Orthopaedic Rehabilitation

Managing Psychosocial Contributors in Low Back Pain Patients—A Randomised Controlled Trial
治療有心理社會促成因素的腰痛患者: 一個隨機對照的研究

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ABSTRACT

Introduction: The efficacy of integrated physiotherapy work rehabilitation program to occupational non-specific low back pain (NSLBP) patients triaged by Orebro Musculoskeletal Pain Questionnaire (OMPQ) for psychosocial risks was investigated.
Methods: 47 subjects were recruited and randomly allocated to either the integrated physiotherapy group or the conventional group. Red flags signs were screened out. The range of the age of the patients was between 18 and 55. They either had history injuries at work or were on sick leave upon recruitment with moderate psychosocial risk.
Results: Statistics was performed on an intention-to-treat analysis. At discharge, the patients of integrated physiotherapy group displayed significant improvement of work recovery expectation, pain self-efficacy, overall subjective progress and satisfaction in comparison with the conventional group ($p < 0.05$). Both groups demonstrated significant improvement of all outcome measures except the recovery expectation showed no difference in the conventional group.
Conclusion: The work related treatment components of integrated physiotherapy group adopted a cognitive behavioral approach may contribute to better improvement.

中文摘要

介紹: 為探討綜合工作復康物理治療方案，對治療透過由厄勒布魯肌肉筋骨痛楚問卷 (Orebro Musculoskeletal Pain Questionnaire)分類為附有心理社會促成因素的職業非特定性下腰痛患者之成效。
方法: 共邀請了47名患者作研究，隨機分配接受綜合工作復康物理治療或常規物理治療。有 "紅旗" 徵兆風險的疾病已被排除，患者的年齡介乎18至55歲，他們不是有工傷病史的就是正在放病假及附有中度的心理社會促成因素。
結果: 統計採用了治療意向分析法 (intention to treat)。治療後, 綜合工作復康物理治療小組的患者在康復期望、疼痛的自我效能感、整體進展及滿意程度，與常規物理治療小組比較，都有顯著的改善(p < 0.05)。另外，除了常規物理治療小組對康復期望沒有顯著的差別外，兩組在其他治療成效的測量上同樣展示了明顯的改善。
結論: 綜合工作復康物理治療方案，是以行為認知方式並加入和工作相關的治療內容，這可能是其獲得更好改善的原因。

Introduction

Work absenteeism due to nonspecific low back pain (NSLBP) annually costs millions of dollars worldwide because of decreased productivity, treatment expenditure, and ongoing compensation payments.[1] In 2007 in Hong Kong, more than 1 million days were lost.[2] According to the Labour Department, the cost of compensation in 2010 was 638 million dollars by the end of 2011. This cost has been escalating, despite an overall reduction in the number of reported work injuries. Work injuries adversely affect

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productivity, increase employees' compensation insurance premiums, and burden the medical and social security systems.[3] However, a large portion of resources is consumed by a small number of patients experiencing ongoing disability because of occupational NSLBP.[4] There is a growing consensus that psychosocial factors such as catastrophic thoughts, fear-avoidance behaviour, expectation of treatment and recovery, and depression contribute significantly to chronic disability.[5] The early identification of patients at high risk of developing chronicity and early intervention have become the focus of recent research on work rehabilitation.[6]

The medical literature shows that purely medical interventions have conflicting effects on work-related outcomes.[7] A treatment programme needs to take into account a patient's physical and psychosocial aspects, and needs to have an explicit return-to-work focus.[8] There are limited studies available in southern Chinese that specifically address the efficacy of rehabilitation on occupational NSLBP patients who exhibit moderate psychosocial risks. In recent years, the Orebro Musculoskeletal Pain Questionnaire (OMPQ) has been widely studied as a screening tool to identify patients at risk of developing chronic disability from low back pain.[9] A recent cohort study shows that this instrument can effectively predict the one-year sick leave and return-to-work outcomes of patients with acute and subacute low back pain.[10] The aim of the current study was to investigate the efficacy of an integrated work rehabilitation programme that incorporated physical training, a cognitive behavioural approach, and interventions that were tailored to a patient's job needs. This was offered to a group of occupational NSLBP patients whose psychosocial risks were triaged by the OMPQ. This questionnaire is specifically designed for patients with musculoskeletal pain. Patients with moderate or high psychosocial risk factors potentially may develop chronic disability. This paper is an interim report that evaluates the psychosocial and clinical outcomes of patients who completed an integrated work rehabilitation programme.

