ORIGINAL ARTICLE

The prognostic value of depressive symptoms, fear-avoidance, and self-efficacy for duration of lost-time benefits in workers with musculoskeletal disorders

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Background: The psychological factors of depressive symptoms, fear-avoidance, and self-efficacy are deemed to be important in the work disability process. However, the prognostic value of these factors for time on benefit is not well understood.

Aims: To analyse the prognostic value of psychological factors for the number of days on total compensation benefit over a 12 month period.

Methods: In a longitudinal study of 187 workers receiving total compensation benefits due to musculoskeletal disorders, the prognostic value of psychological factors measured 4–5 weeks post-injury for duration on total compensation benefit over 12 months was analysed. Cox proportional hazard regression analyses were conducted. Special emphasis was given to variable selection and to the analysis of confounding effects of potential prognostic variables.

Results: The final model indicated that increased depressive symptoms and poorer physical health significantly increase the number of days on total benefit. Confounders included in the final model were pain and fear of income loss. In the final model the impact of fear-avoidance ceased to be significant when work related variables were included in the fully adjusted model. This illustrates that interrelationships between variables must be taken into account when building multivariate prognostic models. The addition of work related variables to the model did not result in any major changes in the adjusted model, which suggests that when measured 4–5 weeks post-injury, psychological and physical health factors are strong predictors of time on benefits, while work conditions are less important.

Conclusion: Results suggest that the presence of depressive symptoms and poor physical health in workers on benefit due to musculoskeletal disorders increases the number of days on total compensation benefits significantly, when controlling for confounding variables.

Over the past decade, many studies have identified prognostic factors for time on benefit or duration of sickness absence, hence a diverse set of prognostic factors can be identified from the literature.^{1–2} Unfortunately, the absence of a comprehensive theoretical framework for the nature of the work disability process impedes interpretation of the broad findings on prognosis of time on benefit.^{1–3}

The few theoretical frameworks of pain-related occupational disability that do exist point to the multifactorial nature of work disability;⁴ they include psychological factors as determinants of work disability duration. One comprehensive model in the field of work-disability is the biopsychosocial model.^{5–7} This model is often used to guide cognitive-behavioural interventions with regard to fear-avoidance and catastrophising of pain contributing to work disability.⁸ Although these interventions treat the “whole” person as the focal point in a comprehensive, integrated therapeutic process to regain daily personal and work activities, they do not address the employee’s decision-making and behaviour change processes regarding return to work (RTW) and hence can not give a theoretical explanation of the RTW process.³ As indicated by several studies, decision-making towards RTW might be based on the beliefs, attitudes and experiences of the individual towards regaining work activities and consequently be less determined by health status itself.^{3–9–10} Recently, Franche and Krause proposed a conceptual framework of work disability—the readiness for return to work model.³ The model considers the multifactorial nature of the work disability process and identifies social and individual factors impacting on the individual’s

ability to initiate and maintain behaviour change, in this case the behaviour of returning to work.³ Hence, this model emphasises that psychological factors reflecting the worker’s readiness for RTW also play an important role in the decision to regain work activities.³

In both conceptual models mentioned above, depressive symptoms, fear-avoidance, and self-efficacy are deemed to be important in the work disability process. However, the prognostic value of these factors for time on benefit is far less understood and has seldom been studied empirically.^{1–2} In a review by Pincus *et al* on psychological factors as predictors for developing chronic low back pain, depressive symptoms (i.e. symptoms that index the depressive state a person is in, not necessarily diagnosed as clinical depression) showed the strongest evidence as a predictor for the transition from acute to chronic, while there was limited evidence for other psychological factors.² The literature to date has focused on the relation between depressive symptoms and musculoskeletal complaints or symptoms. Less has been done on the relation between depressive symptoms and work disability and time on benefits.²

