings and less functional disability, and incurred less costs.

Back school programs became available worldwide after their introduction in 1969 at Danderyd Hospital in Sweden (105). These programs are costly and conflicting results have been reported in the literature regarding their effectiveness (59). Not surprisingly, several experts believe that economics should drive the choice of treatment in the absence of an obviously superior therapy (56). This climate provided the backdrop to a randomized clinical trial undertaken in 1989 in Montreal, which tested the efficacy of a back school program in workers receiving compensation for a first episode of acute work-related LBP (59). That trial's negative results permitted the secondary analysis

reported in this thesis by allowing for the pooling of the intervention and control groups to study the evolution of the cohort over the ensuing year.

METHODOLOGY

3.1 Underlying hypothesis

In compensated workers with a first-time occurrence of significant acute LBP, psychological disturbance is associated with poor outcomes to treatment. Poor outcomes are defined as late return to work and the occurrence of a recurrent compensated episode of LBP within 1 year of the initial injury.

3.2 Objectives

1) To describe and compare the evolution of psychological status, pain, functional disability and spinal flexibility in compensated workers with acute LBP.
2) To determine the association of psychological factors with return to work.
3) To determine the association of psychological factors with a compensated recurrent episode of LBP.

3.3 Goal

To prevent lengthy sickness absence and recurrence by early identification of persons at high risk.

3.4 Study design

The design was a prospective, longitudinal cohort study that combined the intervention and control groups of a randomized controlled trial that had negative results. (For a summary of the trial results, please see Tables A1 and A2 in the Annex.) Follow-up was done at the end of treatment, 6 and 12 months after entry to the study. The longitudinal study design fosters the evaluation of the temporal stability and evolution of psychological and physical healing.

3.5 The original randomized clinical trial

3.5.1 Description of the study population

Patient recruitment began at the Quebec Institute of Physiatry (QIP) on January 1, 1989 and ended on January 1, 1993. Four hundred sixteen (416) consecutive outpatients presenting with a first episode of LBP of less than 3 months duration were assessed for eligibility criteria.

The inclusion criteria were:

1) age 18-50 years
2) inability to work because of LBP
3) receiving compensation from CSST (worker's compensation board) for LBP
4) current episode of LBP of less than 3 months duration.

The exclusion criteria were:

1) a work history of less than 1 year with same employer
2) a previous episode of LBP for which compensation had been received
3) a previous episode of LBP that had lasted for more than 1 week
4) radiation of LBP beyond the knee
5) any of the following: neurological deficit, cancer, ankylosing spondylitis, spinal stenosis, Paget's disease, spondylolisthesis of grade 1 or greater, other serious medical illnesses
6) self-reported mental illness
7) pregnancy or plans to become pregnant in the ensuing 12 months.

The aim of exclusions #2 and #3 were to recruit first lifetime occurrences of significant LBP. Recruitment took three years to gather occurrences in all age,

gender and occupational categories. (Please see section 3.7.) One hundred seventy-two (172) patients were identified as eligible to participate. Of these, 170 persons (99%) consented and provided written informed consent. Participants were randomized to either a standard physiatry treatment program of rehabilitation that included daily physiotherapy and the use of nonsteroidal anti-inflammatory medications, or the same regimen with the addition of back school. Shortly after randomization, two subjects assigned to the back school program were excluded due to violations of the inclusion criteria. One subject was eliminated for having spondylolithesis of grade 1 and the other was eliminated for having a herniated lumbar disc. This left 168 participants in the original sample.

The back school program comprised three 90-minute group education classes on the anatomy and function of the spine, the correct methods for carrying and lifting, and back exercises. All teaching was provided by one instructor. The objectives of the program were to increase self-care and to promote an active attitude for return to work. Both the physician responsible for determining return to work and the physiotherapist responsible for measuring spinal flexibility were blinded to treatment group assignment. Ninety-three percent (156) of study subjects were assessed at the end of treatment, 83% (140) were followed at 6 months and 84% were followed at 12 months. Baseline measures were similar between the treatment groups for demographic characteristics, duration of back pain, spinal flexibility, pain and functional disability. There were no significant differences found in the outcome measures. The final results of the study were that back school neither reduced the number of days of worker absenteeism, nor reduced the number of recurrences. It did, however, increase workers' knowledge of back function and performance of back exercises. A summary of these results are presented in Tables A1 and A2 in the Annex.

3.5.2 Data collection

Data on psychological, social and work-related factors, pain, and functional distress were collected by a research assistant using standardized questionnaires. Measurement of spinal flexibility was obtained by a physiotherapist connected with the study. Study participants were followed for 1 year from the time of recruitment.

3.6 The re-analysis

3.6.1 Description of the study population

The study population was drawn from the participants of the back school clinical trial. The objective of this secondary analysis is to evaluate the relative importance of psychological status in recovery from a first lifetime occurrence of acute LBP. Therefore, persons who reported either an episode of previous LBP with work stoppage and no compensation, or an episode of LBP without work stoppage during the previous 12 months in the initial questionnaire were excluded from analysis. This was to ensure that the study episode was not a recurrence. Prior to the current episode, participants should not have experienced significant LBP that would have influenced the course of healing during this episode.

A flow chart is presented in Figure 1 that shows the reasons for the elimination of 34 members of the original study. It can be seen that 7 subjects were eliminated due to previous episodes of uncompensated absences from work due to LBP; 19 were excluded for having had back pain without stopping work; 3 subjects were excluded because the current back pain episode did not require time off work; 1 subject lacked values on all psychological measures; and 1 subject lacked all outcome information from the CSST.

Upon closer examination, it was observed that 5 subjects with CSST-provided data on the number of compensated days were missing patient-provided return-to-work dates. Queries to the QIP revealed that 3 of these subjects quit the study after the index interview; they were removed from this analysis. The other 2 persons did not go back to work, but went on to collect unemployment insurance. One subject did not return to work because there was no work available, however, no relevant information was accessible on the other subject. Both study participants were followed for 1 year, and neither reported a recurrent episode.

All study participants provided dates on when they stopped work, when they entered the study and when they returned to work. These dates were used to calculate the length of time from stopping work until study entry, and from study entry until return-to-work. Comparisons were made between this calculated number of days off work and the values provided by the CSST. The calculations were found to be a close approximation. The calculated mean number of days was 50.58 (SD=18.95), median of 46.5; the mean from the CSST data was 51.03 (SD=20.20), median of 46. Therefore, for these 2 participants, the date of eligibility of return to work was used as the date of return to work using this calculated number. Taking account of all of these exclusions, 134 subjects remained for this analysis.

3.6.2 Follow-up intervals

Observation times were at recruitment, the end of treatment, 6 and 12 months after study entry. This created a 'sliding scale' for the second interview as the length of time for treatment ranged from 8 to 88 days, the mean length of time was 28.86 days (SD=13.40). Longitudinal results will therefore be interpreted in terms of the change that occurred between study entry until the end of treatment, and the change that occurred from the end of treatment until 6 or

12 months after the beginning of treatment. Dates of interviews were checked for the consecutiveness of the observations. When inconsistencies appeared, the numbers of the interview and the interview dates from at least three questionnaires were cross-checked.

3.6.3 Data management

All computer program files were constructed from the original datasets of responses to the questionnaires. Each database was sorted by subject number and interview number so that the computer read the interviews in the order in which they occurred. A total of twenty different questionnaires were used to obtain the information; five of which were used repeatedly at successive interviews. Each questionnaire contained the subject's unique identification number, the date of the interview and the questions particular to the scale being measured. As questions arose with respect to study participants, variable definitions or procedures used to obtain the information, consultation was sought and obtained from the research assistant who worked with the study and/or the statistician who analyzed the data in the original study. The study period comprised four years.

3.7 Variables

3.7.1 Independent variables - demographic and life-style

Information was collected at baseline on demographic characteristics such as age, gender and type of occupation and on life-style factors such as smoking status (current, ex, never), the number of pack years smoked, the number of cups of coffee consumed each day, the frequency of alcohol intake, participation in sports and the number of concurrent medical problems. Information on the number of stressful life events was also gathered. Type of occupation, frequency of alcohol intake, participation in sports and the number of stressful life events were assessed as follows:

Occupation: This was an open-ended question asking participants for their type of occupation. Initially, this was narrowed into 7 categories that were defined in an ordinal fashion in terms of physical and mental workloads. The categories were: 1) heavy physical labour, 2) light physical labour, 3) blue-collar, 4) construction, 5) health care, 6) service industry, and 7) maintenance. Due to small cell sizes, groups 1 and 2 were collapsed as well as groups 3 and 4, and groups 6 and 7.

Frequency of alcohol intake: There were 6 responses to the question on the frequency of alcohol consumed ranging from less than once a month to every day. This was dichotomized into high and low consumption: once a week and less/2-3 times a week and more.

Participation in sports: This was measured with 14 questions that classified the type of activity, the number of times done per week and the average length of time spent per session. The score for this variable is a composite of activity and intensity and ranges from 0 to 35.

Stressful life events: This was a summation of 5 yes/no responses that pertained to events that transpired during the past year. The questions included 'did anyone close to you die?, were you divorced or separated?, did you lose a job or large sum of money?, was anyone close to you gravely ill?, were you or someone close to you a victim or an accident or major injury?'.

3.7.2 Independent variables - work-related

Job satisfaction, job responsibility, job monotony, physical job demands, assistance from supervisors and co-workers, having a job that caused pain and having a job that caused back pain were assessed at the index interview as follows:

Job satisfaction: Job satisfaction was a summary measure of 6 work-related items scored on a 4-point Likert scale from 'very satisfied' to 'not satisfied at all'. Scores range from 0-24. Questions assessed satisfaction with salary, work conditions, control, relations with coworkers, relations with supervisors, and 'do you like work in general?'.

Six questions related to job characteristics that had previously been identified as risk factors for long-term work disability.

1. Job responsibility: The level of responsibility of the job was coded as 'alot of responsibility', 'some responsibility', and 'not responsible at all'. This was dichotomized into alot of responsibility/some to none at all.

2. Job monotony: The amount of monotony of the work was coded as 'very', 'somewhat', and 'not at all'. This was dichotomized into not at all monotonous/monotonous.

3. Job demands: Physical job demands were coded as 'very physically demanding', 'somewhat physically demanding', 'somewhat easy physically', and 'not requiring physical effort'. This was dichotomized into very demanding/somewhat to not at all demanding.

4. Assistance from supervisors and co-workers: This was determined by questioning whether subjects would receive assistance if they required it. Responses were coded 'yes always', 'yes sometimes', and 'never'. This was dichotomized into always/sometimes to never receive assistance.

5. Pain caused by job: Does the actual work cause pain was answered by 'never', 'once a month or less', 'once a week', and 'nearly every day'. This was dichotomized into once a week or more/less than once a month.

6. Job causing back pain: 'Does the job cause back pain at the end of the day', was also answered by 'never', 'once a month or less', 'once a week', and 'nearly every day'. This was dichotomized into once a week or more/less than once a month.

3.7.3 Independent variables - psychosocial perceptions

Perceptions of general health, stress level and satisfaction with social life were assessed at baseline in the following manner:

Overall general health: 'Compared to a person of your age, would you say your health was generally :excellent, very good, good, average or bad?'. This was dichotomized into excellent/average-very good. No one reported bad.

Stressful life: 'Would you say you life was: very stressful, somewhat stressful, not very stressful, not stressful at all?' This was dichotomized into stressful (very and somewhat)/not stressful (not very and not).

Social life: 'How do you find your social life in general: very satisfying, somewhat satisfying, somewhat unsatisfactory, very unsatisfactory?' This was dichotomized into very satisfying/not very satisfying.

3.7.4 Time-related variables

Measurement of pain intensity, spinal flexibility and functional disability were assessed at all observation periods with the following tools:

Visual Analog Scale: The Visual Analog Scale (VAS) (see Appendix V) is a 10 centimetre horizontal line designed to assess pain intensity. The line is anchored at 0, 'absolutely no pain' and 10, 'the most severe pain you can imagine' (modified from (84)). Subjects were asked to mark the spot on the line that best described the intensity of their pain. This scale is reported to be reliable and valid and can be completed in 30 seconds (65).

Modified Schober: Spinal flexibility was assessed with the modified Schober (10). Each patient was asked to bend forward and the distance was measured

(in centimetres) between two anatomical landmarks. Scores ranged from 0 to 10. This is an internally reliable measure of spinal flexion (10).

Oswestry Disability Questionnaire: The Oswestry Disability Questionnaire (ODQ) (see Appendix III) was designed by Fairbank et al (32) to assess the impact of back pain on activities of daily living. Scores range from 0-100, with higher scores representing greater restriction. There are 10 sections that comprise 6 responses scored 0-5. Total scores are a summation of the 10 sections. According to Fairbank et al. (32), one section may be missed. This scale was shown to be valid and reliable and has been used extensively in LBP studies and clinical trials (41,63,80).

Roland-Morris Disability Questionnaire: The Roland-Morris Disability Questionnaire (RMDQ) (see Appendix IV) is derived from the Sickness Impact Profile and also measures functional disability. It prompts responders on 24 yes/no statements relating to aspects of daily living. It has been demonstrated to be reliable, valid and sensitive to change in LBP patients. (77,78) Scores range from 0-24, with higher scores indicating greater functional impairment. To enhance comparability with the Oswestry, the RMDQ was converted to a 0-100 scale. Both are self-reported measures of functional disability.

3.7.5. Main exposure variables

Psychological status was assessed at all follow-up intervals with two scales to capture the aspects of psychological status that fluctuate with current life events as well as those that remain relatively stable over time. The following two measurement instruments were designed for use in the general population (48,65).

Psychiatric Symptom Index: The Psychiatric Symptom Index (PSI) (see Appendix I) is a psychological distress scale that ranges in value from 0-100. The 29-item symptom checklist was derived by Ilfeld from the Hopkins Symptom Check List (62), and examines symptoms of depression, anxiety, aggressiveness and cognitive disorders that occurred *during the past week.* Respondents select the appropriate frequency of occurrence of each symptom on the list. A score is obtained by summing these responses. The scale is not a measure of psychiatric diagnosis, but is an attempt 'to appraise the frequency of people with sufficiently numerous and intense symptoms to be classified in a group ... likely to be at risk for a degree of psychological distress ... which would require intervention'.

Levels of symptomatology were defined according to quintiles by Ilfeld and Santé Quebec (43,49). The first three quintiles indicated low symptomatology, and corresponded to scores of 9 and less in the Ilfeld study (49) and to scores of 14.8 and below in the 1987 Quebec Health Survey (43). Grouping the baseline scores in this manner presented a problem, however. The lower three quintiles had scores of 20.8 and below, scores considered high by Ilfeld and average-high by Santé Quebec. It was also anticipated that persons would present to the study with elevated distress levels. The lower three quintiles of the PSI from the other 3 observation times corresponded to scores of 12.65 and below, a score that was mid-way between Ilfeld and Santé Quebec. Therefore, for the purposes of this study, scores of 12.65 and less were considered low symptomatology; those above 12.65 were considered high.

The validity of the total PSI and the 4 subscales was ascertained by Ilfeld by determining that the symptoms in the checklist related to the following three criteria : having sought professional help for emotional problems, having recent use of psychotropic medications and the interviewer's rating of the

interviewee's degree of tension (48,49). The PSI has been used successfully to detect changes between groups of patients receiving different treatments and to detect changes within the groups over time (64). In this study, the Cronbach's alpha on the baseline PSI was .80, and the internal consistency alpha scores ranged from .69 to .79. Subsequent interviews produced higher Cronbach's alpha coefficients that ranged from .85 to .88. These results are satisfactory (17,25).

General Well-Being Scale: The General Well-Being Scale (GWBS) (see Appendix II) is a measure of psychological well-being ranges in value from 0-36. The scale was derived from the General Well-Being Schedule that was developed in 1970 by Dupuy (71), and consists of 14 questions that explore the positive and negative aspects of seven indicators of psychological adaptation. These indicators are energy level, control of emotions, general mood, interest in life, stress, perception of physical well being and emotional isolation. Each question is scored 0-3 for the frequency of occurrence *during the previous year*. Scores were obtained by summing the responses.

Only the first 14 items of the original Dupuy scale comprise the GWBS. The total scale and the 7 subscales have been validated and have a high test-retest correlation (33,65). Santé Quebec, however, eliminated two items from the 1987 report that dealt with the perception of well being because of a lack of correlation between the positive and negative perceptions of health status among respondents. This most likely resulted from the ambiguous wording of the questions (43). These questions were eliminated from this analysis as well, leaving 12 responses. This study used the same cutoff as Santé Quebec (1987), where scores of 30-36 indicated positive emotional adaptation (43). The Cronbach's alpha coefficient for the baseline GWBS was .83, and the internal consistency alpha scores ranged from .79 to .82. The Cronbach's

alpha coefficients for the remaining GWBS total scores ranged from .82 to .88 (17,25). These data are comparable to alphas obtained elsewhere (21).

3.7.6. Outcome variables

Information on the duration of worker absenteeism and the incidence of a compensated recurrent episode of LBP was obtained from the study participants and verified with data provided by the CSST. The questionnaires contained participant-provided dates for return to work but not for recurrence. Only information on the incidence of a recurrent compensated event (yes/no) was available.

Return to work: Return to work (RTW) was a dichotomous variable. Early RTW was defined as return to work within 31 days of study entry; late RTW was defined as 32 days and longer. The information was derived from the duration of worker absenteeism, calculated as the number of calendar days from the date of entry to the study until the date of return to work, and obtained from study participants.