Methods

Study design

This was a prospective double-blind, randomised, controlled trial (RCT) that compared the efficacy of an integrated work rehabilitation programme against the efficacy of conventional physiotherapy in patients with a history of low back pain of less than 12 weeks duration. Figure 1 outlines the RCT study flowchart.

Recruitment of the study participants

From August 2010 to October 2011, study participants were recruited from the physiotherapy department of Alice Ho Mui Ling
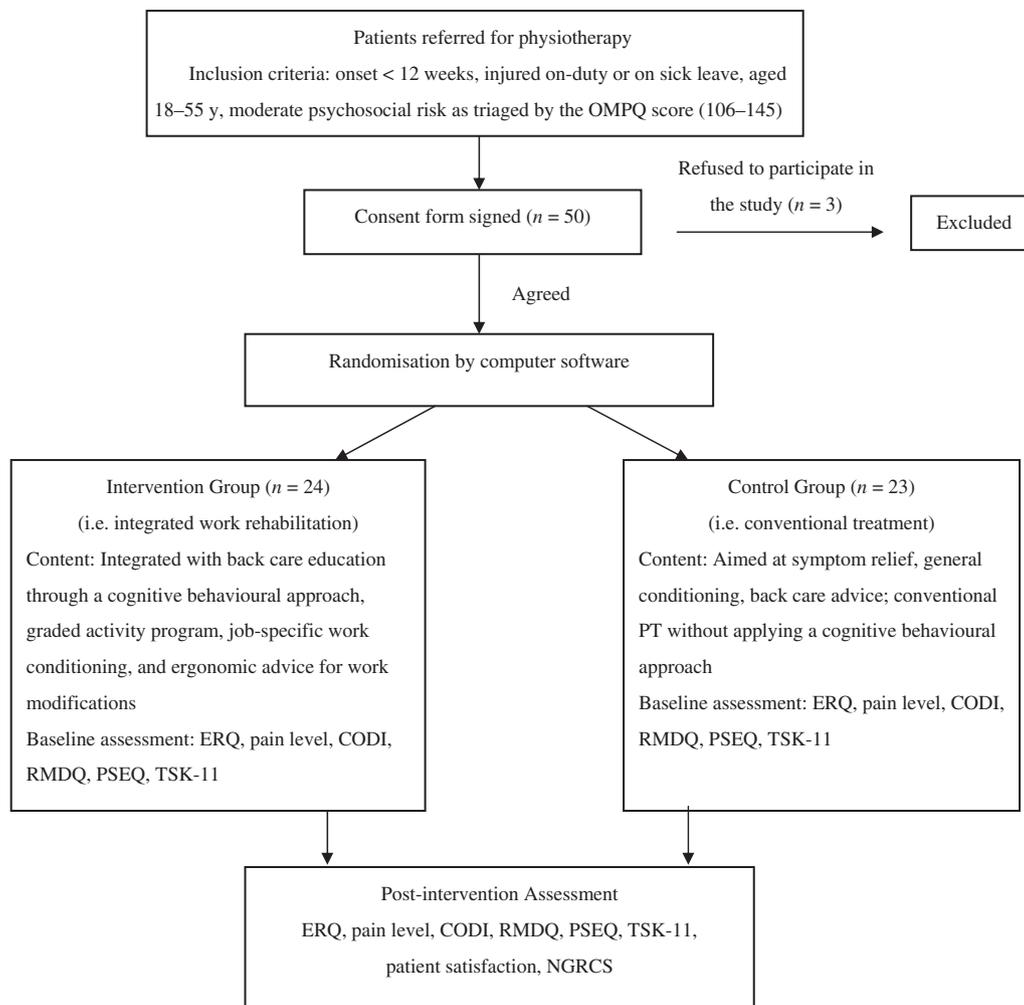
Figure 1. Flowchart of the randomised controlled trial. CODI = Chinese Oswestry Disability Index; ERQ = Work-related Recovery Expectations Questionnaire; NGRCS = numeric global rate of change score; OMPQ = Orebro Musculoskeletal Pain Questionnaire; PSEQ = Pain Self-efficacy Questionnaire; PT = physiotherapy; RMDQ = Roland Morris Disability Questionnaire; TSK-11 = Tampa Scale for Kinesiophobia.