In terms of behavioural change, self-efficacy and fear-avoidance (i.e. the avoidance of physical and work activities based on fear) might play an important role in the work disability process.^{3–7} Although fear-avoidance beliefs are known to be associated with functional disability in general¹¹ and the occurrence of work disability,¹² the evidence of their

Abbreviations: MSD, musculoskeletal disorder; RTW, return to work; WSIB, Workplace Safety & Insurance Board

prognostic value on duration on benefit is scarce. Self-efficacy, i.e. the belief in one's capabilities to organise and execute the courses of action required to produce given attainments,¹³ has only recently been applied to workplace health concerns.³⁻¹⁴ Recovery expectations, a closely related construct of self-efficacy, have been shown to be important prognostic factors for days on benefit.¹⁵⁻¹⁶ It is argued that the workers' motivation to resume work following a musculoskeletal disorder (MSD) episode may be a function of expectations of recovery and value of work, balanced by personal costs of coping with pain.¹⁷ However, the prognostic value of self-efficacy beliefs on decision to return to work is still unknown.

While a few studies have examined concurrently the prognostic value of depressive symptoms and fear-avoidance,^{12,18} no study was found that included depressive symptoms, fear-avoidance beliefs, and self-efficacy in a single prognostic model for return to work. These factors need to be examined concurrently, while controlling for the confounding effect of established prognostic factors.¹ There are indeed a large number of potential prognostic factors for the number of days on total benefit,¹⁻¹⁷ which may confound the relation between the psychological variables and the number of days on total benefit.¹⁹⁻²⁰

The objectives of the study are: (1) to evaluate the prognostic value of depressive symptoms, fear-avoidance, and self-efficacy on the number of days on total benefit in a group of workers receiving compensation benefits due to work related musculoskeletal disorders; and (2) to explore the confounding effects of work related and health related variables on the psychological variables in a prognostic model of number of days on benefit.

METHODS

Study population

In this longitudinal study, the cohort consisted of 187 workers who reported being off work 7 days within the first 14 days after the injury date, with a follow-up period of 12 months. In spring 2002, structured telephone interviews were conducted to gather information about potentially prognostic factors for time receiving benefits, approximately 4 weeks post-injury. Figure 1 shows the recruitment procedure. Potential subjects were approached by phoning them at home. After five attempts, no further effort was made to contact them. A contact meant that a message was left, either to the worker, a person they lived with, or on an answering machine. We did not intend to contact all 6530 subjects, but they were initially identified as potential participants since this was partly a feasibility study. It should be noted that 2627 subjects were never called. Included were workers with a lost-time claim due to a musculoskeletal disorder, with no previous claim in the last 3 months. Workers were excluded when suffering from a fracture, amputation, burn, hernia, head injury, concussion, or electrocution, or when they were unable to speak English.

The eligible population for this study was workers employed by firms that had workers' compensation coverage in the province of Ontario, Canada. The Workplace Safety & Insurance Board (WSIB) of Ontario provides coverage for occupational injuries only, whereas separate insurance systems (private and/or government) provide compensation for non-work-related conditions. About 65% of the workforce in Ontario is covered by the WSIB, accounting for approximately 3.5 million workers. The total number of work related injuries registered by the Ontario WSIB in 2002 was approximately 360 000.²¹

Potential participants were identified from WSIB data files and, due to privacy protection standards, initially contacted by WSIB staff to determine eligibility. Recruiters inquired

whether potential participants agreed to be contacted by a staff member of the research team. It was explained that refusal to be contacted or to participate in the study would not result in any changes in WSIB services. Claimants agreeing to be contacted were sent an information sheet and a consent form. Individuals who agreed to participate in the study were phoned by a research team interviewer. The study was approved by the University of Toronto Ethics Review Board.

Instrumentation

Information was gathered on sociodemographic, psychological, physical, work related psychosocial factors, and work related physical factors. The reliability and validity was good for all established instruments. For those instruments constructed for the current study, we provide the relevant psychometrics in more detail below.