Recurrent episode of low back pain: Recurrence was a dichotomous variable and was defined as a recurrent compensated episode of LBP that occurred during the 12 month follow-up after a RTW of at least 1 day after the initial episode. It was obtained from information provided by the CSST.

3.8 Statistical analysis

3.8.1 Descriptive statistics

An overall description of the study population included the presentation of mean values on the continuous data and frequency distributions on the categorical information. Simple relationships were sought between baseline scores and return to work, recurrence, the Psychiatric Symptom Index and the

General Well-Being Scale. Statistical significance ($p<.05$) between groups was determined with independent t-tests and chi-squared tests as appropriate.

3.8.2 Correlational analysis

Four Pearson correlation matrices were generated on the time-related measurement scales that corresponded to the four observation times. The Pearson correlation coefficients were computed to determine the strength of the linear associations among the variables.

3.8.3 Analysis of variance

One-way repeated measures analysis of variance was carried out to evaluate the evolution of pain intensity, functional disability, spinal flexibility and psychological status during the 12-month follow-up. Three pairwise comparisons were performed using the scores obtained at the end of physiatry treatment (also referred to as post-treatment) as the base of comparison; these included a Bonferonni correction for multiple comparisons. Statistical significance was set at 5%.

3.8.4 Multiple logistic regression

Multiple logistic regression (MLR) was used to identify the predictors of return to work and of recurrence. For both outcomes, all of the baseline variables mentioned in Section 9 and the subscales of the psychological instruments were included in the model building stages. The breakdown of the psychological measures into their components has been reported by others (26,68,76). For recurrence, a second model was constructed using the post-physiatry treatment scores on the time-related dependent variables. Improvement scores on the GWBS and PSI were tested for their ability to predict recurrence. Improvement scores were defined as those that improved in category (from not well-adapted to well-adapted, and from distressed to not

distressed, or the reverse) when assessed after physiatry treatment. A variable that accounted for return-to-work status was included in the model building stages of recurrence to account for the fact that individuals who returned to work early had a greater opportunity to develop a recurrence. All variables were assessed for confounding. Variables in the final model were tested for significant interactions.

3.8.5 Missing data

Missing data were handled in the following ways. In the instance where one subject was missing the value for producing pain on the job, the sample mean was substituted. For the summary measures (i.e., ODQ, RMDQ, PSI, GWBS), missing data were accounted for in the calculations. Three subjects had one missing value on the GWBS scores. Valid scores contained 11 responses (43). The total was calculated as the mean of the responses multiplied by 12, the number of questions. The PSI comprised 29 responses, and a valid score consisted of 26 responses. In this sample, no individual missed more than two responses. The PSI was calculated as the mean divided by 3 multiplied by 100. Following Fairbank et al (32), the Oswestry score was calculated as the total score (summing across the 10 categories) divided by 50, multiplied by 100. One missing datapoint was allowed, in which case the total score was divided by 45 (5 X 9). There were no missing values on the Roland-Morris scores. To make it comparable with the ODQ, the RMDQ was calculated as the sum of responses multiplied by 4.167

RESULTS

4.1 Descriptive statistics

4.1.1 Response rates

One hundred thirty-four (134) subjects were identified with a first lifetime episode of acute LBP. One hundred twenty-nine (129) participants completed the interview at the end of treatment (96%); one hundred seventeen completed interviews at both the 6 and 12 month follow-ups (87%). At 12 months, one subject who had completed the interview failed to complete the GWBS. One-hundred-eleven participants (82.8%) were interviewed at all four observation times. An evaluation of the differences in baseline characteristics between the 111 participants with complete records and the 23 with incomplete records revealed that those with incomplete data had significantly lower well-being scores ($p<.05$). The groups were comparable on all other measures.

4.1.2 Description of those who quit the study

Two of the three people who quit the study following the index interview were male. Quitters ranged in age from 22 to 33, were French-speaking, reported no medical problems, no recurrent compensated episode of LBP, and were assigned to the back school group. Comparisons of the baseline repeated variables showed that quitters had less pain (3.5 vs. 4.3) and lower well-being scores (23.3 vs 30.4) than those who remained in the study.

4.1.3 Description of the study population at entry

The variables in the tables are presented from an analytic viewpoint. Table 1 illustrates the baseline values for the continuous variables of the 134 study participants. It can be seen from the table that the mean age of the group was 32.44 years (sd=7.92), the average number of days from stopping work until study entry (the initiation of physiatry treatment, called DELAY) was 15.26

days (sd=12.68), and the average time until return to work was 36.12 days from entry to the study (range 17 to 93). Table 2 presents the baseline values of the categorical data. From the table it can be seen that 76 subjects were male (56.7%), the majority were current cigarette smokers (56.7%) and 29.9% were blue-collar workers. Prior to the current injury, 48 persons (35.8%) reported their jobs often caused pain and 46 (34.3%) reported their jobs often caused back pain.

4.1.4 Time-related measures

The means of the time-related measurements across the 4 observation times are presented in Table 3. It can be seen from the table that psychological distress, functional disability and pain improved over time, and that the greatest improvement occurred between recruitment and the end of treatment. By comparison, psychological well-being showed minimal fluctuations over time. Although spinal flexibility improved post-physiatry treatment, it deteriorated at 6 and 12 months. These trends are displayed in Graph 1. For the purposes of comparability, VAS was graphed in milimeters and the Schober was multiplied by 10. In addition to presenting the mean scores on the Schober, a dichotomized impairment score was calculated and defined as scores below 5 (impaired) and greater than 5 (normal). The percentage of impairment is shown in Graph 2. It can be seen that the least amount of impairment occurred at the end of treatment and that this improvement was only temporary; scores at 6 and 12 months returned to their baseline values.

Graphs 3 and 4 illustrate the subscales of the two psychological instruments. In the graph of distress, it can be seen that depression diminishes over the year while anxiety increases after treatment ends. Aggressiveness and cognitive disorders follow similar evolutionary patterns showing little variability over time. Scores on the well-being subscales show little fluctuation.

4.1.5 Univariate associations with return to work

All study participants returned to work within 3 months of beginning physiatry treatment. Fifty-two persons (38.8%) returned to work early and 82 (61.2%) returned late. A recurrent episode of LBP was reported by 8 persons (15.4%) who returned to work early and by 9 (11%) who returned to work late. Psychological distress was reported by 38 (73.1%) with early return to work and by 48 (58.5%) with late return to work. Psychological adaptation was reported by 55 (67%) who returned late and by 33 (63.5%) who returned early.

Tables 4 and 5 present the baseline variables stratified by return-to-work status. The late return to work group consumed alcohol less frequently ($p<.02$) and spent more time in physiatry treatment which coincided with return to work ($p<.0001$). By definition they had a longer duration of worker absenteeism. There were no significant differences found in the other baseline measures.

Graphs 5 to 10 present the time-related dependent variables stratified by return to work at the 4 observation times. A noticeable improvement was seen between study entry and the end of treatment in all graphs except well-being (GWBS). The two groups were very similar in their patterns of evolution on all measures. Mental well-being was nearly identical between the groups, but it can clearly be seen that the late return to work group had less psychiatric symptomatology across all time periods. In the graph of the Schober, it can be seen that the groups were indistinguishable at study entry and at the end of treatment, but the early return to work group was impaired at 6 months whereas the late group was impaired at 12 months.

4.1.6 Univariate associations with recurrence

Seventeen persons (12.7%) reported a compensated recurrent episode of LBP and 117 persons (87.3%) had no recurrence. Of the persons reporting a recurrence, 9 (52.9%) returned to work late and 8 (47.1%) returned early. At the index interview, psychological adaptation was reported by 15 (88.2%) of those with a recurrence compared to 73 (62.4%) of those with no recurrence ($p<.04$). Psychological distress was reported by 10 (58.8%) persons with a recurrence and by 76 (65%) of those without a recurrence.

Tables 6 and 7 present the baseline data stratified by recurrence. People with a recurrence were with their employers for less time ($p<.04$), received assistance more often from co-workers and supervisors ($p<.05$) and reported greater control over their emotions ($p<.04$). No significant differences were found in the baseline values of the repeated variables. However, at subsequent observation times there were significant differences between the groups on pain intensity at the end of treatment ($p<.02$), and on the Schober at 6 and 12 months ($p<.0001$); the recurrence group had less pain and greater flexibility.

The repeated measurements stratified by recurrence status are presented in Graphs 11 to 16. It can be seen that the recurrence group reported less pain, functional disability, psychiatric symptomatology and greater positive mental health at baseline. The majority of improvement occurred between entering the study and the end of treatment for all scales excluding well-being. Interactions appear as crossing lines and occurred between the end of treatment and 6 months on all measures except the PSI where it can be seen that the recurrence group always reported less psychiatric symptomatology. It can also be seen that the no recurrence group decreased in functional disability, pain, and distress and increased in well-being at 6 months. This was in reverse order to what transpired in the recurrence group. In Graph 16

it can be seen that the two groups were nearly identical on spinal flexibility at study entry and at the end of treatment, however, those without a recurrence were more impaired at 6 and 12 months.

4.2 Associations with psychological status

To determine differences at study entry, the sample was described by baseline psychological status.

4.2.1 Univariate associations with psychological distress

Individuals were grouped according to baseline PSI scores; low distress was considered as scores of 12.65 and less and high scores were over 12.65. At entry to the study, 86 subjects (64.2%) reported high psychological distress and 48 (35.8%) reported low distress. In the low symptomatology group, 34 persons (70.8%) returned to work late and 7 (14.6%) developed a recurrence. In the high symptomatology group, 48 (55.8%) returned to work late and 10 (11.6%) developed a recurrence. The group was stratified by negative mental health status, and the results are presented in Tables 8 and 9. Significant differences in psychological distress were found in gender ($p<.005$), the number of medical problems ($p<.009$), ODQ ($p<.01$), RMDQ ($p<.01$), pain caused by the job ($p<.02$), general stress level ($p<.007$), and occupation ($p<.02$). Higher distress was reported by a larger percentage of women, by those with a stressful lifestyle, and by those with a job that caused pain. Low symptomatology was associated with less medical problems, less functional disability, and with blue-collar/construction workers. Individuals who reported less psychological disturbance at entry to the study continued to report significantly less distress at the three follow-up interviews ($p<.0000$, $p<.0006$, $p<.0000$, respectively). Lower distress was associated with better positive mental health at study entry ($p<.0000$), at the end of treatment ($p<.0009$), at 6 months ($p<.005$) and at 12 months ($p<.01$).

Graphs 17 to 20 present the repeated measurements stratified by pre-physiatry treatment psychological distress. It can be seen that the groups are comparable on all measures.

4.2.2 Univariate associations with well-being

Individuals were grouped by pre-physiatry treatment well-being status; scores of 30 and more were considered well-adapted and scores under 30 were classified as not well-adapted. The cohort was then described in terms of mental well-being. Eighty-eight persons (65.7%) were considered well adapted at the index interview, and 46 (34.4%) were not well-adapted. Sixty-two and one-half percent (55) of the well-adapted group and 59% (27) of the not well adapted group returned to work late. Seventeen and one-half percent (15) of the well-adapted and 4.4% (2) of the not well-adapted groups developed a recurrence ($p<.04$).

Tables 10 and 11 present the cohort stratified by baseline well-being status. It can be seen that the well-adapted group had significantly less medical problems ($p<.007$), less psychological symptomatology ($p<.0001$), less perceived overall stress ($p<.04$) and less job monotony ($p<.05$). Persons initially classified as well-adapted remained so for the duration of the study; they also remained less distressed.

Graphs 21 to 24 show the time-related variables stratified by baseline well-being values. Similar to the stratification by psychological distress, the groups appear to be nearly indistinguishable from each other. At one year, there are no differences.

4.3 Correlational analysis

Associations between the continuous time-related measures of pain intensity, functional disability, lumbar flexibility, psychological distress and well-being were assessed with Pearson correlation coefficients. In addition, baseline scores were correlated with the number of days of worker absenteeism. The four matrices corresponding to the four observation periods are presented in Tables 12 through 15, where the correlation coefficients appear above the probability levels for each pairwise comparison. The correlation coefficients provided in the following text are significant at the $p<.0001$ level.

4.3.1 Baseline measurements

At the index interview, the highest correlation appeared between the two disability measures ($r=.70$), meaning that 49% of the variability in one measure was accounted for by the other. The association between the psychological scales was moderate ($r=-.42$), and as expected, well-being and distress were inversely related. Distress was unrelated to pain and poorly related to functional disability. The duration of worker absenteeism was poorly correlated with pain ($r=.20$, $p<.02$) and the Schober ($r=-.26$, $p<.002$).

4.3.2 Post-physiatry treatment measurements

At the end of treatment, the greatest associations emerged between the disability scales ($r=.81$), between pain and functional disability ($r=.74$, RMDQ; ODQ $r=.73$), and between the two psychological scales ($r=-.61$). Distress was moderately related to functional disability ($r=.38$, ODQ; $r=.39$, RMDQ), pain ($r=.38$) and poorly associated with the Schober. Well-being was poorly related to other measures excluding the Schober. Spinal flexibility was poorly associated with pain, functional disability and psychological distress.

4.3.3 Six months after study entry

Six months after entering the study, the highest correlations were found between the measures of functional disability (r=.85), pain and functional disability (r=.77, ODQ; r=.73, RMDQ), and the psychological scales (r=-.54). Distress was not related to spinal flexibility but was related to all other measures (r=.26, ODQ; r=.26, RMDQ; r=.29, VAS).

4.3.4 Twelve months after study entry

At the 1-year follow-up, high associations were again seen between the functional disability measures (r=.80), the psychological measures (r=-.58), and pain and functional disability (r=.76, ODQ; r=.75, RMDQ). Well-being and psychological distress were associated with functional disability and pain; distress was also associated with the Schober.

4.4 Evolution of time-related measures/Univariate analysis

A one-way ANOVA for repeated measures was used to determine whether the repeated dependent variables significantly changed over time. Only 111 subjects with complete follow-up data were used in this analysis. Table 16 is presented to show the similarity in the means of the repeated dependent variables between the 111 participants with complete data and those of the 134 in the total sample. It was decided to not pursue the GWBS due to the limited fluctuations in scores over the duration of the study. The test of sphericity was examined prior to interpreting the univariate analyses for within-subject effects. When the test was rejected, the adjusted Greenhouse-Geisser probability was used.

The results of the ANOVAs are presented in Table 17. It can be seen that there was a significant effect of time on pain intensity, functional disability, psychological distress, and spinal flexibility. For psychological distress and

pain, this difference occurred between study entry and the end of treatment. By comparison, functional disability and spinal flexibility showed significant change at all observation times. Significant improvement occurred at the end of treatment for both measures. However, while significant improvement occurred in functional disability at 6 and 12 months, significant deterioration occurred in spinal flexibility at 6 and 12 months when the Schober returned to pre-physiatry treatment values.

One-way repeated measures ANOVAs were then generated to determine whether the subscales of the PSI corresponded to the full recovery that was seen at the end of treatment. A significant effect of time was seen between the means at entry and those at the end of physiatry treatment. However, there was significant deterioration in cognitive disorders ($p<.03$) and borderline improvement in depression at 1 year ($p<.06$) when compared to the end of treatment.

4.5 Multiple logistic regression

The multiple logistic regression analyses were conducted in the following manner: First, univariate procedures were generated on the continuous variables to identify the cutoff points used to group the variables into quartiles. These quartiles were then used to plot the logits ($\ln(p/1-p)$) against the median of the quartile. These graphs provided a visual display that checked for linearity. As no variables were linear in logit, all variables were dichotomized according to their presentations in the graphs. Frequency distributions of the categorized data identified cell frequencies with less than 10 observations, and several variables were subsequently dichotomized due to small cell counts. These included general health, general social, general stress, number of life stressors, and the job-related variables of responsibility, monotony, receiving assistance, physically demanding, causing pain, and causing LBP. Trivariate

models were generated to detect collinearity between the psychological scales and the independent variables. A Spearman Correlation Matrix examined the associations between the dichotomized independent variables. Although many significant correlations were discovered, there were no correlation coefficients above .7. For each model, the significant variables were tested for significant 2-way interactions. Deviance statistics were used to assess the various models.

4.5.1 Model for return to work

Multiple logistic regression analysis was used to determine the predictors of return to work. In univariate analysis, infrequent use of alcohol and a delay of at least 16 days from stopping work until study entry were significantly associated with a late return to work, while psychological distress was borderline. No psychological subscale was found to significantly predict return to work. Psychological distress was then combined with the other variables in trivariate prediction models. Other variables identified were more than 8 years seniority and no life stressors in the preceding 12 months. No variable confounded the association of psychological distress with return to work. No Spearman correlation coefficients were above .7, therefore the stepwise regression procedure included all independent variables. With entry set at .15 and removal at .1, the additional variables that were identified were age under 30 years and a job causing LBP. All of these variables plus those identified by previous chi-square tests as being related to psychological distress, (gender, number of medical problems, ODQ, RMDQ, having a job that produced pain, perceived stress and occupation) were entered into a large model. A list of the variable definitions used in this MLR is presented in Table A3 in the Annex.

Table 18 presents the odds ratios and 95% confidence intervals of the univariate, full and significant-variables-only logistic regression models. It can

be seen from comparing the univariate models with the model with all variables that distress, having the same employer and age become significant after adjusting for the other variables in the model. The significant-variables-only model preserved these relationships and avoided overmodelling.