Nethersole Hospital (AHNH). All patients were 18—55 years old. On recruitment, they had been injured at work or were on sick leave because of back pain. Table 1 lists details of the inclusion and exclusion criteria. Designated physiotherapists or surgeons screened the study participants to rule out the 'red flags' listed in Table 1. The patients who had moderate psychosocial risk factors and an OMPQ score of 106—145 points were invited to participate in the study. After patients gave consent to participate in the study, a computer programme then randomly assigned them to either the integrated work rehabilitation group or the conventional treatment group. The patients did not know which group they were assigned to.

Interventions

The physiotherapists in this study had postgraduate qualifications and received relevant training on the cognitive behavioural approach. The patients in both groups received a course of individual treatment lasting 3 months maximally. The treatment in the conventional treatment group was broadly based on the patients' symptoms at presentation and on their response to treatment. It was normally a combination of treatment, including electrophysical agents for pain relief such as interferential therapy, transcutaneous electrical nerve stimulation, lumbar traction, manual therapy, and exercise therapy.

A cognitive behavioural approach was adopted for the patients receiving treatment in the integrated work rehabilitation programme. The main focus of the programme was functional improvement. Individualised graded activity programme, pacing techniques, work conditioning, return-to-work goal setting, self-management strategies, job analysis, and ergonomic advice were taught to the patients with the aim of improving their physical and functional capabilities with proper attention to return to work.

To improve treatment compliance, patients who missed a treatment session would be reminded by a phone call for the subsequent appointment. The patients would be discharged from the programme when they were able to return to work, had

Table 1
Inclusion and exclusion criteria for patients participating in the study

Inclusion criteria
◆ Onset of back pain <12 weeks
◆ Injured on duty or on sick leave due to musculoskeletal back pain
◆ Adult, aged 18—55 y
◆ Moderate psychosocial risk factors (indicated by an Orebro Musculoskeletal Pain Questionnaire score of 106—145 points)
Exclusion criteria
◆ Sick leave of more than 7 days because of low back pain in the past 12 months
◆ Musculoskeletal problems led to seeking medical consultation in the past 12 months
◆ Previous back surgery in the past 12 months
◆ Radiculopathy with nerve root compromise (with 2 or more of the following signs: weakness with power of less than grade 3; reflex changes; associated sensation loss)
◆ Presence of specific diagnoses such as MRI-verified disc herniation; spondylolisthesis; spinal stenosis (Pavlov's ratio less than 0.8); and inflammatory diseases
◆ Spinal instability exceeding 4 mm on flexion/extension radiographs
◆ Confirmed or suspected serious spinal abnormality (e.g. tumour, infection, vertebral fracture, or cauda equina syndrome)
◆ Pregnancy
◆ Medical diagnosis or comorbid health conditions with contraindications to exercise
◆ Defined or pre-existing psychiatric diagnosis
◆ Drug abuse
◆ Illiteracy
◆ Body mass index of 30 kg/m^2 or greater

MRI = magnetic resonance imaging.

a subjective improvement of 70% or greater, or their condition reached a plateau.