General health perception was measured by the SF-12.²² The scores of the SF-12 are summarised into a physical component score (PCS12) and a mental component score (MCS12).

To measure depressive symptomatology, we used the Center for Epidemiology Studies Depression scale (CES-D).²³ For each of the 20 items, participants were asked to rate their frequency of depressive symptoms during the past week on a four point scale, from 0 (rarely or none of the time) to 3 (most of the time). Item scores are summed together for a total score.

In order to assess the worker's belief about how work might affect their MSD the fear-avoidance work scale (FABQ-W) was used.²⁴ We did not use the physical scale. In our study we reduced the answer categories to five (strongly disagree, disagree, neither disagree or agree, agree, and strongly agree) to make it consistent with the Likert scale of other scales in the telephone survey, in order to facilitate response. Participants were asked to rate their agreement with each of the seven statements as it pertained to their job, ranging from 0 (strongly disagree) to 4 (strongly agree). Item scores were summed together for a total score.

Items for self-efficacy for return to work were generated by a group composed of two clinical psychologists, a psychometrist, and a graduate student in community health research, all with expertise in occupational health. The format of the six items was based on the Arthritis Self-Efficacy Scale.²⁵ Principal component analysis with our sample revealed two factors that explained 66% of the variance: self-efficacy for return to work and assertiveness for return to work. In this study only the former factor is used. For each of the four items, participants were asked to rate their confidence with regard to each item, ranging from 0 (not at all certain) to 4 (completely certain). For example: "You'll be able to solve problems that come up during your return to work period". Item scores were summed together for a total score. The Cronbach's alpha of the self-efficacy measure for RTW in this study was 0.80.

Perceived pain intensity at the moment of the interview (i.e. referring to pain intensity right now) was based on a single 10 point numerical item taken from the Chronic Pain Grade,²⁶ with 0 = no pain and 10 = pain as bad as could be.

To measure work related physical factors, a scale was designed to reflect the established risk factors for development of MSD mentioned by the National Research Council and Institute of Medicine.²⁷ Items from the Physical Workload Survey Questions²⁸ reflecting these risk factors were used and new ones were created for risk factors not addressed in the Physical Workload Survey. Participants were asked the percentage of time their job involves each item, ranging from 0 (not at all) to 5 (almost all the time, 100%). Item scores were summed together for a total score. Factor

analysis on these data revealed three major physical load factors, i.e. heavy loading, repetitive movements, and vibration of body parts, explaining 81% of the variance. Perceived physical workload was also measured using a five-point Likert scale ranging from 0 (not at all demanding) to 5 (extremely demanding). For the purpose of comparability with a former study,¹⁶ item scores were rescaled to a 0–10 scale.

The Job Content Questionnaire²⁹ was used to determine perceived psychosocial workload; and two scales were distinguished, representing “decision latitude” (made up of skill discretion and decision authority) and “psychological demands” (made up of psychological demands and psychological pace). Participants were asked to rate how much they agree with each statement, ranging from 1 (strongly disagree) to 5 (strongly agree). Item scores were summed within each domain and scaled so that the possible range was from 6 to 30.

The Saskatchewan Comorbidity Scale³⁰ is a 15-item self-report scale which assesses the presence of 15 types of comorbidities. Participants were asked if they experienced each condition and then how much it affected their health, rating it on a scale from 0 (does not experience the condition) to 4

(experiences condition: severely affects health). The test-retest intra-class correlation (ICC) was 0.93 (95% CI 0.91 to 0.95).³⁰ The agreement between individual items was adequate (weighted kappa ranged from 0.42 to 0.92).³⁰ The total score consists of a summative score of all items. One item was added to the version used in the current study for female participants to assess whether they had been pregnant in the last 6 months. Item scores were summed and rescaled to 0 to 100, with 0 representing no co-morbidity.