Using the parameter estimates, the odds ratios below 1 were transformed to reflect the increased risk. The best predictors of late return to work were low baseline psychological distress (OR=2.38, 95%CI=1.03-5.56)), 8 years of seniority or more (OR=4.65, 95%CI=1.60-13.55), alcohol intake of once a week or less (OR=3.46, 95%CI=1.30-9.09), having at least 16 days between stopping work until beginning the study (OR=3.07, 95%CI=1.14-8.26) and age under 30 (OR=2.69, 95%CI=1.18-6.25). All variables in the final model were significant at the $p<.04$ level. This model was able to correctly classify 95 of 134 observations (70.9%), and had a specificity of 50.0% and a sensitivity of 84.1%. The false positive rate was 27.4%, the false negative rate was 33.3%. The model was able to predict 69 of the 82 late return to work events. Because late return to work was a common event, there is more informational value provided by a positive test.

4.5.2 Model for recurrence - pre-physiatry treatment

Multiple logistic regression was used to examine the predictors of a recurrent compensated episode of LBP that occurred during the 1-year follow-up. In univariate analysis, control over emotions (OR=4.36 (1.3, 14.2)), anxiety and aggressiveness were found to significantly predict recurrence, while the General Well-Being Scale, age, help on the job, and the RMDQ were found to be borderline predictors. No additional factors were revealed in the trivariate models. No variable confounded the relationship of well-being and recurrence. An automated stepwise selection procedure was generated in a manner similar to the one described above in which all independent variables

were offered. The variables selected were job responsibility, physically demanding job, perceived health and perceived stress. The chi-square tests found well-being to be associated with the number of medical problems, general stress and a monotonous job, and these variables were entered into the MLR.

Table A4 in the Annex presents a list of the variables that were used in the MLR procedure. Two models were tested, one in which all of the variables with the exception of control over emotions were entered, and a second model in which control over emotions was entered but not the GWBS. This was done because the GWBS and control over emotions, a subscale of the GWBS, were collinear. Variables were manually deleted in a backward elimination fashion based on the least significant p-values. The model that included the GWBS was selected based on its smaller deviance.

Table 19 illustrates the odds ratios and 95% confidence intervals of the results of the regression procedures. In comparing the univariate models with the full model, it can be seen that well-being and assistance at work became significant predictors in the presence of the other variables, and that the adjusted odds ratios for aggressiveness and well-being increased. In contrast, age and functional disability became non-significant when adjusted for the other variables. The significant-variables-only model showed a large increase in the odds ratio of aggressiveness which occurred due to the inclusion of assistance. To test for possible confounding, the following variables were entered individually into the model: job responsibility, physically demanding job, seniority and perceived health. Their inclusion did not sufficiently alter the odds ratios to warrant leaving them in the final model.

The parameter estimates were used to transform the odds ratios below 1 to an increased odds. Using pre-physiatry treatment values, recurrence was best predicted by psychological well-being (OR=6.02, 95% CI=1.05-34.57), always receiving assistance from supervisors and co-workers (OR=6.03, 95% CI=1.45-20.00), low anxiety (OR=4.84, 95% CI=1.27-20.00) and high aggressiveness (OR=12.79, 95% CI= 2.97-55.19). All variables in the final model were significant at the p<.04 level. This model was able to correctly classify 118 observations (88.1%) but was able to classify only 2 of the 17 recurrences. The model had a sensitivity of 11.8%, a specificity of 99.1%, a false positive rate of 33.3% and a false negative rate of 11.5%. Because recurrence was a rare event, there is greater information provided by a negative test.

4.5.3 Model for recurrence - post-physiatry treatment

A second prediction model was constructed from combining the data obtained at study entry with the values of the repeated outcomes obtained at the end of treatment. In univariate analysis, anxiety and interest in life were significant predictors of recurrence, while the Oswestry was a borderline predictor. A stepwise procedure was conducted in a similar fashion as previously described. The additional variables identified as predictors were age, effort, delay, perceived health, satisfaction with social life, pain and control over emotions. Neither the improved scores on the PSI and GWBS nor those obtained at the end of treatment were predictive of recurrence. There were no confounders identified. All variables, excluding pain which was collinear with Oswestry, plus gender and assistance on the job (identified previously) were entered into a full model. Variables were then manually deleted based on least significance. The additional variable definitions used for the post-physiatry treatment models are presented in Table A5 in the Annex.

The results of the regression procedures are shown in Table 20. It can be seen that adjusting for other variables altered the odds ratios and confidence intervals of all variables. Physically demanding job, delay, perceived health and control over emotions became significant when adjusting for the other variables in both the full and significant-variables-only models. Social life lost the significance it had attained in the full model and was not kept in the final model.

As previously described, the odds ratios below 1 were converted to an increased risk. Using the post-physiatry treatment scores, recurrence was best predicted by a physically demanding job (OR=7.18 (1.74-29.58)), a short delay (less than 14 days) from stopping work until entering the study (OR=6.18 (1.37-25.00)), less than excellent self-reported health (OR=7.40 (1.61-33.92)), low anxiety (OR=4.78 (1.02-25.00)), high interest in life (OR=6.30 (1.42-27.91)) and low control over emotions (OR=4.97 (1.28-20.00)). All variables in the final model were significant at the $p<.05$ level. The model was able to correctly classify 115 of the 129 observations (89.1%), and was able to predict 5 of the 16 recurrences. This model had a sensitivity of 31.3%, a specificity of 97.3%, a false negative rate of 9.1% and a false positive rate of 37.5%. Because the incidence of recurrence was a rare event, there is greater informational value provided by a negative test.

DISCUSSION

5.1 Study design

To my knowledge, this is the first longitudinal investigation to examine first-time episodes of acute LBP in compensated workers. The study population was selected to be representative of compensated workers who were referred to a physiatry clinic within 3 months of developing acute LBP. The purpose of assessing consecutive clinic patients for eligibility criteria was to reduce sampling bias. All patients seen at the QIP had an equal opportunity to participate in the trial provided they met the study criteria. The variance in the amount of time off work prior to beginning treatment (range 0 to 77 days) suggests that those referred early may be different from those referred late in that the late-referred group may have seen other specialists or received different treatments prior to being seen at the study referral centre.

5.2 Evolution of time-related variables

With the exception of well-being which did not fluctuate over time, there was significant improvement in all the time-related measures at the end of treatment. Pain and psychological distress followed similar evolutionary patterns; no additional improvement occurred after treatment termination, although on average, individuals returned to work with residual pain and somewhat distressed. The assessment intervals were sufficiently wide to render establishing the temporal order of improvement impossible. This could be accomplished by more frequent evaluations during the active treatment phase.

While there was significant deterioration in cognitive disorders at 1 year, the clinical relevance is questionable due to the small difference in comparison

means. There was a trend for depressive symptomatology to improve over time, although it could not be determined whether the higher pre-physiatry treatment depression was the result or the consequence of the current episode of LBP.

Although functional disability improved at 6 and 12 months, spinal flexibility deteriorated after treatment ended. This finding agrees with that of Waddell & Main (99): self-reported disability varies noticeably from objective physical impairment. Interestingly, the scores on the Schober revert to pre-physiatry treatment values at 6 and 12 months. This suggests the temporary improvement due to active physiatry treatment may exceed the individual's normal level of spinal flexibility. Thus physical impairment as measured on the Schober may be a poor determinant of return to work.

The lack of change in well-being likely resulted from the intent of the scale to detect more stable psychological characteristics, making it less susceptible to current life circumstances. In a study with follow-up ranging from 7 to 12 years, Costa et al (21) suggested that the General Well-Being Scale measured enduring characteristics of the individual. By contrast, Scordo (83) claimed to have detected differences in well-being scores that resulted from a 12-week exercise protocol. This would seem unlikely if in fact the 1-year time-frame were used, however, the authors did not present this information.

5.3 Between-groups differences

At baseline, only the frequency of alcohol intake was found to differ between the early and late return to work groups, a difference that may have resulted from type I error. However, those who developed a recurrence were more likely to have less seniority and to receive more help at work, two variables that suggest less job experience. These baseline differences may be due to the

secondary selection process of the healthy worker effect, a phenomenon that occurs during the early years of employment when factors in the work environment produce health disorders that may force the individual to leave the work environment (67,101). Occupational epidemiological studies are particularly susceptible to this type of selection bias that will result in different rates of illness in the occupational setting when compared to the general population.

5.4 Associations with psychological status

Stratification of the sample by psychological status showed that a greater proportion of women reported distress. Further examination of distress by gender revealed that women's scores were consistently rated as high while men's scores were considered high at study entry only. Women's scores ranged from 16.3 to 22.6 and men's scores ranged from 11.5 to 17.8. This association between female gender and high distress agrees with Bolton's findings (15). That population differed in that it included housewives and/or persons with recurrent back pain seen in chiropractic clinics. The results of both studies suggest either that women are more distressed than men or that women are more likely to report distress.

5.5 Associations among time-related variables

It can be seen in Table 21 that psychological status was poorly associated with the other time-related variables. Surprisingly, the correlation coefficient between distress and pain was not significant at study entry and poor at the other observation times. That well-being was poorly correlated with the other measures is not surprising since it did not change in response to the episode of LBP.

Table 21. Correlation coefficients over time. (NS = not significant).

Variables	Pre-tx	Post-tx	6 Mos	12 Mos
PSI & VAS	NS	.38	.29	.25
PSI and disability*	.22	.39	.26	.25
PSI and Schober	NS	-.17	NS	-.19
GWBS and VAS	NS	-.29	NS	-.17
GWBS and disability*	NS	-.29	NS	-.24
GWBS and Schober	NS	NS	NS	NS
VAS and disability*	.52	.74	.77	.76

*The functional disability scale with the higher correlation coefficient was selected.

The moderate association between the two measures of psychological status most likely resulted from the difference in reference points. The PSI was based on symptoms occurring during the past week while the GWBS was based on emotional indicators occurring during the past year. The negative correlation resulted from the reverse order of the scales: better well-being was measured by high scores whereas lower distress was indicated by lower scores.

By far, the greatest correlation appeared between the two functional disability scales; pain and functional disability were also highly associated. Gronblad et al (42) previously demonstrated similar associations. In that study, there were high correlations between the ODQ and the Pain Disability Index (r=.82) and lower associations between the ODQ and VAS scores (r=.62).

5.6 Predictors of work absence

Multiple logistic regression (MLR) was selected rather than survival analysis to examine the duration of work absence because the hazards of the independent variables were not proportional and because there were no censored data (all patients returned to work). Linear and ordinal regression were not selected because RTW within the first 4 weeks of a low back injury

has been found to be rapid and qualitatively different from RTW in the second 4 weeks or beyond (89). Spitzer et al (89) suggested that the slope of the RTW curve changed dramatically after a one month work absence due to LBP. The period between 1 and 3 months was considered the beginning of prolonged disability; after 3 months, chronicization had begun. Early RTW was, therefore, defined as a RTW within 31 days of study entry.

5.6.1 Return to work

In compensated workers with a first episode of significant LBP, increased risk of late return to work was best predicted by low distress, more years of seniority, low alcohol intake, younger age and an increased amount of time off work before initiating treatment. The odds ratios for DELAY and ALCOHOL did not vary from the univariate to the multivariate models, indicating these predictors were independent from the other variables in the multivariate model. Early physiatry treatment predicted early return to work as all study participants returned to work after therapy ended. However, it must be remembered that the cohort was derived from a physiatry centre and individuals referred late in their episodes likely reflect a melange of unsuccessful treatments. Whether individuals who were referred after lengthy delays would have profited from early physiatry intervention is an area for future investigation.

The meaning of a low alcohol intake is unclear. It is plausible that alcohol is a proxy for cultural background, socio-economic status or lifestyle factors. As a proxy, it suggests that the less advantaged feel pressure to return to work. These findings are substantially different from those of Lehmann et al (60) who found that only marital status predicted return to work. That study also differed from this one in that only 54.5% of patients returned to work within 3 months of a work-related injury, the study population included patients with

acute LBP of 2-6 weeks duration who were followed by a spine consultant and did not include treatment programs.

There are several possible explanations to the results of the multivariate model. Age and distress became significant when each was entered into a trivariate model with years of employment (years of employment became significant as well). Thus, the risk of late return to work was greater for workers with more years of seniority and less psychological distress, and for workers with more years of seniority and younger age. One explanation suggests that persons with a longer history of working at the same job are less worried about losing their jobs while on sickness leave. After many years with a company, workers may feel entitled to sick benefits without fear of job loss. The second interpretation implies that cumulative occupational exposure to the young spine may lead to more severe injury or more chronic pathology. The young worker may have a greater tolerance to pain and be able to withstand a hazardous exposure for a longer duration of time. At the time of the work disability, greater damage may have occurred to the spine that suffered prolonged exposure.

5.6.2 Recurrence

The 1-year incidence of a compensated recurrence in this study was only 12.68%. This rate was considerable lower than those reported previously (4,11,93) and may have arisen from the different populations studied, from the various definitions of recurrence or from the beneficial effects of physiatry treatment. Nonetheless, this low incidence increased the margin of error around the estimates of association in the prediction models for recurrence.

5.6.2a Pre-physiatry treatment values

Using baseline measurements, the risk of a recurrence was greater for persons who were well-adapted, less anxious, more aggressive and who perceived themselves to frequently receiving assistance from others at work. Clearly aggressiveness prior to physiatry treatment is an important predictor with an odds ratio of almost 13. The high aggressiveness, low anxiety and better well-being is an odd configuration of characteristics which suggests that individuals may be less cautious during activity thereby increasing the chance of re-injury. Receiving assistance at work suggests a job that can be replicated by another worker. Thus this perception may permit the re-injured worker time off to recuperate. This model for recurrence was similar to the one for back pain reporting that was described by Bigos et al (12) wherein psychosocial factors and workplace perceptions were the best predictors of outcome. This suggests that similar models are useful for both back pain reporting and recurrence.

5.6.2b Post-physiatry treatment values

Using the post-physiatry treatment values of the time-related variables, recurrence was best predicted by a physically demanding job, less time off prior to study entry, less than excellent perceived health, low anxiety, high interest in life and low control over emotions. The post-treatment scores coincided with return to work, as 93.2% returned to work within 11 days of ending physiatry treatment. There was a higher risk of recurrence for those with heavy job demands who began physiatry treatment soon after sustaining their injury, suggesting that the immediate return to a job with perceived high physical demands upon completion of treatment may be unrealistic. Supporting evidence for this comes from Hadler et al (44) who compared compensated and non-compensated workers with acute LBP seen in primary care. They found that compensated workers were more likely to report a physically demanding job. The results of the Hadler et al and of this study

suggest that an ergonomic evaluation be provided to assess the validity of self-reported heavy physical job task. Depending upon these results, potential recommendations might be derived to instruct workers on the proper techniques of physical job performance or to advise employers of possible alterations to the physical work environment. A program of temporary modified work might ease re-entry to the workplace, but the results of one previous investigation are equivocal (103). All interventions would be accompanied by evaluations to assess their effectiveness at reducing the incidence of recurrence.

It is unknown whether the compromised state of health resulted from the current episode of LBP or from a perception that predated the injury. However, the configuration of low anxiety, low control of emotions and high zest for life suggests less cautious behaviours and taking on more than one can handle, both of which may lead to re-injury.

5.7 Comparison of prediction models for recurrence

From a quantitative perspective, the comparison of the two models for recurrence shows that the one using post-physiatry treatment values for the time-related variables was more accurate than the model using baseline scores. The post-physiatry treatment model could accurately predict 31.3% of recurrences compared with the pre-physiatry treatment model which predicted only 11.8%. (Please see Table 22.) Similarly, Klenerman et al (55) found that scores obtained 2 months after a new episode of acute LBP were able to account for 49% of the variance in pain and functional disability at 12 months compared to scores obtained at the index interview which accounted for 32%. The most plausible explanation for these results is the closer temporal relation of the independent variables to the outcome in the models with greater predictive power. This suggests that information gathered at the time of

treatment termination could assist practitioners evaluate who is at risk of a recurrence.

Table 22. Percent accuracy of prediction models for recurrence.

	% Accurately classified	
	Recurrence	No recurrence
Pre-treatment values	11.8	99.1
Post-treatment values	31.3	97.3

From a qualitative perspective, the difference between the two models is that prior to physiatry treatment, psychological profile is the most important predictor of recurrence whereas following treatment, it is the physical demands of the job and certain psychological variables. Moreover, there is a reversal in the direction of the odds ratio of control over emotions suggesting the loss of this attribute following work disability and rehabilitation. Further research is needed to determine when and why this loss occurs during active treatment and to ascertain whether this change in psychological profile influences recurrence. Additionally, an ergonomic assessment is needed to substantiate the self-report of heavy physical job task and to determine if the loss of control over emotions is differential by congruence of job task perception with physical demands analysis. When the evaluation is not congruent with the worker's self-report, further research into the origins of the misperception is warranted.

5.8 The effect of low baseline psychological disturbance

The effect of psychological status on the main outcomes ran counter to the a priori hypotheses: in this population, it was workers with 'better' pre-physiatry

treatment psychological scores that were at greater risk of poor outcomes. These results have generated a new hypothesis.

It is proposed that the doctor-patient relationship involving both the patient's style of presentation and the practitioner's style of practice play an essential role in the patient's recovery. The patient who is experiencing psychological distress or low well-being may communicate this to the physician through both verbal and non-verbal behaviour. The distress serves a signalling function that mobilizes the physician's responsiveness. The physician reacts by providing additional support and by spending more time with the patient, and in doing so, maximizes the beneficial effect of the doctor-patient relationship. The physician's style of practice is influenced by a health care system that provides financial rewards for maximizing the frequency with which patients are 'processed' (i.e., seeing the most patients as possible in the shortest time as possible). Thus the practitioner's response to the patient with no apparent psychological disturbance would be to provide less time and less support. The physician's behaviour may be determined not by clinical/scientific evidence which is often lacking in LBP patients, but by a responsiveness that depends on the presence or absence of a distress signal. In this situation, it is the patient with low disturbance who does not benefit maximally from the therapeutic effect of the doctor-patient relationship.