Outcomes

Demographic data such as gender, age, level of education, employment status, number of days off before the first treatment, height, weight, and body mass index were collected. A research assistant, who served as an independent assessor, assessed the outcomes at preintervention and postintervention. Neither the patients nor the assessor knew which group the patients belonged to. Patients gave their subjective responses by filling out the questionnaires themselves. The research assistant then checked the questionnaires for missing items. The psychosocial outcome and recovery expectation were the primary outcome indicators, which were measured by the work-related recovery expectations questionnaire (ERQ) that Gross and coworkers developed.[11] The ERQ showed adequate internal consistency and construct validity, which correlated moderately with valid functional measures.[12] The ERQ included a five-point Likert scale, which ranged from 'strongly disagree' to 'strongly agree', on which patients rated their level of agreement regarding their beliefs on work related recovery expectation.

The patients were also given a battery of Chinese-validated questionnaires that measured their self-efficacy (assessed by the Pain Self-efficacy Questionnaire [PSEQ]),[13] fear-avoidance (assessed by the Tampa Scale for Kinesiophobia [TSK-11]),[14] and function (assessed by the Chinese version of the Oswestry Disability Index [CODI][15] and the Roland Morris Disability Questionnaire [RMDQ]).[16] Other clinical outcomes were also collected and included the number of treatment sessions, a patient's pain level (assessed by the Numeric Pain Rating Scale [NPRS]),[17] subjective overall improvement (as indicated by the numeric global rate of change score [NGRCS]),[18] and a patient's overall satisfaction.

Data analysis

SPSS software (IBM Statistical Product and Service Solutions version 17.0, IBM Corporation, New York, United States) was used for data analysis. The significant level was set at p less than 0.05. The nonparametric Mann-Whitney U test was used to compare continuous variables between groups; the Wilcoxon signed rank test was used to compare the pretreatment and posttreatment effects within each treatment group; and the Chi-square test was performed for categorical variables. The measurements of the outcomes were analysed in accordance with the intention-to-treat principle.

Ethical approval

The ethics review board of the joint New Territories East Cluster/Chinese University of Hong Kong (NTEC/CUHK) Ethics Committee provided ethical approval of the study.

Results

Demographic profiles

Forty-seven patients were recruited, and 24 patients were allocated to the work rehabilitation group and 23 patients were allocated to the conventional treatment group (Figure 1). Table 2 outlines the demographic profiles of the patients in both groups. There was no statistically significant difference between the two groups. The average duration of low back pain—indicated by the mean (standard deviation)—was 2.81 (2.93) weeks in the work

Table 2
Baseline characteristics of the patients

	Work rehabilitation group ($n = 24$)	Conventional treatment group ($n = 23$)	p^*
Gender			
Male, n (%)	11 (45.8%)	13 (56.5%)	0.464
Female, n (%)	13 (54.2%)	10 (43.5%)	
Age (y), mean (SD)	38.3 (11.2)	36.2 (10.5)	0.475
Height (m), mean (SD)	1.64 (0.10)	1.66 (0.11)	0.551
Weight (kg), mean (SD)	62.76 (15.22)	63.43 (9.42)	0.640
Body mass index (kg/m^2), mean (SD)	23.18 (3.23)	23.13 (3.64)	0.758
Onset duration prior treatment (wk), mean (SD)	2.81 (2.93)	3.76 (2.93)	0.059
Employment status			
Permanent, n (%)	23 (95.8%)	20 (87%)	0.276
Part-time, n (%)	1 (4.2%)	3 (13%)	
Education level			
Primary, n (%)	1 (4.2%)	2 (8.7%)	0.45
Secondary, n (%)	19 (79.2%)	16 (69.6%)	
Tertiary, n (%)	4 (16.7%)	5 (21.7%)	
Still on sick leave upon first physiotherapy session			
Yes, n (%)	18 (75%)	15 (65.2%)	0.464
No, n (%)	6 (25%)	8 (34.8%)	
Injury at work			
Yes, n (%)	14 (58.3%)	17 (73.9%)	0.26
No, n (%)	10 (41.7%)	6 (26.1%)	
OMPQ, mean score (SD)	116.96 (7.92)	122.57 (11.56)	0.088
Pain			
NPRS, mean score (SD) (range $= 0−10$)	5.57 (1.95)	6.38 (1.43)	0.264
Function			
RMDQ, mean score (SD) (range $= 0−24$)	13.13 (4.00)	13.48 (4.86)	0.781
CODI, mean score (SD) (range $= 0−100$)	44.01 (13.01)	42.28 (12.19)	0.662
Self-efficacy			
PSEQ, mean score (SD) (range $= 0−60$)	34.63 (13.32)	31.00 (11.65)	0.183
Fear-avoidance			
TSK-11, mean score (SD) (range $= 11−44$)	32.25 (5.08)	34.48 (3.17)	0.155
Psychosocial			
ERQ, mean score (SD) (range $= 0−5$)	2.95 (0.83)	3.11 (7.66)	0.415

