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Secondary Prevention of Work Disability: Community-Based Psychosocial Intervention for Musculoskeletal Disorders

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Introduction*: One objective of the present research was to examine the degree to which psychological risk factors could be reduced through participation in a community-based psychosocial intervention for work-related musculoskeletal disorders. A second objective was to examine whether psychosocial risk reduction had an effect on the probability of return to work.* Methods*: Participants were 215 Workers Compensation Board claimants with work-related musculoskeletal disorders who had been absent from work for an average of approximately 7 months (M = 28.8 weeks, range = 4–100 weeks) and were referred to a community-based multidisciplinary secondary prevention program in Nova Scotia, Canada.* Results*: In the current sample, 63.7% of participants returned to work within 4 weeks of treatment termination. The percentage reductions in targeted risk factors from pretreatment to posttreatment were as follows: catastrophizing (32%), depression (26%), fear of movement/re-injury (11%), and perceived disability (26%). Logistic regression indicated that elevated pretreatment scores on fear of movement and re-injury (OR = 0.58, 95% CI = 0.35–0.95) and pain severity (OR = 0.64, 95% CI = 0.43–0.96) were associated with a lower probability of return to work. A second logistic regression addressing the relation between risk factor reduction and return to work revealed that only reductions in pain catastrophizing (OR = 0.17, 95% CI = 0.07–0.46) were significant predictors of return to work.* Conclusions*: The results of the present study provide further evidence that risk factor reduction can impact positively on short term return to work outcomes.* Significance*: Outcomes of rehabilitation programs for work disability might be improved by incorporating interventions that specifically target catastrophic*

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thinking. Community-based models of psychosocial intervention might represent a viable approach to the management of work disability associated with musculoskeletal disorders.

KEY WORDS: psychosocial risk factors; occupational disability; secondary prevention; catastrophizing; rehabilitation; work-related musculoskeletal disorders; return to work.

INTRODUCTION

Recent research has pointed to the important role of psychosocial factors as determinants of disability associated with work-related musculoskeletal disorders (WRMD) (1–3). In response to this research, there has been a call for the development of intervention programs that specifically target psychological risk factors for prolonged work disability (3–6). The present research examined whether psychosocial risk factors for work disability could be reduced through participation in a community-based intervention targeted at these psychosocial risk-factors. The present research also examined the degree to which treatment-related reductions in psychosocial risk factors impacted on the probability of return to work.

Work Injury and Pain-Related Disability

In Canada, provincial workers' compensation expenditures on wage loss benefits and health care services for occupational injury are in excess of 6 billion dollars annually (7). WRMDs involving the spine represent the single largest category of injury for which time loss claims are made. Although the majority of individuals who submit time loss claims for WRMDs resume their occupational responsibilities within weeks, a significant proportion of individuals remain permanently occupationally disabled (8,9). Individuals who remain work disabled at 3 months postinjury have a high likelihood of following a chronic course of work disability (10,11). It has been estimated that although only 10–15% cases will follow a trajectory of chronic work-disability, these cases will account for approximately 70% of health care and indemnity costs associated with work-related disorders (9,11). Considerable research has been devoted to discerning the physical and psychosocial variables that distinguish between individuals who return to work and those who remain disabled following occupational injury (5,10,12,13).

Over the past two decades, research has accumulated indicating that traditional biomedical variables cannot fully account for presenting symptoms of pain and disability associated with WRMDs (1,3,9). This is particularly the case regarding work disability (14,15). Biopsychosocial models have been put forward suggesting that a complete understanding of outcomes associated with WRMDs will require consideration of physical, psychological and social factors (3,4,6).

From a clinical perspective, there has been considerable interest in identifying modifiable risk factors for work disability (6,16,17). The hope has been that the identification of modifiable risk factors for work disability could lay the foundation for risk factor targeted interventions that might prevent the development of chronic disability associated with WRMDs (4,5,6,13).

Psychosocial Risk Factors for Work Disability

Psychosocial variables currently hold a prominent place in current theorizing on processes related to work disability (3,4,6,18). Research to date has identified a number of cognitive and affective factors that are related to prolonged work disability (3,17,18,19,20,21). The following section summarizes research on four 'modifiable' psychosocial variables that have been shown to impact significantly on pain-related disability. These include 1) fear of movement/re-injury), 2) catastrophizing, 3) perceived disability and 4) depression.