For occupational classification, data were extracted from the WSIB database and coded as white collar, pink collar, or blue collar, using the system devised by Gaudette and colleagues.³¹ White collar workers are managerial, administrative, and scientific professions; pink collar are clerical, sales, and service workers; and blue collar workers are workers in manufacturing, construction, transportation, and mining.

The availability of workplace accommodation has been shown to have an important impact on prolonged work disability.¹ We therefore asked the worker whether they were offered work accommodation.

In order to detect the presence of a fear of income loss as a potential prognostic factor for time on benefit,^{1 32} we asked

Table 1 Sample characteristics (n = 187)

Variables	Natural units
Age	Mean (SD) 42 (11)
Cumulative days of total compensation (from day of interview)	
Total group	Mean (SD) 45 (78), median 14
Workers with sustainable RTW*	Mean (SD) 13 (41), median 0
Workers with unsustainable RTW†	Mean (SD) 44 (56), median 26
Workers with no RTW‡	Mean (SD) 68 (93), median 32
Gender	
Female	74 (40%)
Male	113 (60%)
Marital status	
Single	51 (27%)
Cohabiting	136 (73%)
Education	
Some high school	39 (21%)
High school completed	91 (49%)
University or college completed	57 (30%)
Site of injury	
Back	108 (58%)
Neck and upper extremity	79 (42%)
Employment status	
Full-time	162 (87%)
Part-time	24 (13%)
Collar classification	
White collar	25 (13%)
Pink	58 (31%)
Blue collar indoor	47 (25%)
Blue collar outdoor	25 (13%)
Workplace size (WSIB data)	
<20 employees	17 (10%)
20–99 employees	30 (17%)
100–999 employees	56 (32%)
≥1000 employees	41 (23%)
Work accommodation available	
Yes	91 (49%)
No	94 (51%)
Personal income	
<\$20 000	35 (19%)
\$20 000–39 999	79 (44%)
\$40 000–59 999	57 (31%)
>\$60 000	10 (6%)
Family income	
<\$40 000	49 (29%)
\$40 000–59 999	54 (32%)
\$60 000–79 999	34 (20%)
≥\$80 000	33 (19%)
Work status at time of interview	
RTW—sustainable	73 (39%)
RTW—unsustainable	22 (12%)
No RTW	92 (49%)
Claim history past 5 years (yes/no)	66 (35%)/121 (65%)

*Sustainable RTW: being at work at time of interview.

†Unsustainable RTW: not at work at time of interview but at least one attempt to RTW in the interval of injury date–interview date.

‡No attempt to return to work and still not back at work at time of interview.

the subjects how often in the past four weeks they felt they could not support themselves or their family the same way they were used to, because of their injury. The answers ranged from 1 (never) to 4 (often).

The outcome variable was the cumulative number of calendar days a claimant received total compensation benefits during 1 year, starting from the date of interview. These data were derived from the administrative database of the WSIB. By choosing date of interview as the inception point, and only including time on benefits accumulated after this point, we ensure that all of the outcome occurs temporally after the baseline predictors are measured; therefore, if the experience of being off work prior to the interview influences their value, we avoid a circularity of argument.

Data analysis

In order to address generalisability of our findings, participants and potential participants were compared on basic

demographic and work related variables, extracted from the WSIB database.

In order to explore the construct validity of the psychological variables, we conducted a factor analysis with items from the depression scale, SF-12 mental health scale, fear-avoidance scale, and self-efficacy scale. We also included pain in the factor analysis as pain is considered to be both a physical and psychological phenomenon.⁶ In order to find the additional prognostic value of depressive symptoms, fear-avoidance and self-efficacy over and above established baseline prognostic factors, the model building was done in three steps:

- (1) Variables with a significant correlation ($\alpha = 0.05$) with at least one of the three main independent variables—depressive symptoms, fear-avoidance, and self-efficacy for RTW—were considered as potential confounding variables and were selected for the next analysis.
- (2) A basic Cox proportional hazard (PH) regression model was built with age, gender, depressive symptoms, fear-avoidance, and self-efficacy as main independent variables. The dependent variable in this analysis is the number of days on total benefit from the date of interview until 12 months follow-up. Each of the potential confounding variables was put in the basic model, one at a time. When the beta values of depressive symptoms, fear-avoidance and/or self-efficacy in the model were modified by more than 10% by a given variable,³³ this variable was identified as a significant confounding variable and included in the final model.
- (3) Two final models were constructed, based on the basic model and the significant confounding variables from Step 2. One model included work related factors and the other did not. This allowed us to reveal the impact of work related aspects on the model.

Factors considered as potential confounding variables for the psychological variables³⁴ were: perceived pain, co-morbidity, availability of work accommodation, work related physical factors and general perceived physical workload, perceived psychosocial workload, physical health, income (personal and family), level of education, and workplace size (from WSIB database and self-reported).

We used the Cox PH regression model. The assumption of non-proportionality was tested by including an interaction term with log(time) for each variable of interest.³⁵ This method has been described in more detail previously.¹⁶ The statistical package SAS 8.0 was used to perform the analyses. For the Cox PH regression analyses we used the PHREG procedure.

RESULTS

Participant recruitment

Over the course of 12 weeks, 6530 potential participants were identified from WSIB claim records. Due to time and eligibility constraints associated with recruitment, WSIB staff recruiters attempted contact with 3903 potential participants. Figure 1 shows the results of recruitment.

Researchers reassessed recorded injuries three months post-injury; a further 18 participants were excluded because their injury type, initially based on original WSIB data entered three weeks post-injury, had been recoded and fell outside of the study eligibility criteria. Hence, the final study sample consists of 187 subjects.

Population characteristics

Table 1 summarises the population characteristics of the 187 subjects. The mean number of days on total benefit after interview during the one year follow-up was 45 ± 78 days

Table 2 Basic statistics of the psychological and work related variables in the participants (n = 187)

	Mean	Median	SD	Observed Min-max	Original scale Min-max
Depressive symptoms (total score)*	17.9	16.0	13.7	0–57	0–60
Fear-avoidance belief about work*	18.3	18.6	4.1	7–24	0–28
Self-efficacy†	12.6	14.0	3.5	0–16	0–16
General health‡			9.7		
Physical health	33.2	33.3	9.7	10.0–65.2	0–100
Mental health	44.2	44.9	10.8	16.0–65.2	0–100
Perceived pain*	4.8	5.0	2.6	0–10	0–10
Co-morbidity*	3.8	0	7.1	0–38.3	0–100
Perceived physical workload*	3.9	4.0	1.0	1–5	1–5
Work related physical factors*			7.3		
Heavy loading	16.6	17.0	6.2	0–25	0–25
Repetitive movements	19.7	25.0	7.3	0–25	0–25
Vibration of body parts	6.6	2.5	8.1	0–25	0–25
Work related psychosocial factors*					
Decision latitude	40.7	42.0	8.3	17–57	12–60
Psychological demands	41.3	40.0	8.2	20–60	12–60

*Higher score indicates worse scores.

†Higher score indicates better scores.

(median 14 days, range 1–365 days). Workers who did not attempt to go back to work between injury and date of interview had a median of 32 days on total compensation benefit. The mean duration of time between injury and interview was 28 ± 5 days. The mean age of the population in this study was 42 ± 11 years; most subjects had at least finished high school (79%), and the majority were male (60%). Most subjects received compensation due to low back pain (58%).

Analyses comparing study participants (n = 187) with potential participants (n = 6530) showed that study participants were slightly older than potential participants. Participants and potential participants were similar in terms of gender and size of company. Participants had a greater number of back injuries than potential participants.

Non-participants had less days on benefit during the 12 months follow-up (mean 37 days).