CODI = Chinese Oswestry Disability Index; ERQ = Work-related Recovery Expectations Questionnaire; NPRS = Numeric Pain Rating Scale; OMPQ = Orebro Musculoskeletal Pain Questionnaire; PSEQ = Pain Self-efficacy Questionnaire; RMDQ = Roland Morris Disability Questionnaire; SD = standard deviation; TSK-11 = Tampa Scale for Kinesiophobia.

* Mann-Whitney U test was performed for continuous variables with the Chi-square test for categorical variables. At the education level, the primary and tertiary subgroups were collapsed together because of the small cell numbers.

rehabilitation group and 3.76 (2.93) weeks in the conventional treatment group. At the first physiotherapy consultation, 75% of the patients in the work rehabilitation group were still on sick leave, compared to 65.2% of the participants in the conventional treatment group. The injury occurred at work in 58.3% of the patients in the work rehabilitation group and in 73.9% of the patients in the conventional treatment group. However, these figures were not statistically significant.

Baseline characteristics

None of the baseline clinical variables between the two groups showed a statistically significant difference (Table 2). Both groups exhibited moderate psychosocial risks: the OMPQ score was 116.96 (7.92) in the work rehabilitation group and 122.57 (11.56) in the conventional treatment group. Both groups had comparable mean

pain levels (5.57 $\pm$ 1.95 in the work rehabilitation group vs. 6.38 $\pm$ 1.43 in the conventional treatment group). At baseline, all other variables (as assessed by the ERQ, TSK-11, and PSEQ) and the patients functional status (as assessed by the RMDQ and CODI) did not differ significantly.

Outcomes at discharge

The outcome data were collected when the patients were discharged from physiotherapy (Figure 1). The number of treatment sessions were 10.95 (7.68) sessions for the work rehabilitation group and 9.61 (7.45) sessions for the conventional treatment group. The physiotherapy sessions were similar in both groups; however, the average direct patient contact time was approximately 30 minutes per session in the work rehabilitation group, compared to an average of 15 minutes per session in the conventional treatment group.

The integrated work rehabilitation group showed significant improvement on the ERQ ($p = 0.002$) and PSEQ ($p = 0.035$) (Table 3). Compared to the conventional physiotherapy group, the integrated work rehabilitation group also showed significant improvement in regard to their overall improvement in the numeric global rate of change score (NGRCS) ($p = 0.044$) and in patient satisfaction ($p = 0.001$). The outcomes in pain level and the functional aspects (as assessed by the RMDQ and CODI) displayed more favourable trends in the integrated work rehabilitation group, compared to the outcome in the conventional treatment group (Table 3). However, the results were not statistically significant.