Fear of Movement/Re-Injury

Fear of pain has been defined as a "highly specific negative emotional reaction to pain eliciting stimuli involving a high degree of mobilization for escape/avoidance behavior" (18,22). Research continues to accumulate showing that fear of pain and/or fear of movement producing pain is associated with heightened levels of disability (18,23,24). Gheldolf *et al*. (25) found that pain-related fears were significant determinants of the inability to work in individuals with back pain.

Catastrophizing

The term catastrophizing is used to describe a particular response to pain symptoms that includes elements of excessive focus on pain sensations, heightened concern about the threat value of pain sensations, and a sense of helplessness or perceiving oneself as unable to cope with pain symptoms (26). Cross-sectional and prospective studies have shown that high levels of catastrophizing are associated with more severe disability in injured workers and more prolonged work absence (16,17,19,21,27,28).

Perceived Disability

Individuals' beliefs about the severity of their health condition, or about their abilities and limitations play a significant role in the level of presenting disability (29,30). Numerous investigations have shown that individuals' beliefs about the severity of their health condition (12,31,32) or about the extent of their physical limitations (1,33,34) are significant predictors of return-to-work outcomes in a variety of occupational musculokseletal pain problems . Treatment-related reductions in perceived disability have been associated with a higher probability of return to work (33,35).

Depression

Clinical reports have consistently shown that the prevalence of depressive disorders is unusually high in individuals suffering from chronic pain (36–39). Depression has been associated with premature termination of involvement in pain management programs, with greater occupational disability and has been implicated as a factor contributing to the transition from acute to chronic pain (40–43). Treatment-related reductions in depression have been associated with a higher probability of returning to work (35,44).

The Present Research

A psychosocial intervention, the Pain Disability Prevention (PDP) Program, was developed as a community-based standardized 10-week treatment program designed to specifically target psychosocial risk factors for pain-related disability. The risk factors targeted by the PDP Program include fear of movement/re-injury, pain catastrophizing, perceived disability and depression. These psychosocial factors were chosen as targets of the intervention on the basis of emerging research suggesting that these factors account for significant variance in return-to-work outcomes, and are amenable to change through intervention. The PDP Program was implemented in 2001 in Nova Scotia, Canada, as part of a community-based approach to the management of pain-related occupational disability. Psychologists in communities across the province were trained to provide the intervention. By adding a psychosocial risk-factor targeted intervention to existing community-based treatment services such as medical management and physiotherapy, the goal was to establish "virtual" multidisciplinary treatment teams at the level of the community. The primary objective of the intervention program was to facilitate return to work by maximizing activity involvement and reducing psychosocial barriers to rehabilitation progress.

One of the goals of the present research was to examine whether psychosocial risk factors for work disability could be reduced through participation in a community-based psychosocial risk-factor targeted intervention. An additional objective of the research was to examine the degree to which reductions in psychosocial risk factors were associated with return to work. All participants in the present research were WCB claimants with WRMDs who were referred to the PDP Program. Assessment of risk factors was conducted at pre-, mid-, and posttreatment, thus permitting analysis of the relation between change in risk factors and return to work status.

METHODS

Participants

The participants were 215 (116 men and 99 women) WCB claimants who had been off work for a period of 2 years or less and who agreed to treatment in a community based multidisciplinary intervention program. At the time of referral, all participants were off work due to a WRMD and were receiving wage replacement benefits from the Workers' Compensation Board of Nova Scotia. Individuals were considered for referral to the intervention program if 1) they were off work for more than 4 weeks, 2) pain symptoms were determined to be a primary limiting factor to return to work (e.g., persistent pain with no objective physical findings), and 3) there was evidence of one or more "yellow flags." Ages ranged from 25 to 63 years ($M = 41.5$; SD = 8.6) for men and from 17 to 60 years ($M = 41.9$; SD = 9.2) for women. The mean duration of time off work was 28.8 weeks with a standard deviation of 17.8 weeks.

Measures

As part of the intervention protocol, assessment of following psychosocial risk factors was conducted at pretreatment, mid-treatment and treatment termination.

Fear of Movement/Re-Injury

The Tampa Scale for Kinesiophobia (45) is a 17-item questionnaire that assesses fear of (re)injury due to movement. The TSK has been shown to be internally reliable (coefficient $\alpha = 0.77$; (46)). The TSK has been associated with various indices of behavioral avoidance and disability (28,46).

Catastrophizing

The Pain Catastrophizing Scale (47) consists of 13 items describing different thoughts and feelings that individuals may experience when they are in pain. The PCS has been shown to have high internal consistency (coefficient $\alpha = -0.87$), and to be associated with heightened pain, disability as well as employment status (17,28,42).