Table 2 shows the basic statistics of the continuous variables that were used in the analyses. With a mean score of 18 ± 14 , depressive symptoms are high in this population sample (a score above 16 indicates a high likelihood of a clinical depressive disorder²³). The two dimensions of work related psychosocial factors had approximately the same values of mean and SD (i.e. around 41 ± 8). Of the work related physical factors, heavy lifting (17 ± 6) and repetitive movements (20 ± 7) were most prominent. Physical health scores were generally worse than mental health scores (33 ± 10 v 44 ± 11 , respectively), indicating the presence of more physical problems than mental health problems, as 50 is the norm for both summary scales in a healthy population.²²

Table 3 Correlation between personal, work related, and health related factors with depressive symptoms, fear-avoidance, and self-efficacy in workers with a compensation claim due to MSD (n = 187)

	Depressive symptoms	Fear-avoidance (for work)	Self-efficacy	Selected for next analysis
Perceived physical workload‡	0.14*	0.33***	–0.12	X
Work related physical factors				
Heavy loading‡	0.11	0.34***	–0.12	X
Repetitive tasks‡	0.16*	0.19*	0.03	X
Vibration‡	–0.03	0.004	0.10	–
Psychosocial workload‡				
Decision latitude	–0.30***	–0.25***	0.27***	X
Psychosocial demands	0.32***	0.47***	–0.31***	X
Physical health‡	–0.09	–0.40***	0.16*	X
Pain‡	0.37***	0.43***	–0.30***	X
Co-morbidity‡	0.10	0.06	–0.17*	–
Body part of injury†	–0.11	–0.07	–0.002	–
Family income†	–0.28***	–0.04	0.17*	X
Personal income†	–0.14	–0.17*	0.07	X
Education†	–0.10	0.03	0.02	–
Marital status†	0.11	0.01	–0.04	–
Fear of income loss†	0.55***	0.28***	–0.21**	X
Work accommodation†	–0.003	0.17	0.03	–
Workplace size†	–0.12	0.04	0.06	–
Number of employees working at worksite†	–0.03	0.07	–0.01	–
Part time–full time†	–0.07	0.13	–0.07	–
Collar status†	0.001	–0.15	0.07	–
Claim history† (previous 5 years)	0.19**	0.21**	–0.003	X

*p ≤ 0.05, **p ≤ 0.01, ***p ≤ 0.001.

†Spearman rank correlation; ‡Pearson's r².

Table 4 Confounding effect of personal, work related and health related factors on the basic Cox PH model including depressive symptoms, fear-avoidance and self-efficacy as prognostic variables and the number of days on total compensation benefit as outcome variable (n = 160)

Basic β values (no confounding variable)	Depressive symptoms		Fear-avoidance (for work)		Self-efficacy	
	–0.01381	Difference	–0.04660	Difference	–0.02680	Difference
Factors included						
One at a time:						
Perceived physical workload	–0.01375	1%	–0.04445	5%	–0.02702	1%
Work related physical factors						
Heavy loading	–0.01381	0%	–0.05186	11%	–0.02546	55%
Repetitive tasks	–0.01294	6%	–0.04637	1%	–0.02597	3%
Psychosocial workload						
Decision latitude	–0.01501	9%	–0.05340	15%	–0.01879	3%
Psychosocial demands	–0.01465	6%	–0.05888	26%	–0.02301	14%
Physical health	–0.01862	35%	–0.02541	45%	–0.04246	58%
Pain	–0.01233	11%	–0.02842	39%	–0.03366	26%
Family income*	–0.01613	17%	–0.04381	6%	–0.02533	5%
Personal income†	–0.01359	2%	–0.04642	1%	–0.02677	1%
Fear of income loss‡	–0.01042	25%	–0.04136	11%	–0.03643	36%
Claim history (previous 5 years)	–0.01357	2%	–0.04319	7%	–0.02577	4%

Dummy variables: * <\$60 000; † <\$40 000; ‡ often.