The results of two recent investigations may provide evidence that support this hypothesis (50,63). In both of these randomized controlled trials, physician response was determined by treatment group assignment. The intervention group in the Indahl et al study (50) received physician-provided explanations, assurances and encouragement on the benefits of normal activity, while in the Malmivaara et al study (63), the control group received physician recommendation to continue normal activity. Although the authors of both

studies suggested that it was the maintenance of normal activity that was responsible for the superior outcomes, it is herein submitted that the physician behaviours were partly responsible for those outcomes by promoting a positive therapeutic relationship. Several researchers have reviewed the beneficial effects of the doctor-patient relationship. Smith & Turner (87) suggested that a good therapeutic relationship represents physician concern, legitimizes patient help-seeking behaviour and reinforces the physician's wish to provide assistance. Turner et al's (95) review of the literature implied that practitioners can favourably or unfavourably affect their patients' outcomes through their own behaviours toward the patient and the treatment. Positive doctor-patient encounters were associated with positive outcomes, while negative encounters were associated with negative outcomes. If this hypothesis can be shown to be true, early determination of psychological status could assist physicians to direct added support to patients who on the surface appear to require it the least. The early doctor-patient interactions may influence the course of low back work disability and merit further exploration.

5.9 Bias

There are three possible sources of bias in this study. The first potential bias arises from the possibility of misclassification of psychological status. Psychological status was a self-reported measure and subjects may have exaggerated their symptoms to justify receiving compensation. This is supported by Greenough (41) who found that 38% of workers compensated for LBP and 5% of the non-compensated workers reported psychological disturbance. In Greenough's retrospective cohort study, psychological disturbance was defined as elevated scores on at least 3 of 8 psychometric instruments. Subjects were first time attenders at an orthopaedic surgeon's practice with LBP of only 1 week's duration. However, in this study, psychological disturbance was defined by poorer scores on only one instrument

and the first administration of psychological testing occurred simultaneously with the beginning of treatment. Subjects may have been reacting to the initiation of a new therapy or to entering a research protocol.

A second possible source of bias may have resulted from the elimination of the participants with incomplete data. The 23 incomplete-responders comprised 21% of the study population and were similar to responders on all but the General Well-Being Scale, where incomplete-responders were more likely to have lower scores. This would not have biased the main associations of the baseline values with return to work or recurrence which used all 134 observations in the analyses. However, the lack of a significant change in well-being over time may have been biased by their elimination, although looking at the comparison scores presented in Table 16, this seems unlikely.

The third possible source of bias may be in the handling of persons lacking return to work dates. The justification for removing the 3 cases who quit the study after the index interview was that these individuals lost contact with the QIP when they abandoned the study (they also quit physiotherapy). In contrast, substituting the date of eligibility of return to work for the 2 persons who collected unemployment insurance seemed to be more valid than classifying these subjects as not returning to work, which would have indicated they were not well enough to return. These individuals were followed at all 4 observation times. Documentation from the QIP indicated that one subject was healthy enough to return to work but had no available work. There was no information on the other subject and it was assumed he too was healthy enough to return to work at the time his compensation ended. This decision was based on the premise that a person must be willing and able to work to collect unemployment insurance.

All variables in this study were assessed for their effects on the association between the psychological instruments and outcomes. All measured potential confounders were included in the prediction models, thus the observed effects are unlikely to be due to confounding by any of these variables.

5.10 Study limitations

One limitation of this study is the increase in the margin of error around the estimates of association due to the small number of recurrences. This explains the wide 95% confidence intervals in the models for recurrence. A second limitation of the study is the lack of pre-injury levels on all the time-dependent variables. In the absence of this information, it is impossible to know if the changes in the scores reflect a return to pre-injury levels. A third limitation is the inability to assess referral bias. It is assumed that patient referral resulted from the preferences of the treating physicians. However, because consecutive patients were assessed, this sample is thought to be representative of patients seen in a physiatry clinic.

5.11 Limitations of the occupational LBP literature

One general criticism of the extant literature on occupational LBP is the lack of an accepted taxonomy. Harper et al (46) suggest a taxonomy that adapts the International Classification of Impairments, Disabilities and Handicaps (ICIDH) (WHO,1980) definitions of impairment, disability and handicap to the chronic low back pain setting. However, it was not applied to acute LBP. It was also not adopted by the occupational LBP literature. To deal with this inconsistency, a glossary was provided in the preliminary pages of this thesis to indicate to the reader the precise meanings of the terminology used.

Additional problems are encountered by studies of work disability within the context of worker's compensation. In this system the boundary between

impairment, disability and handicap is obscured by administrative and legal protocols. The decision to consider a back disorder in a work site as a disability rests with the CSST and is based on both the filing of a claim by the worker and the acceptance of the claim (of the impairment) by the CSST. Furthermore, return to work is often associated with residual pain and functional limitations (89). Thus, there is no clear distinction between impairment and disability. A handicap is the result of prolonged disability, the expiration of CSST or other insurance benefits and the termination of the relationship with the employer (2 years for large businesses, 1 year for small businesses). The focus of the current occupational LBP literature is on the early indicators of chronicity, i.e., between 1 and 3 months of work absence (89) so that the handicap situation may be avoided. The lack of a clearly defined conceptual biopsychosocial framework reflects the need for future research on the return to work process within the compensation system.

CONCLUSION

This is the first known longitudinal study of a first lifetime occurrence of acute occupational LBP in workers who were seen in a physiatry clinic. The temporal sequencing of improvement showed that the majority of the healing in pain, distress, functional disability and spinal flexibility occurred by the end of physiatry treatment. No additional improvement occurred in either pain or distress following the discontinuation of treatment, and further research is needed to determine whether pain or psychological distress resolves secondarily to the other. At return to work, only 15% (19) reported no pain while a further 43% (56) reported low distress. Functional disability continued to improve 6 months after study entry and remained improved at the 12 month assessment. Spinal flexibility was greatest at the end of physiatry treatment and deteriorated afterward. This temporary increase in flexibility may have resulted from the treatment's effect to extend flexibility beyond the usual performance level. Well-being measured more enduring psychological attributes and was not affected during the 1 year follow-up.

The results of the logistic regression analyses were contrary to the a priori hypothesis. Low levels of psychological disturbance prior to physiatry treatment predicted the poorer outcomes after adjusting for significant predictors and potential confounders. This suggests the possibility of predicting return to work and recurrence from entry-level psychological profile. It was also determined that the information available at the termination of physiatry treatment predicted recurrence with greater accuracy than the model using pre-treatment variables only.

Two approaches to further research have been suggested. The first approach, based on psychological profile, would determine the reasons for the higher risk

of late return to work and of recurrence in workers presenting to physiatry with low distress and good well-being, respectively. Additionally, it needs to be determined when and why individuals lose their sense of control over emotions during active physiatry treatment. The second approach focuses on self-reports of heavy physical work. Further research would include an ergonomic evaluation of the job to determine the congruence of the perception of job task with the physical demands of the job. Research is also needed to determine the relationship between the congruence of that perception and the loss of control over emotions.

Much has been gleaned about the evolution of recovery from a first lifetime episode of acute LBP. However, this was a secondary analysis and important issues of causality were not addressed by the study design and methodology. Moreover, the novel findings of the prediction models need to be replicated by others. The results of this analysis suggest that it is possible to identify who is at risk of prolonged work absence even in workers with a first lifetime low back injury. These findings have spawned new avenues for future research into the complex interrelationships among the many factors affecting the course of recovery from acute occupational LBP.

SUMMARY

The longitudinal results of this secondary analysis suggest that the elevated levels of pain and psychological distress that were assessed prior to the initiation of physiatry treatment were resolved by the termination of treatment. Due to the study design, it was not possible to detect which characteristic resolved secondarily to the other nor to determine if pre-injury levels were achieved.

The results of the prediction models suggest that psychological profile can identify workers at risk of late return to work and recurrence. These results were contrary to the a priori hypothesis in that it was the lack of psychological disturbance that predicted the poorer outcomes. Pre-physiatry treatment distress, a measure of psychological state that responds to current life events, was associated with an early return to work. Pre-physiatry treatment well-being, a measure of psychologically enduring traits, was associated with a recurrent episode of low back pain. There was a higher risk of recurrence in workers with greater control over emotions prior to treatment, however, after treatment ended, the elevated risk was associated with less control.

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TABLES

Figure 1. Flow chart of subjects eliminated from this analysis.

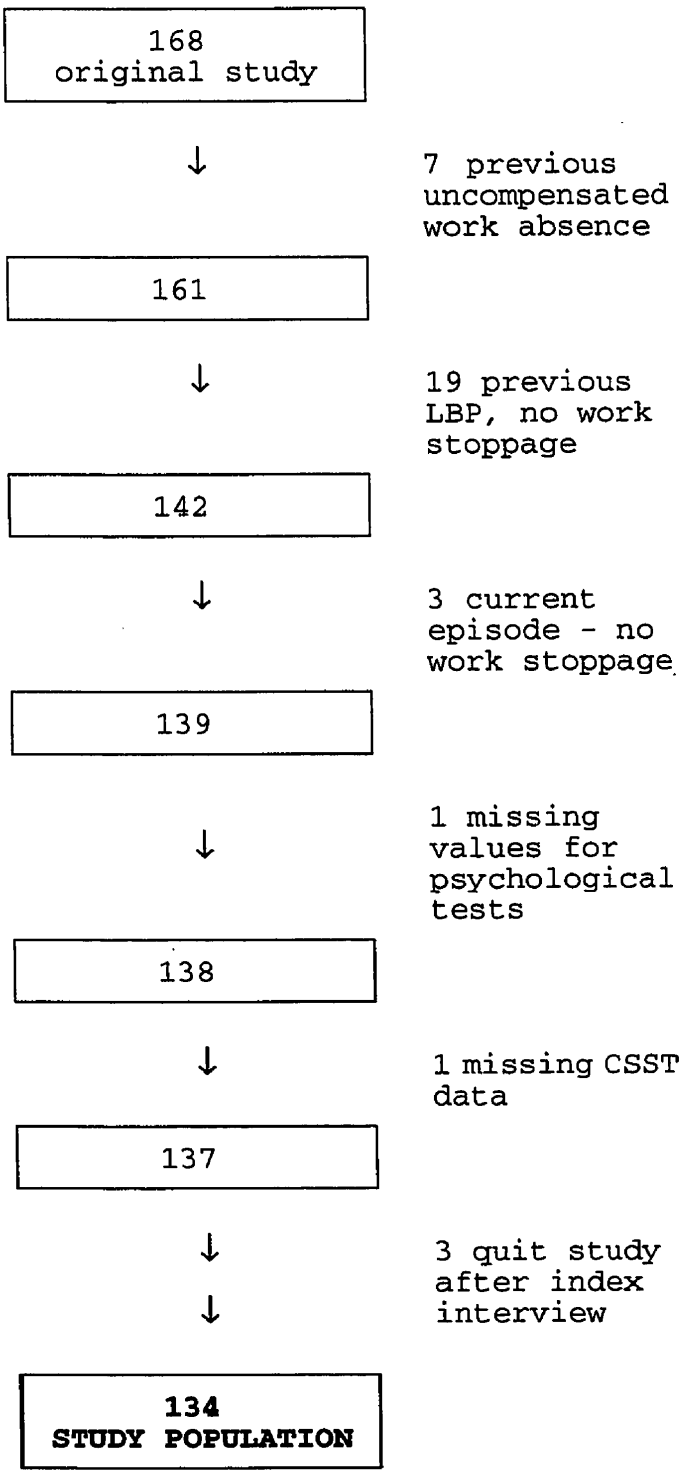


Table 1. Baseline values of continuous data. (N=134)

Variable (units)	Mean	Std Dev	Range
Age (yrs)	32.44	7.92	20-50
Same employer (yrs)	6.05	5.31	1-32
Coffee (cups/day)	2.45	2.39	0-15
Pack years (smokers only)	18.98	15.94	.5-80
Alcohol (0-6)	2.13	1.52	0-6
Sports[▲]	14.39	8.81	0-35
Medical problems (0-19)	1.16	1.36	0-6
Life stressors (0-5)	0.54	0.82	0-3
Job satisfaction[■]	20.06	2.77	10-24
Psychological scales			
GWBS[*]	30.39	5.23	8-36
PSI[°]	19.88	12.85	0-67
Pain level[▬]			
VAS	4.31	1.90	.5-9.4
Functional status[✱]			
Roland-Morris	44.52	19.29	0-91.7
Oswestry	32.78	14.49	6-70.0
Spinal flexibility			
Schober[£]	5.51	1.26	1.5-8.5
Time[§] (in calendar days)			
Delay	15.26	12.68	0-77
Physiatry	28.86	13.40	8-88
Return to work	36.12	14.05	17-93

■ Scored 0-24. Higher scores indicate greater job satisfaction.
▲ Scored 0-35. Higher scores indicating greater participation.
* Scored 0-36. Higher scores indicate greater well-being.
° Scored 0-100. Higher scores indicate greater distress.
▬ Scored 0-10. Higher scores indicate severe pain.
✱ Scored 0-100. Higher scores indicate greater disability.
£ Scores 5 and below indicate impairment.
§ Not all measured at baseline.

Table 2. Baseline values of categorical data. (N=134).

Variable	Frequency	Percent
Demographic characteristics		
Gender		
Male	76	56.7
Female	58	43.3
Language		
English	5	3.7
French	129	96.3
Occupation		
Heavy manual labour	2	1.5
Manual labour	23	17.2
Blue-collar	40	29.9
Construction	5	3.7
Health care	32	23.9
Service industry	18	13.4
Maintenance	14	10.4
Smoking status		
Non-smoker	36	26.9
Former smoker	22	16.4
Current smoker	76	56.7
Treatment group assignment		
Standard care	66	49.3
Back school	68	50.7
Psycho-social characteristics		
Social life		
Very satisfied	75	56.0
Somewhat satisfied	56	41.8
Somewhat dissatisfied	2	1.5
Dissatisfied	1	0.7
General health		
Excellent	50	37.3
Very good	55	41.0
Good	26	19.4
Fair	3	2.2
General stress		
Very stressful	9	6.7
Somewhat stressful	45	33.6
Somewhat unstressful	66	49.3
Not stressful at all	14	10.4

Table 2. Baseline values of categorical data - continued.

Variable	Frequency	Percent
Psycho-occupational characteristics		
Responsibility		
A lot	94	70.1
Other	40	29.9
Monotony		
Not at all	85	63.4
Monotonous	49	36.6
Job demands		
Very physical	40	29.9
Somewhat-not at all	94	70.1
Help from others		
Always receive	65	48.5
Sometimes-never	69	51.5
Pain caused by job		
Occasionally-never	86	64.2
Often	48	35.8
Low back pain caused by job		
Occasionally-never	88	65.7
Often	46	34.3

Table 3. Repeated measurements across time.

SCALE	INITIAL INTERVIEW mean (sd) N=134	END RX mean (sd) N=129	6 MONTHS mean (sd) N=117	12 MONTHS mean(sd) N=117
Psychological measures				
PSI *	19.88 (12.85)	14.16 (12.69)	14.08 (15.75)	13.89 (11.94)
Anxiety	6.60 (4.15)	4.80 (4.15)	4.87 (4.95)	4.90 (3.98)
Depression	6.29 (4.83)	4.33 (4.45)	3.75 (5.30)	3.52 (3.98)
Aggression	2.27 (2.21)	1.64 (1.84)	1.72 (2.20)	1.77 (1.94)
Cognition	2.14 (2.04)	1.56 (1.99)	1.89 (2.41)	1.90 (2.00)
GWBS ♦	30.38 (5.23)	30.25 (5.31)	30.11 (5.87)	30.74 (5.62)
Energy	5.17 (0.97)	4.96 (1.23)	4.97 (1.25)	5.02 (1.31)
Control	4.88 (1.36)	4.98 (1.33)	4.82 (1.32)	5.05 (1.20)
Interest	5.09 (1.17)	4.94 (1.34)	5.01 (1.34)	5.16 (1.15)
Humour	5.27 (1.10)	5.16 (1.15)	5.08 (1.31)	5.22 (1.11)
Stress	4.75 (1.24)	4.95 (1.12)	4.84 (1.34)	4.81 (1.33)
Isolation	5.22 (1.21)	5.26 (1.12)	5.42 (1.09)	5.47 (1.02)
Functional disability *				
Oswestry	32.78 (14.49)	10.55 (10.93)	7.26 (9.52)	6.18 (9.35)
RMDQ	44.52 (19.29)	14.50 (15.49)	8.58 (14.16)	7.23 (13.60)
Pain intensity *				
VAS	4.31 (1.90)	1.38 (1.73)	1.20 (1.73)	1.22 (1.94)
Spinal flexibility ♦				
Schober	5.51 (1.26)	6.17 (0.86)	5.09 (2.61)	5.04 (2.65)

* Higher scores indicate greater impairment.
♦ Lower scores indicate greater impairment.

Table 4. Univariate associations with return-to-work. Continuous data.