Perceived Disability

The Pain Disability Index (48) assesses the degree to which respondents perceive themselves to be disabled in seven different areas of daily living (home, social, recreational, occupational, sexual, self-care, life support). For each life domain, respondents are asked to provide perceived disability ratings on 11-point scales with the endpoints (0) *no disability* and (10) *total disability*. The PDI has been shown to be internally reliable and significantly correlated with objective indices of disability (49,50).

Depression

The Beck Depression Inventory II (51) is a commonly used self-report measure of depression. The BDI-II consists of 21 items describing various symptoms of depression. The BDI-II has been shown to be a reliable and valid index of depressive symptoms in chronic pain patients and primary care medical patients (52,53).

Pain Severity

The McGill Pain Questionnaire (54) was used to assess current pain severity. Participants were asked to endorse adjectives that best described their current pain experience. The Pain Rating Index (PRI) is a weighted sum of all adjectives endorsed, and is considered one of the more reliable and valid indices of an individual's chronic pain experience (55).

Primary Outcome

Return to Work

Return to work status was assessed 4 weeks following termination of the PDP program. Return to work information and claim status were obtained directly from WCB files. Participants were classified as having returned to work if they had returned to full time

preinjury employment or full time alternate employment, and their claim was closed. All other clients were classified as not having returned to work.

Procedure

The Intervention Program

Individuals were considered candidates for referral to the intervention when the case worker determined that the individual was at risk for prolonged disability. Criteria for determination of appropriateness of referral included being off work for more than 4 weeks, no evidence of objective organic pathology to support ongoing work disability, and evidence of yellow flags. Case workers had previously attended orientation sessions on the nature of yellow flags and their relation to work disability. Risk for prolonged work disability was determined informally through telephone interview. Risk factors considered during the interview included: high level of pain intensity, previous time loss claims, request for additional medical evaluation, low expectation of return to work, and indications of heightened emotional distress. When WCB case workers identified a client as a potential candidate for the PDP Program, the client was referred to the PDP trained psychologist closest to the client's community of residence. Case workers introduced the PDP referral to the claimant as an opportunity to learn to deal better with the challenges associated with persistent pain, with the goal of resuming preinjury activities. The rate of referral acceptance was 89%. The PDP Program was offered to complement existing community-based services for the treatment of occupational injury (e.g., medical management and physiotherapy). Physical therapy was provided by a network of community-based physiotherapists who had received orientation in a functional restoration approach to rehabilitation endorsed by the WCB.

During the first session of the PDP Program, clients were invited to view the PDP Information Video. The PDP Information Video features interviews with medical and rehabilitation experts on the factors that contribute to successful recovery from musculoskeletal injury. The information content emphasizes the benign nature of most musculoskeletal injuries, the importance of activity involvement and return to work, the dangers of liberal use of narcotic analgesics, and briefly describes the goals of the PDP Program. The video was conceived as a vehicle for providing important medical/rehabilitation/reassurance information that is often difficult to communicate effectively within the time constraints of typical physician visits.

Clients were also provided with a copy of the PDP Client Workbook. The PDP Client Workbook serves as the platform for the implementation of many of the intervention components of the program and also serves to maximize fidelity to treatment protocol. The Client Workbook is formatted as a daily agenda to facilitate the tasks of goal setting, activity scheduling, and graded activity involvement. The daily recording format is sufficiently structured to maintain consistency in treatment direction, but sufficiently open to accommodate varying pace of treatment progression. The PDP Client Workbook contains detailed information on the basics of activity planning, structured scheduling, and strategies for overcoming barriers to activity involvement. The PDP Client Workbook also provides the client with a summary of the central themes of the treatment sessions.

The client and clinician meet on a weekly basis for a maximum of 10 weeks. The program can be terminated prior to 10 weeks if the client is ready to return to work. In the initial weeks of the program, the focus is on developing a structured activity schedule for the client in order to facilitate resumption of preinjury activities. Activity goals are set within different life role domains including family, social and occupational roles. Different treatment modules are invoked to target specific obstacles to rehabilitation progress (e.g., depression, catastrophic thinking, fear of movement and perceived disability). The PDP Program involves the use of structured activity scheduling strategies and graded activity involvement to target risk factors such as fear of movement/re-injury and perceived disability. Thought monitoring and cognitive restructuring strategies are used to target catastrophic thinking and depression. In the final stages of the program, the focus of the intervention turns toward activities that will facilitate re-integration into the workplace.