Within-group analysis

A comparison of the pretreatment and posttreatment data in each group showed a significant improvement in all variables ($p < 0.01$, using the Wilcoxon signed rank test), with the

Table 3
Outcome results at discharge

	Work rehabilitation group ($n = 24$)	Conventional treatment group ($n = 23$)	p
Primary outcome			
ERQ, mean score (SD) (range $= 0−5$)	2.01 (0.88)	2.88 (0.77)	0.002*
Other clinical outcomes			
PT sessions, n (SD)	10.95 (7.68)	9.61 (7.45)	0.649
NGRCS, mean score (SD) (range $= −10$ to $+10$)	7.71 (1.81)	6.24 (2.88)	0.044*
Pain level†, mean score (SD) (range $= 0−10$)	2.42 (1.95)	3.14 (2.37)	0.267
RMDQ†, mean score (SD) (range $= 0−24$)	5.83 (4.65)	6.59 (5.42)	0.613
CODI†, mean score (SD) (range $= 0−100$)	18.9 (14.02)	22.55 (14.33)	0.394
Patients' satisfaction, mean score (SD) (range $= −10$ to $+10$)	8.64 (3.15)	4.14 (3.21)	0.001*
PSEQ, mean score (SD) (range $= 0−60$)	48.21 (9.34)	41.95 (10.16)	0.035*
TSK-11†, mean score (SD) (range $= 11−44$)	26.79 (7.99)	29.36 (6.60)	0.205

CODI = Chinese Oswestry Disability Index; ERQ = Work-related Recovery Expectations Questionnaire; NGRCS = numeric global rate of change score; PSEQ = Pain Self-efficacy Questionnaire; PT = physiotherapy; RMDQ = Roland Morris Disability Questionnaire; TSK-11 = Tampa Scale for Kinesiophobia.

* Indicates a significant value, which was set at $p = 0.05$. The Mann-Whitney U test was performed.

† The higher the score, the more disabled are the patients.

exception of the ERQ in the conventional treatment group ($p = 0.468$). This indicates that the conventional and integrated work rehabilitation groups both showed significant improvement after completing their respective programmes, but the conventional treatment did not produce a significant change for the psychosocial risk profile.

Discussion

The results of the study showed that the integrated physiotherapy work rehabilitation programme was effective in treating patients with subacute NSLBP and moderate psychosocial risk factors. Work-related injury is a potential risk factor in rehabilitation. Therefore, the target study participants were patients with low back pain who had acquired their injury at work or who were on sick leave. Low back pain that is severe enough to require a prolonged sick leave will also be a potential risk factor in rehabilitation. Patients with nonchronic NSLBP were chosen for this study because the subacute phase is often the most critical phase for implementing an integrated multidimensional intervention programme.[6] To the best of our knowledge, this is the first randomised, controlled study in the Chinese population that evaluated the effectiveness of a physiotherapy work rehabilitation programme in improving clinical outcomes in workers with moderate psychosocial risk factors (which were demarcated by OMPQ scores). No existing intervention using specific exercises that have an explicit relation to work has focused on a patient's return to work.[8]