VARIABLE	EARLY[§] mean (sd) N=52	LATE mean (sd) N=82	T-TEST p-value
Age	32.87 (7.48)	32.17 (8.22)	.62
Same employer	5.21 (4.53)	6.59 (5.72)	.15
Pack years (smokers)	19.60 (19.00)	18.58 (13.71)	.77
Sports	14.37 (9.57)	14.40 (8.36)	.98
Coffee	2.63 (2.84)	2.33 (2.07)	.50
Alcohol	2.52 (1.53)	1.88 (1.47)	.02
Medical problems	1.33 (1.54)	1.05 (1.24)	.25
Life stressors	0.67 (0.86)	0.46 (0.79)	.15
Job satisfaction	19.94 (3.03)	20.13 (2.61)	.70
Psychological scales (at baseline)			
PSI ✿	20.77 (12.37)	19.32 (13.18)	.53
Anxiety	6.69 (4.20)	6.54 (4.13)	.84
Depression	6.60 (4.62)	6.10 (4.98)	.56
Aggression	2.48 (2.17)	2.13 (2.23)	.38
Cognition	2.31 (2.13)	2.04 (1.99)	.46
GWBS ♦	30.37 (5.85)	30.40 (4.84)	.99
Energy	5.27 (0.95)	5.11 (0.98)	.36
Control	4.75 (1.57)	4.96 (1.21)	.41
Interest	5.08 (1.20)	5.10 (1.15)	.92
Humour	5.27 (1.05)	5.27 (1.14)	.99
Stress	4.73 (1.30)	4.76 (1.21)	.91
Isolation	5.27 (1.34)	5.20 (1.12)	.73
Pain level ✿ (at baseline)			
VAS	4.23 (1.85)	4.35 (1.94)	.73
Functional status ✿ (at baseline)			
Oswestry	31.22 (15.17)	33.78 (14.04)	.32
Roland-Morris	44.30 (19.80)	44.66 (19.09)	.92
Spinal flexibility ♦ (at baseline)			
Schober	5.69 (1.15)	5.39 (1.32)	.19
Time			
Delay	13.48 (12.53)	16.39 (12.72)	.20
Physiatry	19.46 (4.38)	34.82 (13.79)	.0001
Return to work	25.13 (3.92)	43.09 (13.70)	.0001

§ Early return to work defined as 31 days and less.
♦ Lower scores indicative of greater impairment.
✿ Higher scores indicative of greater impairment.

Table 5. Univariate associations with return to work. Categorical data.

VARIABLE	EARLY[§] N (%) N=52	LATE N (%) N=82	CHI-Q TEST p-value
Demographic characteristics			
Gender			.86
Male	30 (57.7)	46 (56.1)	
Female	22 (42.3)	36 (43.9)	
Language			
English	2 (3.9)	3 (3.7)	
French	50 (96.1)	79 (96.3)	
Occupation			.40
Physical labour	7 (13.5)	18 (22.0)	
Blue-collar/construction	17 (32.7)	28 (34.2)	
Health care	12 (23.1)	20 (24.4)	
Service/maintenance	16 (30.8)	16 (19.5)	
Smoking status			.63
Nonsmokers	13 (25.0)	23 (28.1)	
Exsmokers	7 (13.5)	15 (18.3)	
Smokers	32 (61.5)	44 (53.7)	
Treatment group assignment			.20
Back school	30 (57.7)	38 (46.3)	
Standard care	22 (42.3)	44 (53.7)	
Psycho-social characteristics			
Social life			.75
Very satisfied	30 (57.7)	45 (54.9)	
Other	22 (42.3)	37 (45.1)	
General stress			.71
Stressful	22 (42.3)	32 (39.0)	
Not stressful	30 (57.7)	50 (61.0)	
Overall health			.88
Excellent	19 (36.5)	31 (37.8)	
Fair-very good	33 (63.5)	51 (62.2)	

[§] Early return to work defined as 31 days and less.

Table 5. Univariate associations with return to work. Categorical data - continued.

VARIABLE	EARLY[§] N (%) N=52	LATE N (%) N=82	CHI-SQ TEST p-value
Psycho-occupational characteristics			
Responsibility			.34
A lot	34 (65.4)	60 (73.2)	
Other	18 (34.6)	22 (26.8)	
Monotony			.72
Not at all	32 (61.5)	53 (64.6)	
Other	20 (38.5)	29 (35.4)	
Job demands			.84
Very physical	15 (28.9)	25 (30.5)	
Somewhat-not at all	37 (71.2)	57 (69.5)	
Help from others			.94
Always receive	25 (48.1)	40 (48.8)	
Sometimes-never	27 (51.9)	42 (51.2)	
Pain caused by job			.82
Occasionally-never	34 (65.4)	52 (63.4)	
Often	18 (34.6)	30 (36.6)	
Low back pain caused by job			.50
Occasionally-never	36 (69.2)	52 (63.4)	
Often	16 (30.8)	30 (36.6)	

[§] Early return to work defined as 31 days and less.

Table 6. Univariate associations with recurrence. Continuous data.

VARIABLE	NO RECURRENCE mean (sd) N=117	RECURRENCE mean (sd) N=17	T-TEST p-value
Age	32.91 (8.01)	29.18 (6.61)	.07
Same employer	6.29 (5.54)	4.41 (3.00)	.04
Pack years	19.14 (15.22)	17.83 (21.21)	.79
Sports	14.18 (8.75)	15.82 (9.39)	.47
Coffee	2.39 (2.06)	2.82 (4.07)	.67
Alcohol	2.14 (1.55)	2.06 (1.34)	.84
Medical problems	1.15 (1.34)	1.24 (1.56)	.80
Life stressors	0.56 (.82)	0.41 (.80)	.48
Job satisfaction	20.07 (2.85)	20.00 (2.26)	.92
Psychological scales (at baseline)			
PSI ✲	19.99 (12.58)	19.08 (14.93)	.78
Anxiety	6.74 (4.06)	5.65 (4.72)	.31
Depression	6.38 (4.80)	5.71 (5.15)	.60
Aggression	2.14 (2.08)	3.18 (2.88)	.07
Cognition	2.15 (2.11)	2.06 (1.56)	.86
GWBS ◆	30.06 (5.33)	32.47 (4.08)	.08
Energy	5.12 (0.99)	5.53 (0.72)	.10
Control	4.79 (1.39)	5.53 (0.94)	.03
Interest	5.05 (1.20)	5.35 (0.86)	.32
Humour	5.22 (1.15)	5.59 (0.62)	.06
Stress	4.71 (1.27)	5.00 (1.00)	.37
Isolation	5.19 (1.21)	5.47 (1.18)	.37
Pain level ✲ (at baseline)			
VAS	4.41 (1.88)	3.64 (1.95)	.12
Functional disability ✲ (at baseline)			
Oswestry	33.58 (14.78)	27.32 (11.18)	.10
Roland-Morris	45.58 (19.35)	37.25 (17.76)	.10
Spinal flexibility ◆ (at baseline)			
Schober	5.46 (1.28)	5.84 (1.09)	.25
Time			
Delay	15.46 (12.87)	13.88 (11.55)	.63
Physiatry	29.21 (14.02)	26.41 (7.72)	.42
Return to work	36.50 (14.56)	33.47 (9.77)	.41

◆ Lower scores indicative of greater impairment.
✲ Higher scores indicative of greater impairment.

Table 7. Univariate associations with recurrence. Categorical data.

VARIABLE	NO RECURRENCE N (%) N=117	RECURRENCE N (%) N=17	CHI-SQ TEST p-value
Demographic characteristics			
Gender			.74
Male	67 (57.3)	9 (52.9)	
Female	50 (42.7)	8 (47.1)	
Language			
English	4 (3.42)	1 (5.9)	
French	113 (96.6)	16 (94.1)	
Occupation			.14
Physical labour	21 (18.0)	4 (23.5)	
Blue-collar /construction	40 (34.2)	5 (29.4)	
Health care	25 (21.4)	7 (41.2)	
Service /maintenance	31 (26.5)	1 (5.9)	
Smoking status			.95
Smokers	67 (57.3)	9 (52.9)	
Exsmokers	19 (16.2)	3 (17.7)	
Nonsmokers	31 (26.5)	5 (29.4)	
Treatment group assignment			.85
Back school	59 (50.4)	9 (52.9)	
Standard care	58 (49.6)	8 (47.1)	
Psycho-social characteristics			
Social life			.43
Very satisfied	67 (57.3)	8 (47.1)	
Other	50 (42.7)	9 (52.9)	
General stress			.26
Stressful	45 (38.6)	9 (52.9)	
Not stressful	72 (61.5)	8 (47.1)	
Overall health			.21
Excellent	46 (39.3)	4 (23.5)	
Fair-very good	71 (60.7)	13 (76.5)	

Table 7. Univariate associations with recurrence. Categorical data - continued.

VARIABLE	NO RECURRENCE N (%) N=117	RECURRENCE N (%) N=17	CHI-SQ TEST p-value
Psycho-occupational characteristics			
Responsibility			.24
A lot	80 (68.4)	14 (82.4)	
Other	37 (31.6)	3 (17.7)	
Monotony			.91
Not at all	74 (63.3)	11 (64.7)	
Other	43 (36.8)	6 (35.3)	
Job demands			.10
Very physical	32 (27.4)	8 (47.1)	
Somewhat-not at all	85 (72.7)	9 (52.9)	
Help from others			.05
Always receive	53 (45.3)	12 (70.6)	
Sometimes-never	64 (54.7)	5 (29.4)	
Pain caused by job			.96
Occasionally-never	75 (64.1)	11 (64.7)	
Often	42 (35.9)	6 (35.3)	
Low back pain caused by job			.53
Occasionally-never	78 (66.7)	10 (58.8)	
Often	39 (33.3)	7 (41.2)	

Table 8. Univariate associations with psychological distress. Continuous data.

VARIABLE	LOW DISTRESS§ mean (sd) N=48	HIGH DISTRESS mean (sd) N=86	T-TEST p-value
Age	30.92 (07.46)	33.29 (08.09)	.10
Same employer	5.58 (04.44)	6.31 (05.75)	.45
Pack years +	17.92 (17.28)	19.52 (15.32)	.64
Sports	15.96 (09.40)	13.51 (08.39)	.12
Coffee	2.21 (01.92)	2.58 (02.61)	.35
Alcohol	2.25 (01.52)	2.06 (01.52)	.49
Medical problems	0.75 (01.06)	1.38 (01.46)	.005
Life stressors	0.52 (00.82)	0.56 (00.82)	.80
Job satisfaction	20.52 (02.47)	19.80 (02.91)	.15
Pain level ¤			
VAS	4.10 (01.83)	4.42 (01.93)	.35
Functional status ¤			
Oswestry	28.64 (13.54)	35.09 (14.56)	.01
Roland-Morris	39.06 (18.78)	47.57 (19.00)	.01
Spinal flexibility ♦			
Schober	5.62 (01.22)	5.44 (01.28)	.44
Time *			
Delay	15.52 (14.23)	15.12 (11.80)	.86
Physiatry	29.69 (12.28)	28.40 (14.03)	.59
Return to work	36.44 (11.31)	35.94 (15.43)	.83

§ Scores below 12.65.
+ Smokers only.
♦ Lower scores indicative of greater impairment.
¤ Higher scores indicative of greater impairment.
* Not all assessed at baseline.

Table 9. Univariate associations with psychological distress. Categorical data.

VARIABLE	LOW DISTRESS[§] N (%) N=48	HIGH DISTRESS N (%) N=86	CHI-SQ TEST p-value
Demographic characteristics			
Gender			.005
Male	35 (72.9)	41 (47.7)	
Female	13 (27.1)	45 (52.3)	
Language			
English	1 (02.1)	4 (04.0)	
French	47 (97.9)	82 (95.3)	
Occupation			.02
Physical labour	8 (16.7)	17 (19.8)	
Blue-collar /construction	24 (50.0)	21 (24.4)	
Health care	10 (20.8)	22 (25.6)	
Service /maintenance	6 (12.5)	26 (30.2)	
Smoking status			.54
Nonsmokers	15 (31.2)	21 (24.4)	
Exsmokers	6 (12.5)	16 (18.6)	
Smokers	27 (56.3)	49 (57.0)	
Treatment group assignment			.90
Back school	24 (50.0)	42 (48.8)	
Standard care	24 (50.0)	44 (51.2)	
Psycho-social characteristics			
Social life			.13
Very satisfied	31 (64.6)	44 (51.2)	
Other	17 (35.4)	42 (48.8)	
General stress			.007
Stressful	12 (25.0)	42 (48.8)	
Not stressful	36 (75.0)	44 (51.2)	
Overall health			.13
Excellent	22 (45.8)	28 (32.6)	
Fair-very good	26 (54.2)	58 (67.4)	

§ Scores below 12.65.

Table 9. Univariate associations with psychological distress. Categorical - continued.

VARIABLE	LOW DISTRESS§ N (%) N=48	HIGH DISTRESS N (%) N=86	CHI-SQ TEST p-value
Psycho-occupational characteristics			
Responsibility			.60
A lot	35 (72.9)	59 (68.6)	
Other	13 (27.1)	27 (31.4)	
Monotony			.56
Not at all	32 (66.7)	53 (61.6)	
Other	16 (33.3)	33 (38.4)	
Job demands			.90
Very physical	10 (28.6)	30 (30.3)	
Somewhat-not at all	25 (71.4)	69 (69.7)	
Help from others			.09
Always receive	28 (58.3)	37 (43.0)	
Sometimes-never	20 (41.7)	49 (57.0)	
Pain caused by job			.02
Occasionally-never	37 (77.1)	49 (57.0)	
Often	11 (22.9)	37 (43.0)	
Low back pain caused by job			.86
Occasionally-never	32 (66.7)	56 (65.1)	
Often	16 (33.3)	30 (34.9)	

§ Scores below 12.65.

Table 10. Univariate associations with well-being. Continuous data.

VARIABLE	NOT WELL§ mean (sd) N=46	WELL ADAPTED mean (sd) N=88	T - TEST p - value
Age	32.72 (08.47)	32.30 (07.67)	.77
Same employer	6.35 (06.24)	5.90 (04.79)	.67
Pack years	16.81 (14.83)	20.14 (16.50)	.32
Sports	14.15 (08.78)	14.51 (08.87)	.82
Coffee	2.15 (01.94)	2.60 (02.59)	.26
Alcohol	1.87 (01.28)	2.26 (01.62)	.16
Medical problems	1.63 (01.55)	.91 (01.19)	.007
Life stressors	.50 (00.75)	.57 (00.85)	.65
Job satisfaction	19.50 (02.89)	20.35 (02.69)	.09
Pain level ¤			
VAS	4.37 (01.98)	4.27 (01.86)	.77
Functional status ¤			
Oswestry	31.24 (14.61)	33.59 (14.44)	.37
Roland-Morris	43.11 (18.57)	45.26 (19.73)	.54
Spinal flexibility ♦			
Schober	5.50 (01.45)	5.51 (1.16)	.96
Time*			
Delay	14.20 (10.29)	15.82 (13.79)	.44
Physiatry	28.91 (15.76)	28.83 (12.08)	.98
Return to work	36.65 (17.39)	35.84 (12.04)	.78

§ Scores of 29 and less.
♦ Lower scores indicative of greater impairment.
¤ Higher scores indicative of greater impairment.
* Not all assessed at baseline.

Table 11. Univariate associations with well-being. Categorical data.

VARIABLE	NOT WELL§ N (%) N=46	WELL ADAPTED N (%) N=88	CHI-SQ TEST p-value
Demographic chacteristics			
Gender			.44
Male	24 (52.2)	52 (59.1)	
Female	22 (47.8)	36 (40.9)	
Language			
English	4 (08.7)	1 (01.1)	
French	42 (91.3)	87 (98.9)	
Occupation			.22
Physical labour	10 (21.7)	15 (17.1)	
Blue-collar /construction	13 (28.3)	32 (36.4)	
Health care	8 (17.4)	24 (27.3)	
Service/maintenance	15 (32.6)	17 (19.3)	
Smoking status			.70
Nonsmokers	12 (26.1)	24 (27.3)	
Exsmokers	6 (13.0)	16 (18.2)	
Smokers	28 (60.9)	48 (54.6)	
Treatment group assignment			.11
Back school	19 (41.3)	49 (55.7)	
Standard care	27 (58.7)	39 (44.3)	
Psycho-social characteristics			
Social life			.08
Very satisfied	25 (54.4)	34 (38.6)	
Other	21 (45.7)	54 (61.4)	
General stress			.04
Stressful	24 (52.2)	30 (34.1)	
Not stressful	22 (47.8)	58 (65.9)	
Overall health			.23
Excellent	14 (30.4)	36 (40.9)	
Fair-very good	32 (69.6)	52 (59.1)	

§ Scores of 29 and less.

Table 11. Univariate associations with well-being. Categorical data - continued.

VARIABLE	NOT WELL§ N (%) N=46	WELL ADAPTED N (%) N=88	CHI-SQ SQ TEST p-value
Psycho-occupational characteristics			
Responsibility			.37
A lot	30 (65.2)	64 (72.7)	
Other	16 (34.8)	24 (27.3)	
Monotony			.05
Not at all	24 (52.2)	61 (69.3)	
Other	22 (47.8)	27 (30.7)	
Job demands			.61
Very physical	15 (32.6)	25 (28.4)	
Somewhat -not at all	31 (67.4)	63 (71.6)	
Help from others			.40
Always receive	20 (43.5)	45 (51.1)	
Sometimes-never	26 (56.5)	43 (48.9)	
Pain caused by job			.18
Occasionally-never	26 (56.5)	60 (68.2)	
Often	20 (43.5)	28 (31.8)	
Low back pain caused by job			.22
Occasionally-never	27 (58.7)	61 (69.3)	
Often	19 (41.3)	27 (30.7)	

§ Scores of 29 and less.