The PDP Program uses a structured reporting format where psychologists prepare a mid-treatment and treatment termination report according to designated guidelines. Treatment reports are intended to provide a description of treatment-related changes in risk factors targeted by the program as well as obstacles to progress that might have been encountered. An audit of all reports submitted was conducted and graded according to the degree to which they reflected adherence to the PDP protocol (excellent, good, unacceptable). Only cases for which reports were graded as excellent or good (86%) were retained for further analysis.

A network of 77 psychologists, distributed widely across the province, had previously been trained to administer the PDP Program. The implementation of the PDP Program is described in more detail elsewhere (28). The PDP Program was initiated following referral unless initial assessment revealed that the client was not a suitable candidate for treatment. As part of the current program of research, community-based psychologists were asked to forward copies of PDP Program assessment results (identified only by claim number) to our research center. The PDP Program assessment results were then linked to the WCB administrative data base.

Individual's progress through the intervention program at different rates and treatment is terminated as soon as a client returns to work. As such, some clients may be enrolled in the program for less than 10 weeks. In the analyses addressing the predictive value of risk factor reduction, if participants did not complete all three assessments, the last assessment values were carried forward.

Data Analyses

Logistic regression was applied in hierarchical analyses to determine how well pretreatment demographic information, questionnaire scores, and changes in those scores during treatment predicted Return-to-Work. Several statistics were computed in the logistic regression analyses. The significance of improvement in model fit by adding variables in the hierarchical analyses was obtained from chi-square comparisons, and the unique contribution of each variable was evaluated by the significance of the corresponding odds ratio (OR). The 95% confidence interval (CI) for each OR was also computed, and model fit for groups of variables was assessed with the value of -2 times the log likelihood (-2LL). The Nagelkerke R^2, which ranges between 0 and 1, provided an index of the proportion of variability that was explained by the predictor variables in each analysis (56). Percentages of correct classification, including sensitivity (percent correct predictions of those who

Table I. Characteristics of Participants ($N = 215$)

	Completed treatment				Did not complete treatment				
	RTW		Not RTW		RTW		Not RTW		
Characteristic	N	(%)	N	(%)	N	(%)	N	(%)	Total
Gender									
Male	59	(51)	40	(34)	9	(8)	8	(7)	116
Female	55	(56)	27	(27)	14	(14)	3	(3)	99
Injury Site									
Back or Neck	64	(48)	52	(39)	12	(9)	5	(4)	133
Upper extremity	24	(59)	7	(17)	8	(20)	2	(5)	41
Lower extremity	12	(63)	3	(16)	1	(5)	3	(16)	19
Occupation									
Laborer	31	(50)	22	(35)	8	(13)	1	(2)	62
Nursing	18	(58)	7	(23)	5	(16)	1	(3)	31
Fishing	6	(60)	2	(20)	0	(0)	2	(20)	10
Driving	4	(44)	2	(22)	2	(22)	1	(11)	9
Retail	6	(43)	5	(36)	2	(14)	1	(7)	14
Trade	11	(38)	16	(55)	1	(3)	1	(3)	29
Clerical	2	(50)	1	(25)	0	(0)	1	(25)	4
Restaurant	4	(67)	2	(33)	0	(0)	0	(0)	6
Not Stated	32	(64)	10	(20)	5	(10)	3	(6)	50

Note. RTW: returned to work. Not RTW: did not return to work.

returned to work) and specificity (percent correct predictions of those who did not return to work), were determined for the probability threshold value of 0.5.

Results

Sample Characteristics

A description of the study sample is provided in Table I. A large majority (181; 84.2%) of the 215 initial participants completed all 10 weeks of the treatment program. Eleven (5.1%) took the initial self-report instruments but did not continue until the mid-treatment evaluation. Twenty-three (10.7%) completed at least half of the treatment and the mid-treatment measures before discontinuing.

Analyses of the data in Table I indicated that Return-to-Work was not related to Gender, $\chi^2(1, N = 215) = 2.84$, $p > 0.05$ or Occupation, $\chi^2(8, N = 215) = 10.74$, $p > 0.20$, but there was a significant relationship between Return-to-Work and Injury Type $\chi^2(2, N = 193) = 6.15$, $p < 0.05$. The proportion of back and neck injuries was somewhat higher in relation to upper and lower extremity injuries in those patients who did not return to work. Completion of treatment was not related to Gender, $\chi^2(1, N = 215) = 0.25$, $p > 0.50$, Injury Type $\chi^2(2, N = 193) = 3.52$, $p > 0.15$, Occupation, $\chi^2(8, N = 215) = 6.02$, $p > 0.50$, or Return-to-Work, $\chi^2(1, N = 215) = 0.27$, $p > 0.50$.