The ERQ is a useful indicator for managing patients with nonchronic NSLBP and it shows a strong predictive ability for return-to-work outcomes.[6] Studies[19,20] show that, for every one-point worsening of the recovery expectation score, workers are approximately 26% (95% CI is 8-40%) less likely to experience a suspension of time-loss benefits. A positive patient recovery expectation was associated with 37% faster suspension of time-loss benefits,[19] which was a surrogate indicator of return-to-work. One study[20] concurred with other studies that indicated that the recovery expectation of patients with subacute low back pain also predicted their 3-month return-to-work rate. A significant improvement after completing an integrated physiotherapy programme could shorten the length of work disability. The treatment components emphasised work analysis, return-to-work plans, and work-related goals setting delivered through a cognitive behavioural approach. These components may have contributed to the improvement in ERQ scores in our patients. Case formulation was also included in the cognitive behavioural approach physiotherapy programme. This may help improve patients' pain self-efficacy and improve their engagement in a physiotherapy exercise programme. Self-efficacy in patients with pain significantly influences the utilisation rate of pain-coping strategies.[13] However, kinesiophobia (as assessed by the TSK-11) did not show a significant difference in the work rehabilitation group. At the outset, the initial TSK-11 scores in both groups were very high (more than 30 out of 44 points). An exaggerated level of pain-related fear during the acute stage or the persistence of fear-avoidance behaviours beyond the acute phase resulted in a poor prognosis.[6,21] The decrease in the TSK-11 score in the integrated work treatment group was not significantly greater than its decrease in the conventional treatment group. It may be that the treatment insufficiently targeted fear-avoidance beliefs in the work rehabilitation group. Our results showed that the ERQ, PSEQ, and TSK-11 scores were not linear or at a similar magnitude. This could be accounted for by the fact that the questionnaires were exploring different constructs in work disability for patients with NSLBP. Our experiences with patients having moderate psychosocial risks concurred with the results of general updated studies,[21,23]

despite conflicting evidence indicating that kinesiophobia and fear-avoidance beliefs are predictors of subsequent work disability.[6,22] High pain level, disability, low recovery expectation, and fear-avoidance beliefs are risk factors for developing chronic work disability. This study demonstrated that early interventions of the physical and psychosocial aspects of NSLBP could impart positive outcomes.

Clinical significance and value

Physiotherapy management in Hong Kong for patients with NSLBP currently places considerable effort on symptom relief and restoration of general function. To facilitate a patient's return to work, effective management of work-related low back pain needs to focus on disability management that entails psychosocial components. This prospective randomised, controlled trial confirmed the effectiveness of a 'new' integrated physiotherapy work rehabilitation programme by using an intention-to-treat principle. The programme incorporated updated concepts of psychosocial management and work-targeted interventions. Effective rehabilitation was developed to enable workers with specific job demands to receive appropriate physical training, psychosocial training, and ergonomic modifications. Previous studies have primarily focused on job demands, but not on workers' psychosocial profiles. Our approach may not be limited to patients with NSLBP; it can also be applied to other musculoskeletal conditions in other Asian populations having moderate psychosocial risks.

Limitations

The current study was a pilot study on an integrated physiotherapy work rehabilitation programme and the sample size was small. Incorporating the physical demands, the nature of the job, medication utilisation, and other medical expenses will provide a wider perspective in managing the psychosocial risks of these patients. In the future, medical utilisation and longterm outcomes (in particular, the length of time before the return to work or sick leave data) should be performed. Alleged injury-on-duty cases are different from non–injury-on-duty cases that require sick leave. Therefore, the results of our study need to be interpreted with caution. Other studies may be required.

Conclusion

The integrated work rehabilitation group displayed significant improvement, compared to the conventional treatment, in regard to recovery expectation, pain self-efficacy, overall subjective improvement, and patient satisfaction. Both groups nevertheless showed a significant improvement preintervention and postintervention. However, the conventional treatment group had an insignificant change in recovery expectation before and after treatment. Treatment components emphasizing work analysis, return-to-work plans, and work goals setting delivered in a cognitive behavioural approach may have contributed to better improvement in the integrated work rehabilitation group.