Table 12. Pearson Correlation Coefficients of time-related variables - baseline. (N=134). Correlation coefficient above p-value.

	ODQ	RMDQ	VAS	GWBS	PSI
RMDQ	0.69850 0.0001				
VAS	0.44787 0.0001	0.51721 0.0001			
GWBS	0.01901 0.8274	0.04584 0.5989	-0.04555 0.6013		
PSI	0.18082 0.0365	0.22167 0.0101	0.08535 0.3268	-0.42163 0.0001	
SCHOBER	-0.29426 0.0006	-0.45651 0.0001	-0.28558 0.0008	-0.09067 0.2975	-0.09322 0.2840

RMDQ Roland-Morris Disability Questionnaire
ODQ Oswestry Disability Questionnaire
VAS Visual Analog Scale
GWBS General Well-Being Scale
PSI Psychiatric Symptom Index

Table 13. Pearson Correlation Coefficients of time-related variables - post-treatment. (N = 129). Correlation coefficient above p-value.

	ODQ	RMDQ	VAS	GWBS	PSI
RMDQ	0.81123 0.0001				
VAS	0.73322 0.0001	0.74466 0.0001			
GWBS	-0.28878 0.0009	-0.26148 0.0028	-0.28641 0.0010		
PSI	0.37702 0.0001	0.38731 0.0001	0.38101 0.0001	-0.61078 0.0001	
SCHOBER	-0.20408 0.0203	-0.24043 0.0061	-0.23263 0.0080	0.09936 0.2626	-0.17237 0.0508

RMDQ Roland-Morris Disability Questionnaire
ODQ Oswestry Disability Questionnaire
VAS Visual Analog Scale
GWBS General Well-Being Scale
PSI Psychiatric Symptom Index

Table 14. Pearson Correlation Coefficients of time-related variables - 6 months. (N = 117)
Correlation coefficient above p-value.

	ODQ	RMDQ	VAS	GWBS	PSI
RMDQ	0.85403 0.0001				
VAS	0.76938 0.0001	0.72972 0.0001			
GWBS	-0.04828 0.6052	-0.10355 0.2666	-0.12330 0.1853		
PSI	0.25991 0.0047	0.26475 0.0039	0.29417 0.0001	-0.53863 0.0001	
SCHOBER	-0.29051 0.0015	-0.18430 0.0467	-0.28216 0.0021	0.02718 0.7711	-0.10408 0.2641

RMDQ Roland-Morris Disability Questionnaire
ODQ Oswestry Disability Questionnaire
VAS Visual Analog Scale
GWBS General Well-Being Scale
PSI Psychiatric Symptom Index

Table 15. Pearson Correlation Coefficients of time-related variables - 12 month. (N=116)
Correlation coefficient above p-value.

	ODQ	RMDQ	VAS	GWBS	PSI
RMDQ	0.80089 0.0001				
VAS	0.75549 0.0001	0.74665 0.0001			
GWBS	-0.20979 0.0238	-0.23804 0.0101	-0.16775 0.0719		
PSI	0.24765 0.0074	0.22152 0.0169	0.25002 0.0068	-0.57604 0.0001	
SCHOBER	-0.12479 0.1820	-0.13718 0.1420	-0.20485 0.0274	0.12345 0.1867	-0.18916 0.0420

RMDQ Roland-Morris Disability Questionnaire
ODQ Oswestry Disability Questionnaire
VAS Visual Analog Scale
GWBS General Well-Being Scale
PSI Psychiatric Symptom Index

Table 16. Comparison of group means on the repeated variables (total sample and those with complete data).

Scale	Total Sample N=134	Complete Data N=111
General Well-Being Scale *		
Time 1	30.38	30.90
Time 2	30.25	30.51
Time 3	30.11	30.11
Time 4	30.74	30.75
Psychiatric Symptom Index		
Time 1	19.88	19.32
Time 2	14.16	13.85
Time 3	14.08	13.29
Time 4	13.89	13.85
Oswestry Disability		
Time 1	32.78	32.35
Time 2	10.55	10.52
Time 3	7.26	7.20
Time 4	6.18	6.28
Roland-Morris Disability		
Time 1	44.52	43.80
Time 2	14.50	14.30
Time 3	8.58	8.37
Time 4	7.23	7.02
Visual Analog Scale		
Time 1	4.31	4.34
Time 2	1.38	1.41
Time 3	1.20	1.23
Time 4	1.22	1.21
Schober		
Time 1	5.51	5.47
Time 2	6.17	6.19
Time 3	5.09	5.26
Time 4	5.04	5.20

* Not pursued in ANOVA due to limited fluctuation.

Table 17. Results of analysis of variance on 111 subjects with complete data.

Variable	Overall Pr > F	T1 / T2 Pr > F	T2 / T3 Pr > F	T2 / T4[§] Pr > F
PSI	.0001	.0003*	.6791	.9954
VAS	.0001	.0003*	.3219	.3204
ODQ	.0001	.0003*	.0039*	.0003*
RMDQ	.0001	.0003*	.0018*	.0003*
Schober	.0002	.0003*	.0003*	.0003*

* includes Bonferroni correction for multiple comparisons
§ T1 = pre-treatment; T2 = post-treatment; T3 = 6 months; T4 = 12 months.

Table 18. Logistic regression results. Odds ratios and 95% confidence intervals for late return to work.

Variable	Univariate models OR	95% CI	Model with all variables OR	95% CI	Significant * variables only OR	95% CI
Age	.56	.27-1.14	.38	.15-.95	.37	.16-.85
Gender	1.07	.53-2.15	1.61	.57-4.57		
Job categories						
Service/maintenance	1.00					
Physical labour	2.58	.84-7.84	2.31	.60-8.87		
Blue-collar/construction	1.65	.66-4.13	1.52	.48-4.85		
Health care	1.67	.62-4.51	1.44	.40-5.20		
Delay	2.99	1.19-7.51	3.94	1.36-11.45	3.07	1.14-8.26
Seniority	2.28	.93-5.55	5.51	1.71-27.74	4.65	1.60-13.55
Alcohol	.31	.13-.76	.30	.10-.90	.29	.11-.77
Medical problems	.63	.31-1.29	.54	.23-1.30		
Life stressors	.50	.25-1.03	.61	.26-1.44		
Stress	.87	.43-1.77	2.38	.88-6.48		
Job causing pain	1.09	.53-2.25	1.20	.49-3.00		
RMDQ	1.10	.55-2.21	.90	.32-2.52		
ODQ	1.52	.75-3.09	1.54	.72-4.09		
PSI	.52	.24-1.11	.29	.10-.80	.42	.18-.97

* refer to page 45 in text for details

Table 19 . Logistic regression results using baseline values of time-related variables for recurrent episode. Odds ratios and 95% confidence intervals are presented. (N=134).

Variable	Univariate models OR	95% CI	Model with all variables OR	95% CI	Significant * variables only OR	95% CI
Age	.22	.04-1.01	.66	.10-4.38		
Gender	1.19	.43-3.31	1.27	.32-5.07		
Seniority	.64	.22-1.84	1.16	.29-4.70		
Health	2.11	.65-6.86	4.82	.88-26.25		
Medical problems	1.10	.39-3.10	.77	.20-3.00		
Stress	1.80	.65-5.01	3.92	.84-18.27		
Assistance	.35	.11-1.04	.12	.02-.61	.18	.05-.69
Responsible job	.46	.13-1.71	.27	.04-1.79		
Physical job	2.36	.84-6.65	3.65	.78-17.09		
Monotonous job	.94	.32-2.72	2.28	.50-10.48		
RMDQ	.35	.11-1.04	.92	.21-4.14		
GWBS	4.52	.99-20.71	8.58	1.07-68.62	6.02	1.05-34.57
Anxiety	.32	.11-.92	.18	.03-.96	.21	.05-.79
Aggressiveness	2.93	1.01-8.49	7.23	1.31-4.01	12.79	2.97-55.19

* refer to page 46 in text for details

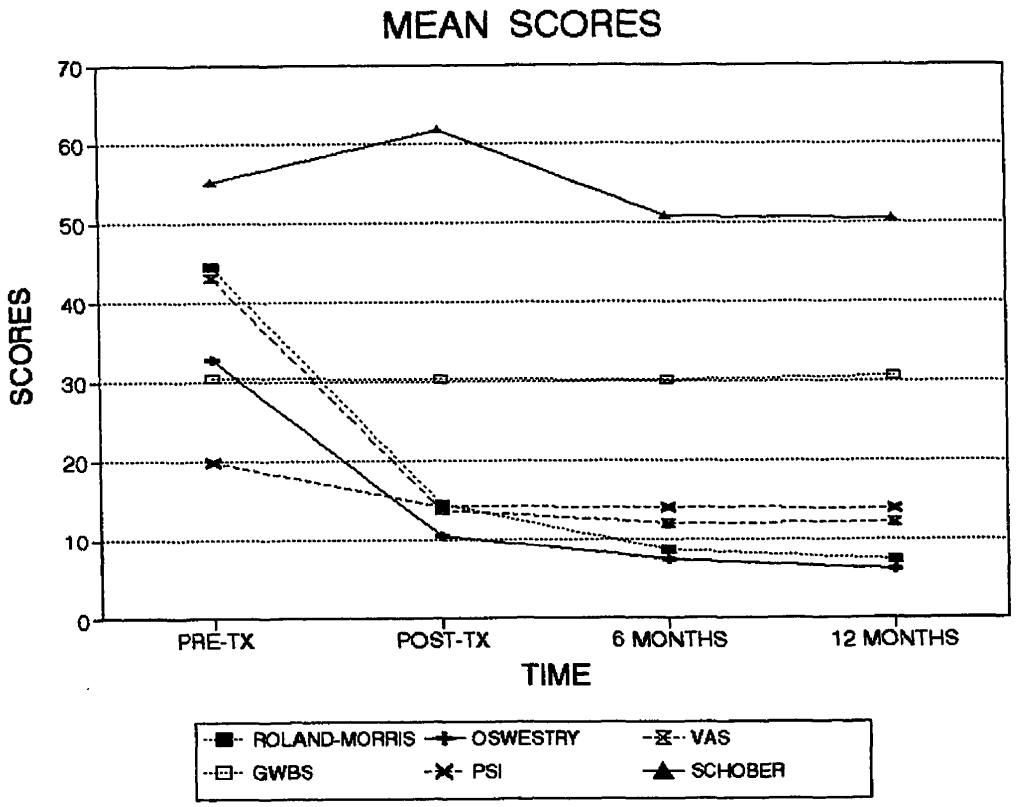
Table 20. Logistic regression results using Time 2 values of time-related variables for recurrent episode. Odds ratios and 95% confidence intervals are presented. (N=129)

Variable	Univariate models OR	95% CI	Model with all variables OR	95% CI	Significant* variables only OR	95% CI
Age	.23	.05-1.07	.27	.04-1.77		
Gender	1.35	.47-3.86	1.96	.46-8.47		
Seniority	.75	.26-2.22	.34	.06-1.86		
Health	1.99	.60-6.54	5.54	.85-36.06	7.40	1.61-33.92
Social life	1.81	.63-5.19	7.40	1.07-51.27		
Delay	.39	.12-1.29	.14	.03-.77	.16	.04-.73
Physical job	2.65	.91-7.66	12.17	1.83-80.80	7.18	1.74-29.58
Assistance	.39	.13-1.19	.51	.11-2.35		
ODQ	.28	.08-1.04	.35	.06-1.99		
Anxiety	.27	.07-1.00	.08	.01-.65	.21	.04-.98
Interest	3.87	1.15-12.44	19.36	2.32-161.80	6.30	1.42-27.91
Control	.66	.23-1.90	.15	.03-.73	.20	.05-.78

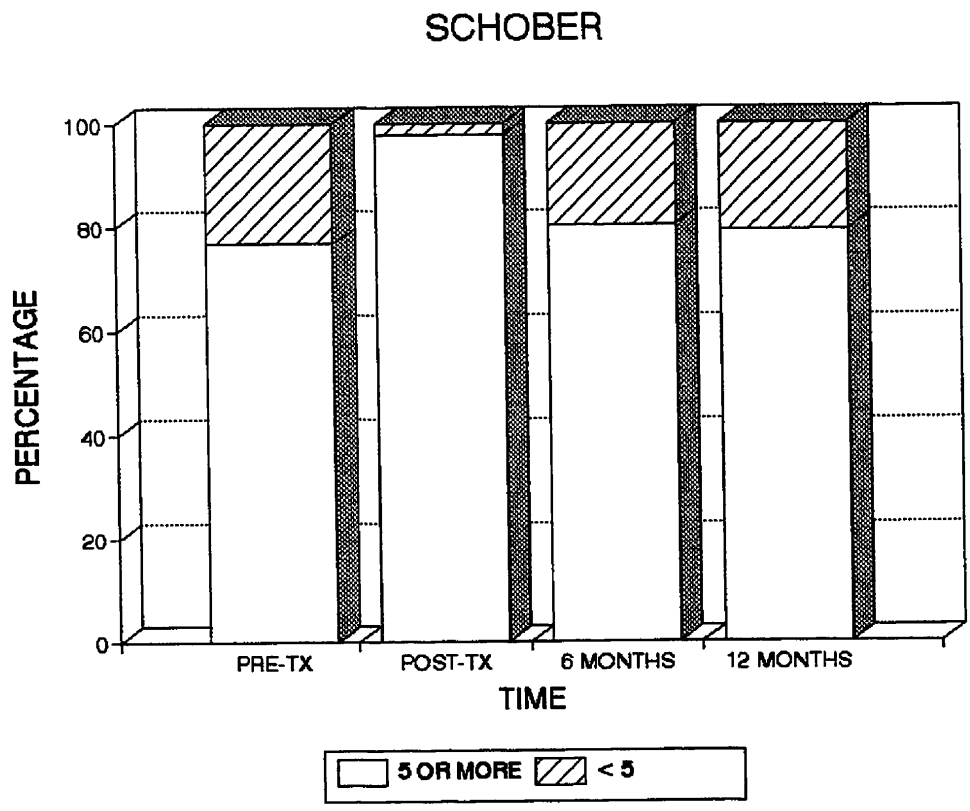
*refer to page 48 for details

GRAPHS

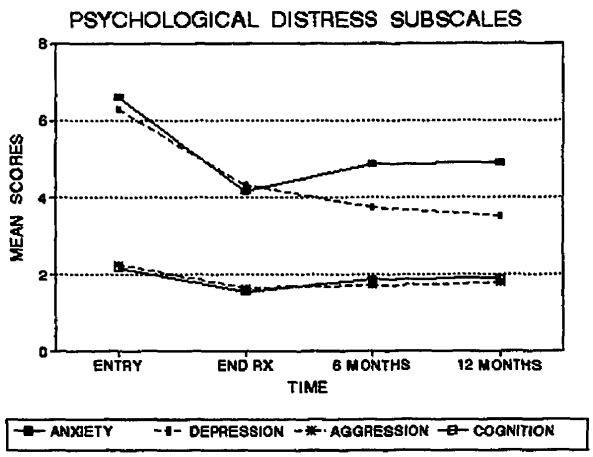
Graph 1. Evolution of LBP in patients with first time episodes. Mean scores across time on time-related variables. (N=134)

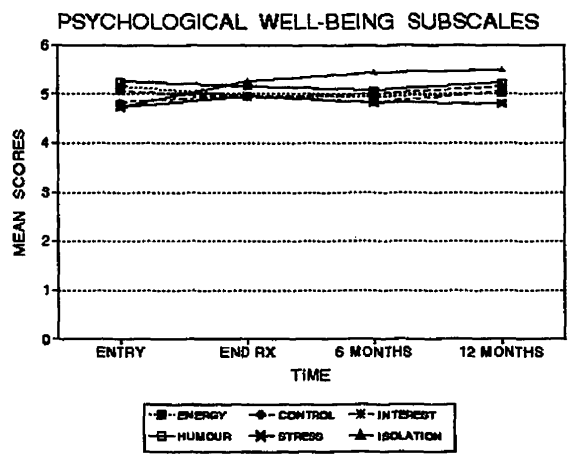


Graph 2. Evolution of LBP in patients with first time episodes. Percentage impairment on the Modified Schober. (N=134)



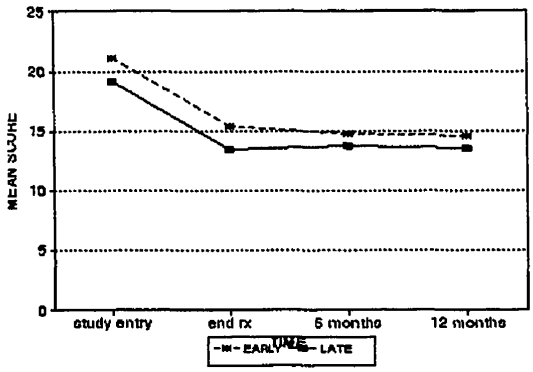
Graphs 3 and 4. Evolution of LBP in patients with first time episodes. Psychological subscales across time.