Table II gives a breakdown of participant ages, the duration of time since they last worked, and pretreatment questionnaire scores. Time off work was distributed as follows: 4–12 weeks (16%), 3–6 months (40%), 6–12 months (35%), and greater than 12 months (9%). Analyses of variance revealed few pretreatment differences among participants, related to Return-to-Work or treatment completion. For individuals who returned to work,

Table II. Ages, Duration of Absence From Work, Baseline Scale Scores, and Final Scale Scores for 215 Participants

	Completed treatment				Did not complete treatment			
	RTW ($N = 114$)		Not RTW ($N = 67$)		RTW ($N = 23$)		Not RTW ($N = 11$)	
Variable	*M*	(SD)	*M*	(SD)	*M*	(SD)	*M*	(SD)
Demographic								
Age (years)	42.1	(8.6)	41.9	(7.9)	37.3	(10.8)	44.5	(11.8)
Absence from work (weeks)	22.8	(11.7)	40.8	(20.9)	24.1	(18.9)	28.6	(11.7)
Baseline scores								
Pain Catastrophizing Scale	20.4	(10.4)	33.9	(10.1)	18.8	(10.6)	26.9	(9.8)
Tampa Scale for Kinesiophobia	38.9	(7.2)	46.7	(7.4)	37.1	(7.2)	46.1	(9.5)
Pain Disability Index	36.9	(12.2)	48.7	(12.3)	34.8	(12.3)	42.6	(14.4)
Beck Depression Inventory II	13.0	(8.2)	22.4	(12.8)	11.3	(9.6)	19.9	(9.8)
McGill Pain Questionnaire	29.3	(13.9)	40.8	(14.7)	29.3	(15.4)	36.3	(9.0)
Final scores								
Pain Catastrophizing Scale	10.1	(8.1)	29.3	(9.4)	14.4	(10.7)	28.4	(11.8)
Tampa Scale for Kinesiophobia	33.4	(8.2)	43.8	(8.0)	35.3	(7.2)	46.5	(9.2)
Pain Disability Index	22.7	(13.4)	43.6	(11.4)	32.8	(12.9)	39.5	(17.2)
Beck Depression Inventory II	7.3	(6.3)	20.4	(10.9)	9.4	(9.4)	20.2	(16.5)
McGill Pain Questionnaire	22.4	(12.2)	43.1	(16.3)	27.7	(14.6)	39.8	(13.1)

Note. RTW: returned to work. Not RTW : did not return to work.

scores on none of the pretreatment risk factor measures differed as a function of whether or not participants completed all 10 weeks of the program ($p > 0.25$ for all), but those who completed less than 10 weeks were significantly ($p < 0.05$) younger. For individuals who did not return to work, participants who completed less than 10 weeks tended ($p < 0.07$) to be off work for a shorter period of time and had significantly ($p < 0.05$) lower initial scores on the PCS than participants who completed all 10 weeks of the program.

Treatment Outcome

Within 4 weeks of the termination of the PDP Program, 114 (63%) participants who completed all 10 weeks of the program had returned to work. The percentage reductions in targeted risk factors from pretreatment to posttreatment were as follows: catastrophizing (32%), depression (26%), fear of movement/re-injury (11%), and perceived disability (26%). Pain severity was reduced by 10%. All of these reductions were highly significant ($p < 0.001$) for the 181 patients who completed treatment.

Predicting Outcome from Pretreatment Risk Factor Measures

Logistic regression analyses were conducted to determine the variables that were influential in predicting Return-to-Work. Variables were entered in blocks in three steps. All continuous variables were standardized to provide a common scale for interpreting the associated ORs. In the first block, Time off Work was entered with participant Age and Gender for the 194 participants with ages recorded. In this analysis, Age did not contribute significantly ($p > 0.40$), but both Gender and Time off Work produced significant increments to predicting Return-to-Work. Therefore, Gender and Time off Work were re-

Table III. Summary of Hierarchical Logistic Regression Analyses for Predicting Return-to-Work from Demographic Variables and Pretreatment Questionnaire Scores ($N = 215$)