References

1. Tveito TH, Hysing M, Eriksen HR. Low back pain interventions at the workplace: a systematic literature review. *Occup Med (Lond)* 2004;**54**:3–13.
2. Labour Department. c2012. Labour department annual report [Internet]. Available from: http://www.labour.gov.hk/tc/public/AnnualReport.htm. [updated December 28, 2011; cited April 5, 2012].
3. Lai HS, Chan CC. Implementing a pilot work injury management program in Hong Kong. *J Occup Rehab* 2007;**17**:712–26.
4. Williams RM, Westmorland MG, Lin CA, et al. Effectiveness of workplace rehabilitation interventions in the treatment of work-related low back pain: a systematic review. *Disabil Rehabil* 2007;**29**:607–24.
5. Swinkels-Meewisse IE, Roelofs J, Oostendorp RA, et al. Acute low back pain: pain-related fear and pain catastrophizing influence physical performance and perceived disability. *Pain* 2006;**120**:36–43.
6. Iles RA, Davidson M, Taylor NF. Psychosocial predictors of failure to return to work in nonchronic nonspecific low back pain: a systematic review. *Occup Environ Med* 2008;**65**:507–17.
7. Nieuwenhuijsen K, Bültmann U, Neumeyer-Gromen A, et al. Interventions to improve occupational health in depressed people. *Cochrane Database System Reviews* 2008. Issue 2. Art. No.: CD006237.
8. Schaafsma F, Schonstein E, Whelan KM, et al. Physical conditioning programs for improving work outcomes in workers with back pain. *Cochrane Database System Reviews* 2010. Issue 1. Art. No.: CD001822.
9. Hockings RL, McAuley JH, Maher CG. A systematic review of the predictive ability of the Orebro Musculoskeletal Pain Questionnaire. *Spine* 2008;**33**:494–500.
10. Law RKY, Lee EWC, Law SW, et al. The predictive validity of OMPQ on the rehabilitation outcomes for patients with acute and subacute non-specific LBP in a Chinese population. *J Occup Rehabil* 2012, http://dx.doi.org/10.1007/s10926-012-9404-y.
11. Gross DP, Battie MC. Work-related recovery expectations and the prognosis of chronic low back pain within a workers' compensation setting. *J Occup Environ Med* 2005;**47**:428–33.
12. Gross DP, Battie MC. Factors influencing results of functional capacity evaluations in workers' compensation claimants with low back pain. *Phys Ther* 2005;**85**:315–22.
13. Lim HS, Chen PP, Wong TC, et al. Validation of the Chinese version of pain self-efficacy questionnaire. *Anesth Analg* 2007;**104**:918–23.
14. Wong WS, Kwok HY, Luk KDK, et al. Fear of movement/(re)injury in Chinese chronic pain patients: factorial validity of the Chinese version of the Tampa Scale for Kinesiophobia. *J Rehabil Med* 2010;**42**:620–9.
15. Chow JH, Chan CC. Validation of the Chinese version of the Oswestry Disability Index. *Work* 2005;**25**:307–14.
16. Tsang RCC. Measurement properties of the Hong Kong Chinese version of the Roland-Morris disability questionnaire. *Hong Kong Physiother J* 2004;**22**:40–9.
17. Stratford PW, Spadoni G. The reliability, consistency, and clinical application of a numeric pain rating scale. *Physiother Can* 2001;**53**:88–91.
18. Kamper SJ, Maher CG, Mackay G. Global rating of change scales: a review of strengths and weaknesses and considerations for design. *J Manual Manipulative Ther* 2009;**17**:163–70.
19. Cole DC, Mondloch MV, Hogg-Johnson S. Listening to injured workers: how recovery expectations predict outcomes – a prospective study. *CMAJ* 2002;**166**:749–54.
20. Schultz IZ, Crook JM, Berkowitz J, et al. Biopsychosocial multivariate predictive model of occupational low back disability. *Spine* 2002;**27**:2720–5.
21. Rainville J, Smeets RJ, Bendix T, et al. Fear-avoidance beliefs and pain avoidance in low back pain—translating research into clinical practice. *Spine J* 2011;**11**:895–903.
22. Grotle M, Vollestad NK, Veierod MB, et al. Fear-avoidance beliefs and distress in relation to disability in acute and chronic low back pain. *Pain* 2004;**112**:343–52.
23. Turner JA, Franklin G, Fulton-Kehoe D, et al. Worker recovery expectations and fear-avoidance predict work disability in a population-based workers' compensation back pain sample. *Spine* 2006;**31**:682–9.