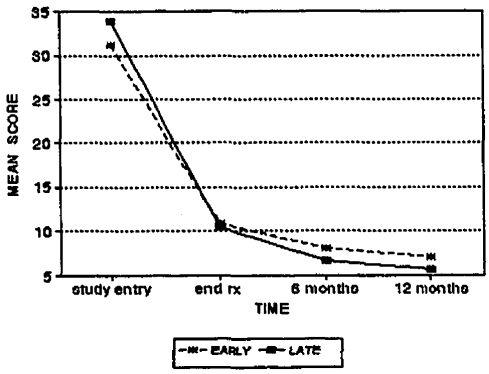


Graphs 5 to 10. Evolution of LBP in patients with first time episodes. Time-related variables by return to work status.

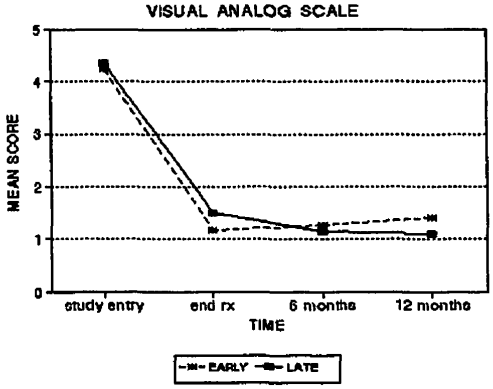
PSYCHIATRIC SYMPTOM INDEX



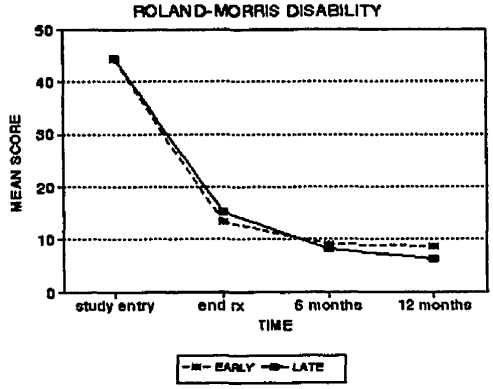
OSWESTRY DISABILITY SCALE



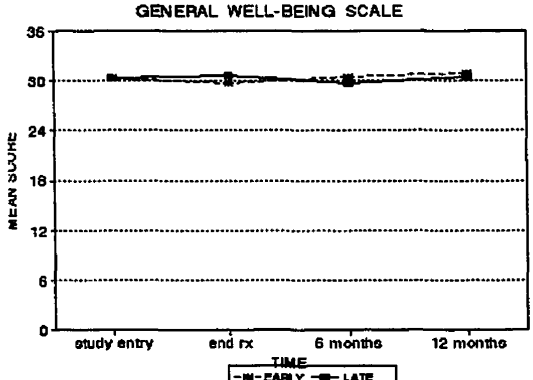
VISUAL ANALOG SCALE



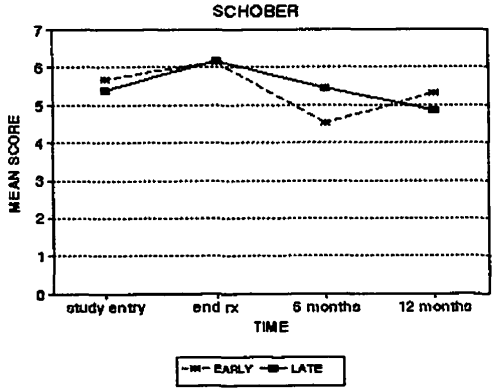
ROLAND-MORRIS DISABILITY



GENERAL WELL-BEING SCALE

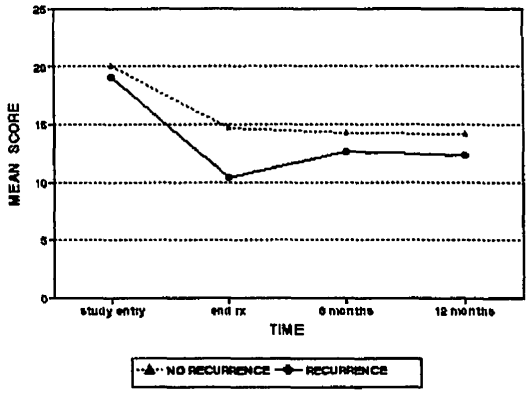


SCHOBER

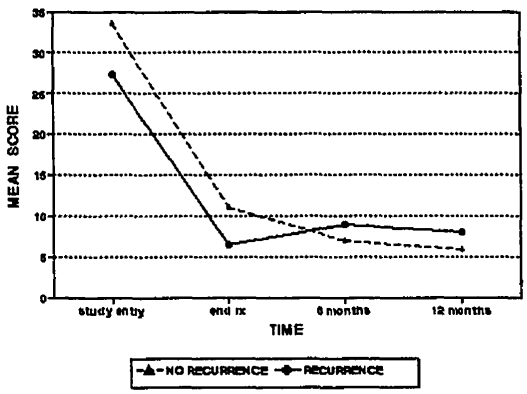


Graphs 11 to 16. Evolution of LBP in patients with first time episodes. Time-related variables by recurrence status.

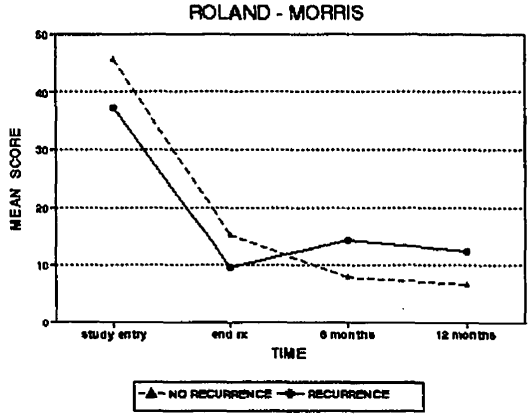
PSYCHIATRIC SYMPTOM INDEX



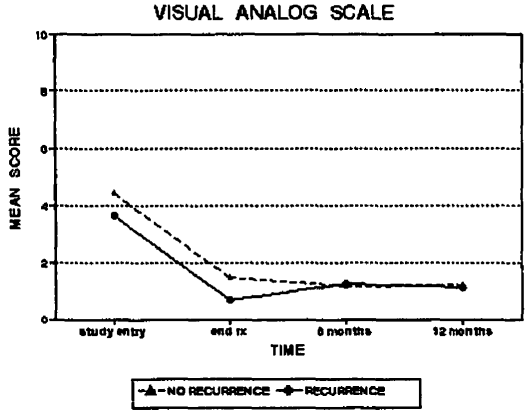
OSWESTRY DISABILITY SCALE



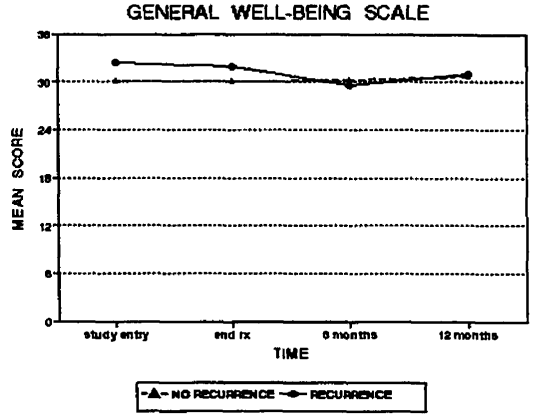
ROLAND - MORRIS



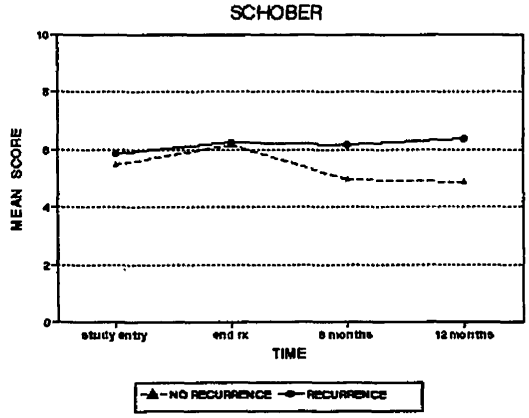
VISUAL ANALOG SCALE



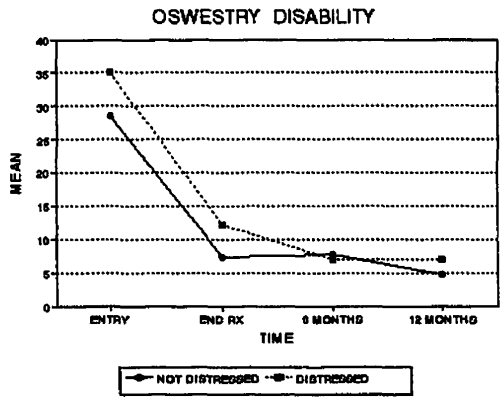
GENERAL WELL-BEING SCALE

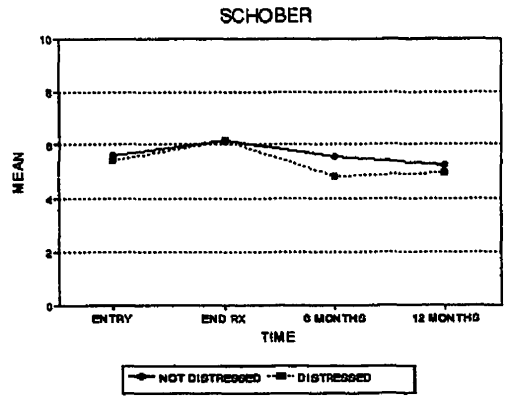


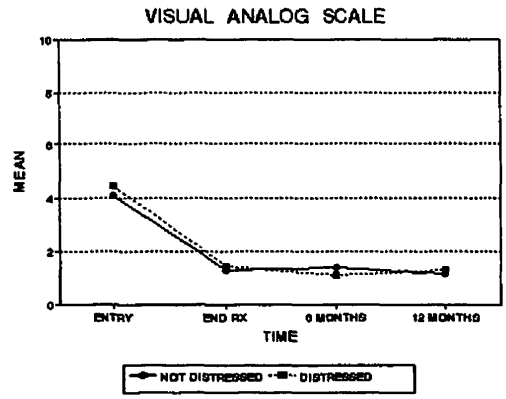
SCHOBER

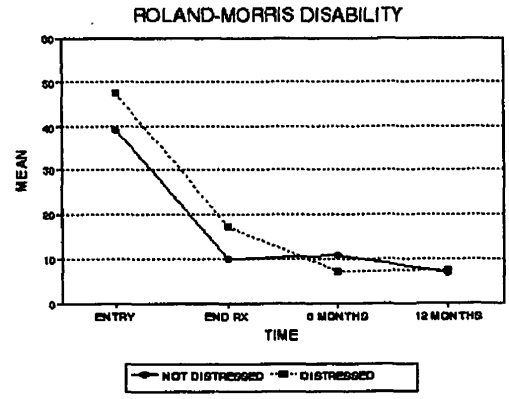


Graphs 17 to 20. Evolution of LBP in patients with first time episodes. Time-related variables by baseline PSI.

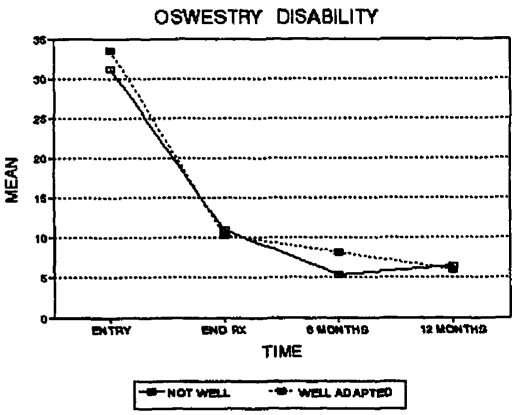


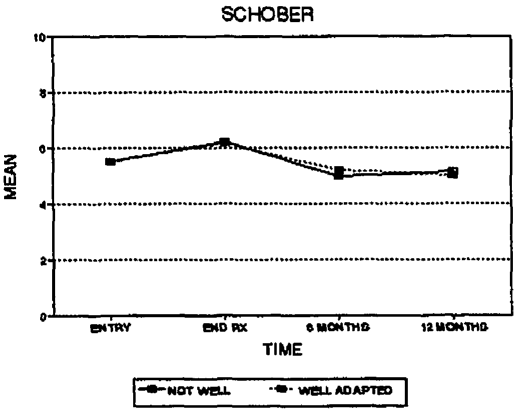


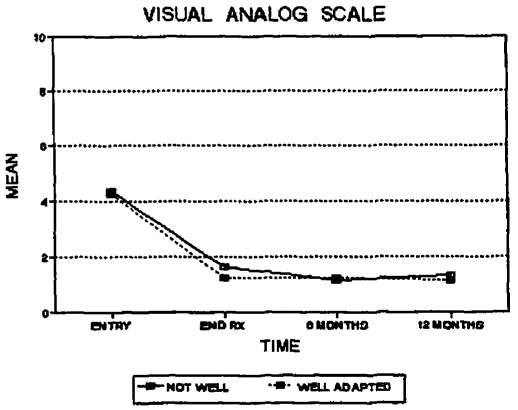


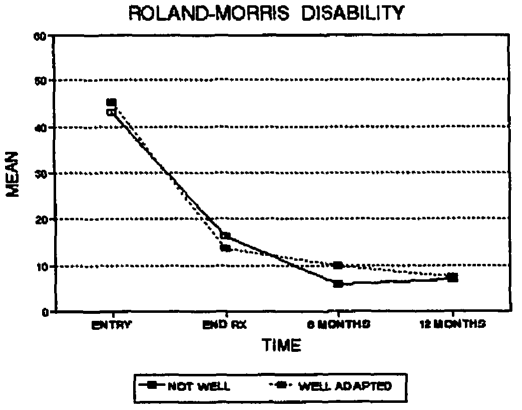


Graphs 21 to 24. Evolution of LBP in patients with first time episodes. Time-related variables by baseline GWBS.









ANNEX

Table A1. Main outcomes of back school intervention trial. Work absenteeism and recurrence of LBP by back school and standard therapy treatment groups.

Variable units ()	Back school	Standard therapy	p- value
Median time to RTW days (interquartile range)	33 (27-40)	33 (26-41)	.48
Patients returning to work number (%)	80 (97.6)	85 (98.8)	.61
Recurrence number (%)	14 (17.5)	10 (11.8)	.16
Mean duration of recurrence days (SD)	42.1 (38.3)	61.7 (44.4)	.26

Table A2. Assessment of knowledge (multiple choice exam) and performance of exercises.

Variable	Time				p-value
	Zero time mean (sd)	Post treatment mean (sd) (sd)	6 months mean (sd)	12 months mean (sd)	
Knowledge (0-100)					
Back school	46.8 (10.5)	73.0 (17.9)	72.8 (15.9)	71.9 (13.6)	
Standard care	47.9 (11.7)	53.6 (12.0)	51.7 (12.1)	55.5 (13.6)	.0001
Exercise performance (0-25)					
Back school	NA	19.9 (4.7)	19.1 (5.6)	18.7 (6.2)	
Standard care	NA	13.0 (3.4)	11.9 (3.5)	11.9 (4.3)	.0001

NA = not applicable

Table A3. Variable definitions used in logistic regression for return to work.

Psychological distress (PSI)
0=low symptomatology
1=high symptomatology
Seniority
0=1-8 years with same employer
1=more than 8 years
Alcohol consumption
0=once a week or less
1=more than once a week
Time delay
0=16 days or less
1=17 or more days
Age
0=20-29 years
1=age 30 and over
Gender
0=male
1=female
Number of life stressors
0=none
1=1 or more
Job causing pain
0=once a month or less
1=once a week or more
Stress
0=stressful
1=not stressful
RMDQ
0=low disability
1=high disability
ODQ
0=low disability
1=high disability
Medical problems
0=none
1=1 or more

Table A4. Variable definitions used in logistic regression for recurrence.

Psychological well being (GWBS)
0=not well adapted
1=well adapted
Receive assistance from others
0=always
1=sometimes to never
Anxiety
0=low (lowest quartile, less than or equal to 4)
1=moderate-high
Aggressiveness
0=low (lowest quartile, less than or equal to 2)
1=high
Control
0=low-medium (median split, less than or equal to 5)
1=high
Age
0=20-35 years
1=more than 35 years
Gender
0=male
1=female
RMDQ
0=low disability
1=high disability
Health
0=excellent
1=fair to very good
Physically demanding job
0=not at all to somewhat
1=very physical
Responsible job
0=alot
1=none to average amount
Monotonous job
0=not at all
1=monotonous
Stress
0=stressful
1=not stressful
Number of medical problems
0=none
1=1 or more

Table A5. List of additional variables used with post-treatment model for recurrence.

Time delay
0=13 days or less
1=14 days or more
Social life
0=satisfied
1=not satisfied
Oswestry
0=low disability
1=high disability

APPENDIX

APPENDIX I. Psychiatric Symptom Index.