Step	Variables added at each step	Statistical summary							% Correct classification		
		$\Delta\chi^2$	Δdf	R^2	-2LL	OR	95% CI	p	Sensitivity	Specificity	Total
0	Baseline (no variables)								1.0	0.0	63.7
1	Demographic variables	46.43	2	0.27	235.2			<0.001	92.0	44.9	74.9
	Gender (Male = 0; Female = 1)					0.60	.32–1.13	>0.10			
	Time off Work					0.32	.21–.49	<0.001			
2	Initial questionnaire scores	46.95	5	0.48	188.3			<0.001	91.2	65.4	81.9
	Pain Catastrophizing Scale					0.61	.35–1.07	>0.05			
	Tampa Scale for Kinesiophobia					0.58	.35–.95	<0.05			
	Pain Disability Index					0.67	.41–1.08	>0.05			
	Beck Depression Inventory II					1.03	.62–1.69	>0.50			
	McGill Pain Questionnaire					0.64	.43–.96	<0.05			

Note. ORs are adjusted for other variables. Continuous variables are standardized. -2LL $= -2$ times the log likelihood. $\Delta\chi^2$ and Δdf are the change in χ^2 and associated degrees of freedom resulting from the addition of predictor variables, and p is the statistical significance of the change or of the OR for a variable. CI: confidence interval. R^2 is the Nagelkerke (56) R^2. Baseline rate was obtained by predicting that all patients will return to work. % correct classification is based on a cutoff probability of 0.5 for the logistic regression function.

tained, and analyses were conducted for the full sample of 215 participants with initial questionnaire scores entered as a block in the second step. The results of these analyses are summarized in Table III. For the full complement of 215 patients and with Age removed, Gender was not a significant predictor in the first block, but Time off Work was negatively related to Return-to-Work. The pretreatment values from all five questionnaires were significantly ($p < 0.001$) related to Return-to-Work when considered separately, but as shown in Table III, only the scores from the TSK and MPQ made significant, unique, negative contributions to the prediction of Return-to-Work.

Predicting Outcome from Changes in Risk Factor Measures

To evaluate the changes in questionnaire scores that occurred during treatment, the last score obtained in treatment was determined and used as an additional predictor of Return-to-Work. The last questionnaire score, in effect, incorporates the initial score plus the change that occurred during treatment, and adding the final questionnaire score variables to pretreatment variables in the logistic regression analysis assesses the contribution to prediction from score changes during treatment. The last score for all 215 patients was determined in the following way. The last score was the posttreatment score for the 181 patients who completed treatment. The last score for the 34 patients who did not complete treatment was the mid-treatment score ($N = 23$), if available, or the pretreatment score ($N = 11$), if the mid-treatment score was not obtained.

Table IV summarizes for all 215 patients the results from adding the last scores on the questionnaires to prediction from Gender, Time off Work, and pretreatment scores. As indicated in Table IV, only final PCS scores added significantly to prediction. The number of

Table IV. Summary of Hierarchical Logistic Regression Analyses for Predicting Return-to-Work From Demographic Variables and Pretreatment and Posttreatment Questionnaire Scores ($N = 215$)

Step	Variables added at each step	Statistical summary							% Correct classification		
		$\Delta\chi^2$	Δdf	R^2	-2LL	OR	95% CI	p	Sensitivity	Specificity	Total
1	Initial variables	93.39	7	0.48	188.3			<0.001	91.2	65.4	81.9
2	Last questionnaire scores obtained	56.65	5	0.69	131.6			<0.001	92.0	82.1	88.4
	Pain Catastrophizing Scale					0.17	0.07–.46	<0.001			
	Tampa Scale for Kinesiophobia					1.12	0.50–2.52	>0.50			
	Pain Disability Index					0.75	0.32–1.77	>0.50			
	Beck Depression Inventory II					0.75	0.32–1.77	>0.50			
	McGill Pain Questionnaire					0.59	0.28–1.21	>0.10			
	Final model			0.68	135.0				90.5	79.5	86.5
	Time off Work					0.56	0.36–0.89	<0.025			
	Last Pain Catastrophizing Scale					0.16	0.09–0.30	<0.001			
	Last McGill Pain Questionnaire					0.43	0.25–0.72	<0.005			

Note. The final model consists of only those variables that make a significant unique contribution to prediction of Return-to-Work. ORs are adjusted for other variables in the equations. Continuous variables are standardized. -2LL $= -2$ times the log likelihood. $\Delta\chi^2$ and Δdf are the change in χ^2 and associated degrees of freedom resulting from the addition of predictor variables, and p is the statistical significance of the change or of the OR for a variable. R^2 is the Nagelkerke (56) R^2. % correct classification is based on a cutoff probability of .5 for the logistic regression function.

sessions completed in treatment was also evaluated. Sessions was a highly skewed variable, and it did not approach significance as a predictor of Return-to-Work when entered either as a continuous or categorical variable.

A final model was obtained by using a forward solution stepwise entry of all variables. With this procedure, only Time off Work and the final PCS and MPQ scores provided unique contributions to predicting Return-to-Work. All three variables were negatively related to Return-to-Work, but the terminal PCS score was the best predictor (lowest OR) of the three. In fact, prediction of Return-to-Work from only the last PCS score was nearly as good as from the final model that used three predictor variables. Using only the last PCS score variable, the OR was 0.100 (95% confidence interval: 0.056–0.180), and the Nagelkerke R^2 was 0.61. The classification rate using only the final PCS scores was 84.2% with a sensitivity of 90.5% and a specificity of 73.1%.

When analyses were conducted with only the 181 patients, who completed treatment, the posttreatment PCS score (standardized) was an excellent predictor of Return-to-Work. Prediction from this single scale in logistic regression resulted in a Nagelkerke R^2 of 0.67 (-2LL $= 116.9$) and a classification accuracy of 85.1% (sensitivity = 90.4%; specificity = 76.1%). The OR was 0.069 (95% confidence interval: 0.033–0.144). An optimal unstandardized cut score of 18 (Return-to-Work if posttreatment PCS less than or equal to 18) correctly classified 85.6% of the cases (sensitivity = 86.8%; specificity = 83.6%). Adding the other posttreatment scores to posttreatment PCS produced a small (Nagelkerke $R^2 = 0.73$) but significant, $\chi^2(4, N = 181) = 15.7$, $p < 0.005$ improvement in prediction

of Return-to-Work (correct classification rate of 88.4%), but none of the four scales produced a significant unique contribution to prediction. An increase in accuracy to 89.5% by adding Time off Work to the five posttreatment scales was also small (Nagelkerke $R^2 = 0.75$) but significant, $\chi^2(1, N = 181) = 7.0$, $p < 0.01$.

DISCUSSION

Secondary prevention programs are designed to minimize risk factors for prolonged pain and disability. At an average of 7 months postinjury, the sample included in the present study would be considered at high risk for continuing along a trajectory of chronic work-disability (11). Through the reduction of psychosocial risk factors, the objective of the PDP Program was to prevent further disability. The PDP Program specifically targets four psychological variables that have been shown to be risk factors for chronicity following injury (13). Although other psychosocial variables have been identified in epidemiological studies as risk factors for chronicity, pain catastrophizing, fear of movement/re-injury, perceived disability and depression were chosen as targets of intervention due to their amenability to change through intervention.

The present research joins a growing literature suggesting that psychosocial risk factor reduction is associated with higher probability of return to work outcomes (28,33,44). Participation in the PDP Program was associated with significant reductions in all psychosocial risk factors assessed and, reductions in these risk factors significantly predicted return to work. However, there was considerable shared variance in the relation between risk factor reduction and return to work. The results of the multivariable logistic regression indicated that only reductions in pain catastrophizing contributed significant unique variance to the prediction of return to work beyond the variance accounted for by gender, duration of work absence, and other risk factors measures. These findings indicate that although reductions in all risk factors assessed in the present study might increase the probability of return to work, interventions that aim to reduce levels of pain catastrophizing may be accounting for the outcome. A robust relation between pain catastrophizing and return to work outcomes has also been reported in individuals with work-related upper extremity disorders (15,57).

It is interesting to note that although initial pain severity afforded significant prediction of return to work, pain reduction was not the primary predictor of outcome. Pain reduction was a significant predictor of outcome when considered alone but not when combined with other psychological risk factors. These findings are consistent with previous research indicating that pain severity is a significant determinant of work disability (13,15). However, the findings also highlight that pain reduction will not necessarily achieve return to work outcomes. Rehabilitation interventions that focus mainly on pain reduction may not be as effective as interventions that target psychological risk factors for chronicity (15).

The results showing that risk factor reduction is associated with higher probability of retuning to work have important implications for the nature of early interventions for pain-related occupational injury. Psychosocial interventions have been underrepresented in secondary prevention programs (11). It has been common practice to target psychosocial factors primarily in the treatment of individuals with long standing pain and disability, where treatment goals are often more palliative in nature, with a focus on the consequences of injury (e.g., mood disorders) as opposed to risk factors for chronicity. The incorporation of risk-factor targeted psychosocial interventions in earlier stages of recovery holds promise

of yielding significant improvement in outcomes for individuals who are at risk of following a trajectory of prolonged pain-related disability.