13

NO: _____

NOM : _____

PRENOM : _____

STADE : _____

8)

16 Les questions qui suivent portent sur divers aspects de votre santé.
La façon dont vous vous êtes senti(e) durant la dernière semaine a pu être différente de celle dont vous vous êtes senti(e) l'année passée.
Pouvez-vous nous dire avec quelle fréquence AU COURS DE LA DERNIERE SEMAINE:

ENCERCLER VOTRE REPONSE

	jamais	de temps en temps	assez souvent	très souvent
16.1 Vous êtes-vous senti(e) ralenti(e) ou avez-vous manqué d'énergie?	1	2	3	4
16.2 Avez-vous eu des étourdissements ou l'impression que vous alliez vous évanouir?	1	2	3	4
16.3 Avez-vous senti que votre coeur battait vite ou fort sans avoir fait d'effort physique?	1	2	3	4
16.4 Avez-vous eu des difficultés à vous concentrer?	1	2	3	4
16.5 Vous êtes-vous senti(e) désespéré(e) en pensant à l'avenir?	1	2	3	4

	ENCERCLER VOTRE REPONSE			
	jamais	de temps en temps	assez souvent	très souvent
16.6 Vous êtes-vous senti(e) seul(e)?	1	2	3	4
16.7 Avez-vous eu des blancs de mémoire?	1	2	3	4
16.8 Avez-vous perdu intérêt ou plaisir dans votre vie sexuelle?	1	2	3	4
16.9 Avez-vous transpiré sans avoir travaillé fort ou avoir eu trop chaud?	1	2	3	4
16.10 Vous êtes-vous senti(e) découragé(e) ou avez-vous eu les "bleus"?	1	2	3	4
16.11 Vous êtes-vous senti(e) tendu ou sous pression?	1	2	3	4
16.12 Vous êtes-vous laissé(e) emporter contre quelqu'un ou quelque chose?	1	2	3	4
16.13 Avez-vous eu l'estomac dérangé ou senti des brûlements d'estomac?	1	2	3	4
16.14 Vous êtes-vous senti(e) ennuyé(e) ou peu intéressé(e) par les choses?	1	2	3	4
16.15 Avez-vous remarqué que vos mains tremblaient?	1	2	3	4
16.16 Avez-vous ressenti des peurs ou des craintes?	1	2	3	4
16.17 Avez-vous eu des difficultés à vous souvenir des choses?	1	2	3	4
16.18 Avez-vous eu des difficultés à vous endormir ou à rester endormi(e)?	1	2	3	4
16.19 Avez-vous pleuré facilement ou vous êtes-vous senti(e) sur le point de pleurer?	1	2	3	4

	ENCERCLER VOTRE REPONSE			
	jamais	de temps en temps	assez souvent	très souvent
16.20 Avez-vous eu de la difficulté à reprendre votre souffle?	1	2	3	4
16.21 Avez-vous manqué d'appétit?	1	2	3	4
16.22 Avez-vous dû éviter des endroits, des activités ou des choses parce que cela vous faisait peur?	1	2	3	4
16.23 Vous êtes-vous senti(e) agité(e) ou nerveux(se) intérieurement?	1	2	3	4
16.24 Avez-vous pensé que vous pourriez mettre fin à vos jours?	1	2	3	4
16.25 Vous êtes vous senti(e) négatif(ve) envers les autres?	1	2	3	4
16.26 Vous êtes-vous senti(e) facilement contrarié(e) ou irrité(e)?	1	2	3	4
16.27 Vous êtes-vous faché(e) pour des choses sans importance?	1	2	3	4
16.28 Avez-vous eu des difficultés à prendre des décisions?	1	2	3	4
16.29 Avez-vous eu des tensions ou des raideurs dans votre cou, votre dos ou d'autres muscles?	1	2	3	4

17 Maintenant, pouvez-vous nous dire comment vous vous êtes senti(e) en général au cours des douze (12) derniers mois?

ENCERCLER VOTRE REPONSE

	presque jamais	moins de la moitié du temps	plus de la moitié du temps	la plupart du temps
17.1 Je me suis senti(e) plein(e) d'entrain et d'énergie	1	2	3	4
17.2 Je n'ai pas eu de problème avec ma santé	1	2	3	4
17.3 Il m'a été facile de maîtriser mes émotions (de ne pas me sentir "pogné(e)" en dedans)	1	2	3	4
17.4 La vie a été plutôt ennuyeuse	1	2	3	4
17.5 Mon moral était plutôt bas	1	2	3	4
17.6 J'étais tendu(e), sur les nerfs	1	2	3	4
17.7 Je me suis senti(e) de bonne humeur et le coeur léger	1	2	3	4
17.8 Je me suis senti(e) passablement seul (e)	1	2	3	4
17.9 J'ai dû faire des efforts pour contrôler mes émotions (pour ne pas me sentir "pogné(e)" en-dedans)	1	2	3	4
17.10 Il s'est passé des tas de choses intéressaantes	1	2	3	4
17.11 Je me suis fait du souci à propos de ma santé	1	2	3	4

	presque jamais	moins de la moitié du-temps	plus de la-moitié du-temps	la plupart du temps
17.12 Je me suis senti(e) épuisé(e),usé(e), à bout	1	2	3	4
17.13 Je me suis senti(e) suffisamment détendu(e)	1	2	3	4
17.14 je me suis senti(e) aimé(e) et apprécié (e)	1	2	3	4

APPENDIX III. Oswestry Disability Questionnaire.

MAL DE DOS

ECHELLE SUBJECTIVE D'INCAPACITE Pointage:.....

Stade:.....

No:..... Nom:.....Prénom:.....

Note: Ce questionnaire a pour but d'informer votre médecin sur l'impact qu'a votre mal dos sur votre vie de tous les jours. Vous êtes prié(e) de répondre à chaque section, et faire une croix dans seulement une case par section. Il se peut que vous ayez l'impressi que deux énoncées s'appliquent à votre cas, mais nous vous prions de ne marquer que la ca qui répond le mieux à votre cas, durant les dernières 24 heures.

Section 1 - Intensité de la douleur
[] Ma douleur n'est pas assez sévère pour que je prenne des analgésiques.
[] Ma douleur est sévère, mais je réussis à me passer d'analgésiques.
[] Ma douleur est totalement soulagée par les analgésiques.
[] Ma douleur est modérément soulagée par les analgésiques.
[] Ma douleur n'est que très peu soulagée par les analgésiques.
[] Les analgésiques n'ont aucun effet sur ma douleur, de sorte que je n'en prends pas.

Section 2 - Soins personnels (se laver, s'habiller etc)
[] Je peux m'occuper de mes soins personnels normalement, sans que cela ne cause de do leur additionnelle.
[] Je peux m'occuper de mes soins personnels normalement, mais cela me cause des douleu additionnelles.
[] Mes soins personnels augmentent ma douleur, de sorte que je dois les faire lentement avec précaution.
[] J'ai besoin d'un peu d'aide pour mes soins personnels, mais je fais la plupart des ch ses moi-même.
[] J'ai besoin d'aide chaque jour pour la plupart de mes soins personnels.
[] Je ne m'habille pas, je me lave avec difficulté et je reste au lit.

Section 3 - Manutention
[] Je peux manipuler des objets lourds sans douleur additionnelle.
[] Je peux manipuler des objets lourds, mais cela me cause de la douleur.
[] La douleur m'empêche de soulever des objets lourds à partir du sol, mais je peux faire s'ils sont à ma portée. Ex: sur une table.
[] La douleur m'empêche de soulever des objets lourds mais je peux soulever des objets le gers ou de poids moyen s'ils sont à ma portée.
[] Je ne peux manipuler que des objets très légers.
[] Je ne peux manipuler aucun objet.

Section 4 - Marche
[] La douleur ne m'empêche pas de marcher à volonté.
[] La douleur m'empêche de marcher plus qu'un mille.
[] La douleur m'empêche de marcher plus que 1/2 mille.
[] La douleur m'empêche de marcher plus que 1/4 de mille.
[] Je ne peux marcher qu'à l'aide d'une canne ou de béquilles.
[] Je reste au lit la plupart du temps et j'ai de la difficulté à me rendre à la toilette

Section 5 - Station assise
[] Je peux m'asseoir sur n'importe quel fauteuil pour aussi longtemps que je le désire.
[] Ce n'est que dans mon fauteuil favori que je peux m'asseoir aussi longtemps que je désire.
[] La douleur m'empêche de m'asseoir plus qu'une heure à la fois.
[] La douleur m'empêche de m'asseoir plus que 1/2 heure à la fois.
[] La douleur m'empêche de m'asseoir plus que 10 minutes à la fois.
[] La douleur m'empêche complètement de m'asseoir.

Section 6 - Station debout
[] Je peux rester debout aussi longtemps que je veux sans que cela n'augmente ma douleur
[] Je peux rester debout aussi longtemps que je veux, mais cela augmente ma douleur.
[] La douleur m'empêche de rester debout plus qu'une heure à la fois.
[] La douleur m'empêche de rester debout plus que 1/2 heure à la fois.
[] La douleur m'empêche de rester debout plus que 10 minutes à la fois.
[] La douleur m'empêche complètement de rester debout.

Section 7 - Sommeil
[] La douleur ne m'empêche pas de dormir.
[] La douleur me réveille parfois la nuit quand je me retourne, mais je puis me rendormi
[] Je dois prendre des médicaments pour dormir.
[] Je dors moins de 4 heures, à cause des douleurs.
[] Je dors moins de 2 heures, à cause des douleurs.
[] La douleur m'empêche complètement de dormir.

Section 8 - Activités sexuelles [] non applicable.
[] J'ai des activités sexuelles normales et elles n'augmentent pas ma douleur.
[] J'ai des activités sexuelles normales mais elles augmentent ma douleur.
[] J'ai des activités sexuelles presque normales, mais elles me causent beaucoup de do
leur.
[] Mes activités sexuelles sont très réduites à cause de la douleur.
[] Mes activités sexuelles sont presque nulles.
[] Mes activités sexuelles sont nulles.

Section 9 - Activités sociales
[] Mes activités sociales sont normales et n'augmentent pas ma douleur.
[] Mes activités sociales sont normales mais augmentent ma douleur.
[] La douleur n'entrave pas de façon importante mes activités sociales, à l'exception
certaines activités que je dois limiter. Ex: la danse.
[] La douleur a réduit mes activités sociales, et je sors moins souvent.
[] La douleur limite mes activités sociales à celles que je peux avoir à la maison.
[] La douleur empêche toute activité sociale.

Section 10 - Voyages
[] Je peux voyager comme je veux, sans que cela augmente ma douleur.
[] Je peux voyager comme je veux, mais cela augmente ma douleur.
[] La douleur est sévère mais je réussis à faire des trajets de 2 heures.
[] La douleur m'empêche de faire des trajets de plus qu'une heure à la fois.
[] La douleur réduit les trajets que je peux faire à moins de 30 minutes à la fois.
[] La douleur m'empêche de me déplacer autrement que pour aller chez le médecin ou à l'hô
pital.

Commentaires.....

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.....

.....

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APPENDIX IV. Roland-Morris Disability Questionnaire.

ECHELLE DE ROLAND

Numéro: _____

Nom: _____

Prénom: _____

Stade: _____

Pointage: _____

Pour les besoins du présent document, il est entendu que le masculin comprend le féminin.

Quand le dos vous fait mal, vous trouvez peut-être difficile de faire certaines des choses que vous faites normalement.

La liste qui suit regroupe des phrases que les gens disent pour se décrire eux-mêmes quand ils ont mal au dos. Quand vous les lirez, certaines vous frapperont peut-être parce qu'elles vous décrivent tel que vous êtes aujourd'hui même. Au fur et à mesure que vous prenez connaissance de cette liste de phrases, analysez l'état dans lequel vous êtes aujourd'hui. Si vous lisez la phrase qui décrit votre état actuel, cochez-la. Si la phrase ne s'applique pas à vous, laissez un blanc et passez à la suivante. Attention: ne cochez la phrase que si vous êtes certain qu'elle vous décrit tel que vous êtes aujourd'hui.

1. Je reste à la maison la plupart du temps à cause de mon dos. _____
2. Je bouge fréquemment pour essayer de trouver une position confortable pour mon dos. _____
3. Je marche plus lentement que d'habitude à cause de mon dos. _____
4. A cause de mon dos, je ne fais aucun des travaux que j'avais l'habitude de faire dans la maison. _____
5. A cause de mon dos, j'utilise la rampe pour monter les escaliers. _____
6. A cause de mon dos, je m'allonge plus souvent pour me reposer. _____
7. A cause de mon dos, je dois m'agripper à quelque chose pour me lever de mon fauteuil. _____
8. A cause de mon dos, je demande à des gens de faire des choses pour moi. _____
9. Je m'habille plus lentement que d'habitude à cause de mon dos. _____
10. Je peux seulement me tenir debout durant de courte périodes à cause de mon dos. _____

)6b (suite)

11. A cause de mon dos, j'essaie de ne pas me pencher ou de ne pas m'agenouiller. ___

12. Je trouve celà difficile de me lever de ma chaise à cause de mon dos. ___

13. J'ai presque tout le temps mal au dos. ___

14. Il m'est difficile de me retourner dans mon lit à cause de mon dos. ___

15. Je n'ai pas très bon appétit parce que j'ai mal au dos. ___

16. J'ai de la difficulté à mettre mes bas parce que j'ai mal au dos. ___

17. Quand je marche, je peux seulement franchir de courtes distances parce que j'ai mal au dos. ___

18. Je dors moins bien à cause de mon dos. ___

19. Parce que j'ai mal au dos, j'ai besoin d'aide pour m'habiller. ___

20. Je reste assis la plupart du temps à cause de mon dos. ___

21. J'évite les gros travaux dans la maison à cause de mon dos. ___

22. Parce que j'ai mal au dos, je suis plus irritable et de mauvaise humeur que d'habitude. ___

23. A cause de mon dos, je monte les escaliers plus lentement. ___

24. Je reste au lit la plupart du temps à cause de mon dos. ___

APPENDIX V. Visual Analog Scale.

Numéro: _____
Nom : _____
Prénom: _____
Stade: _____
Pointage: _____

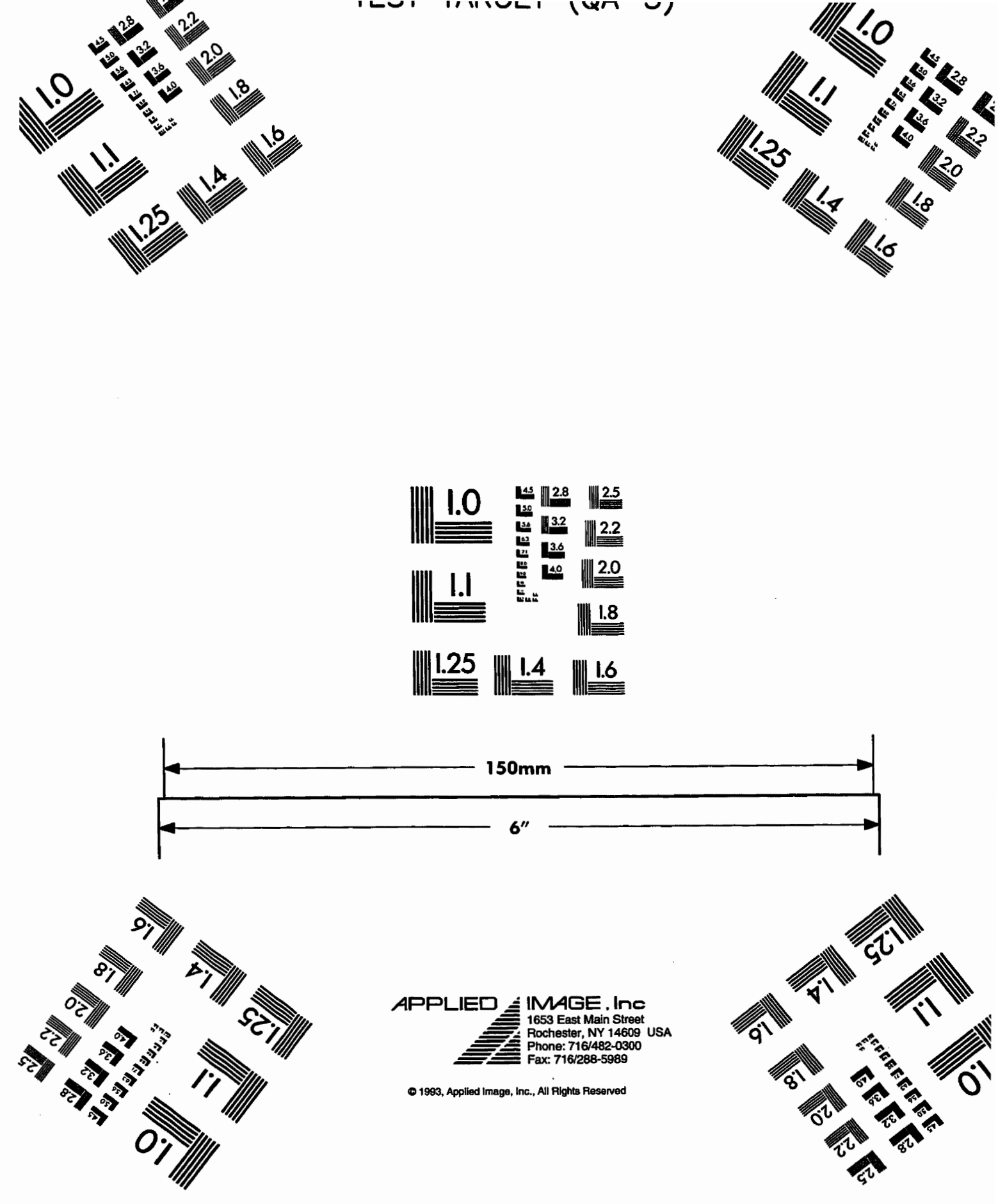
ECHELLE DE LA DOULEUR

Nous aimerions savoir à quel point votre dos vous fait mal en ce moment même. La ligne ci-dessous est une échelle allant de "absolument aucune douleur" à "la pire douleur qu'on puisse imaginer". Choisissez un point sur cette ligne afin d'indiquer l'intensité de votre douleur et marquez ce point à l'aide d'un X : (comme suit: _____X_____)

|—————————————————————————————|

ABSOLUMENT AUCUNE DOULEUR

LA PIRE DOULEUR QU'ON PUISSE IMAGINER



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