The present research is consistent with the findings of previous investigations showing that psychosocial factors are significant determinants of work disability (5,13,14,19). Pretreatment scores on measures of pain catastrophizing, fear of movement/re-injury, perceived disability, depression, and pain severity were independently associated with the probability of returning to work. Logistic regression indicated that only pretreatment fear of movement/re-injury scores and pain severity contributed significant unique variance to the prediction of return to work. Taken together, these findings suggest that high scores on measures of psychosocial risk factors are associated with prolonged work absence (and poorer treatment outcome) in individuals with WRMDs, and further reveal that there is a high degree of overlap among these measures.

The pattern of findings that emerges from the present research emphasizes the importance of multivariate approaches to risk factor analyses incorporating several measures of psychosocial risk factors. Reviews of risk factor research have pointed to pain catastrophizing, fear of movement/re-injury, perceived disability and depression as important psychosocial determinants of chronicity (13). However, there appears to be a high degree of shared variance among these variables and that each does not make a unique contribution to the prediction of return to work. Studies that include only one of these psychosocial risk factor measures risk overrepresenting or overestimating the contribution of a particular risk factor. The common variance among psychosocial risk factors suggests that there might be essential underlying dimensions or features of psychosocial risk for work disability and that any measure or construct that taps these elements will likely emerge as a significant predictor of return to work outcomes. On the basis of the current findings, it is possible to speculate that the essential features of psychosocial risk for work disability might include the tendency to focus excessively on pain sensations, to magnify the threat value associated, to feel helplessness (i.e., pain catastrophizing), and the fear of future injury (15,57).

Challenges to effective secondary prevention lie not only in the development of risk-factor targeted interventions, but also in developing mechanisms by which individuals at risk can be identified. Psychosocial risk factors for chronicity may be particularly likely to go undetected during routine primary care. Treating physicians often become aware of psychological factors in pain and disability only once chronicity has developed and the client has become treatment resistant. Screening instruments for psychological risk factors for chronicity have been developed and have been shown to have predictive value for prolonged pain and disability (15,58). In order to facilitate the timely implementation of secondary prevention interventions, it will be necessary to address more systematically how screening measures for risk factors of chronicity can be incorporated into the primary care setting.

Some degree of caution is warranted in the interpretation of the present findings. Return to work was assessed in the short term at 4 weeks following treatment termination. Information about individuals who returned to work after 4 weeks was not available. No information was available about work retention. Individuals who might only have remained at work for a few weeks were still have been classified as having returned to work. The designation of return to work as a dichotomous variable also has implications for the interpretation of data. Individuals who were involved in graduated return to work programs but still receiving compensation were classified as not having returned to work. All of these factors might have influenced the nature of risk factors that were found to be predictive

of outcome. Another limitation concerns the manner in which decisions were made about an individual's suitability for the present intervention. Although case workers received orientation in 'yellow flags' it is not clear how available information was 'weighted' in individual cases to make a decision about referral to the PDP Program. Since sample composition would have significant bearing on the results of predictive analyses, the lack of information of the selection strategies or biases of the case workers limits the strength of conclusions that can be drawn from the findings.

Information about fidelity to protocol was limited and based primarily on a report audit. Features of the program such as the information video, the client workbook and standardized reporting were designed to foster adherence to protocol. However, the manner in which the treatment program was implemented may have varied from one clinician to the next. By using community-based professionals as providers of the program, it was not possible to incorporate mechanisms to verify session-to-session fidelity in protocol. Divergences from protocol would have influenced return to work outcomes as well as the results of risk factor reduction analyses. In addition, the absence of a control group or comparison group does not allow the determination of the specific effects of the intervention. More confident statements about the impact of the risk factor reduction program described in this study must await verification through a randomized clinical and long term follow up to assess the maintenance of treatment gain. It would also be of interest to address how return to work outcomes might be augmented through the inclusion of other interventions aimed at modifiable risk factors such as ergonomic exposure, work demands, and job stress (59,60).

In spite of these limitations, the findings of the present study highlight the importance of psychosocial risk factors as determinants of clinical course following a WRMD, as well as the importance of risk factor reduction in contributing to return to work outcomes. Fear of movement and re-injury emerged as a risk factor for poor treatment outcome, and the reduction on pain catastrophizing emerged as a predictor of return to work. The findings of this research suggest that outcomes of secondary prevention programs for work disability might be improved by incorporating interventions that specifically target catastrophic thinking. The present research also illustrates how community-based models of psychosocial intervention might represent a viable approach to the management of work disability associated with musculoskeletal disorders.

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