All models are adjusted for age and gender.

Variable selection

Factor analysis confirmed the presence of three major constructs within the psychological measures, i.e. depressive symptoms (the mental component score of the SF-12 was associated with this scale), self-efficacy, and fear-avoidance for work (pain was associated with this scale). The explained variance by the three factors was 86%. Because factor structure confirmed the a priori constructs included in the study, depressive symptoms, fear-avoidance, and self-efficacy were included in the primary prognostic model for the number of days on total compensation benefit. Because pain is both a physical and psychological phenomenon,⁶ it was included in subsequent analyses, despite the fact that it was related to the fear-avoidance factor.

Table 3 shows the correlation of personal factors, work related factors and health related factors with depressive symptoms, fear-avoidance, and self-efficacy. Decision latitude, psychosocial demands, perceived pain and fear of income loss were significantly correlated with all three psychological variables. Physical health was strongly associated with fear-avoidance for work. Table 3 also indicates the variables with a significant correlation with at least one of the three main psychological variables.

Table 4 presents the confounding effect of each separate variable on the basic Cox PH model (adjusted for age and gender) including depressive symptoms, fear-avoidance, and self-efficacy as prognostic variables and the number of days on total benefit as outcome measure. Physical health and pain had a strong confounding effect on all three psychological variables in the model (difference range 11–58%). Physical health had the most impact on all three variables (range 35–58%). Additionally, family income and fear of income loss changed the beta of depressive symptoms by 17% and 25% respectively. Fear-avoidance for work was mostly influenced by decision latitude (15%) and psychosocial demands (26%). Heavy lifting (55%), psychosocial demands (14%) and fear of income loss (35%) had a clear confounding effect on self-efficacy. Only variables that showed a confounding effect on depressive symptoms, fear-avoidance and/or self-efficacy of more than 10% were included as confounding variables in the final Cox PH model. None of the variables showed an interaction with time, hence no interaction terms were included in the final model.

Psychological factors and duration on total benefit

Initially 73 of the 187 workers who made a claim did return to work before time of interview, of which 27 subsequently

did not have a recurrent time on benefits during follow-up. Therefore the sample used in the Cox PH regression modelling was 160.

In the basic Cox PH regression model with depressive symptoms, fear-avoidance for work and self-efficacy as the prognostic variables, both depressive symptoms (HR 0.99, 95% CI 0.97 to 1.00, $p = 0.07$) and fear-avoidance (HR 0.95, 95% CI 0.91 to 1.00, $p = 0.06$) showed a borderline significant effect on the number of days on total benefit during 12 months follow-up, whereas self-efficacy had no effect on the number of days on total benefit. This model was adjusted for age and gender.

The final Cox PH regression model is shown in table 5. A multivariate model is presented without the work related factors, and subsequently with all factors included. Adding the work related factors did not change the coefficients of the psychological factors substantially. Depressive symptoms and physical health were significant prognostic factors for the number of days on total benefit during 12 months follow-up in both models.

DISCUSSION

We analysed the prognostic value of psychological factors for the number of days on total compensation benefit during 12 months, adjusting for confounding variables. Special emphasis was given on variable selection and relationships between potential prognostic variables. Increased depressive symptoms and a poorer perceived physical health were significant predictors of more days on total compensation benefit and, as such, appear to be important risk factors for prolonged work disability. Physical health (concomitantly a significant predictor), perceived pain, psychosocial workload and fear of income loss showed the most profound confounding effect on depressive symptoms, fear-avoidance for work and/or self-efficacy beliefs. In the final prognostic model, adding work related variables did not change the model in any meaningful way. Taken together, our results suggest that when measured 4–5 weeks post-injury, depressive symptoms and physical health factors are strong predictors of prolonged time on benefits, while work related factors are less important.

Psychological factors and duration on total benefit

Several studies have shown that relationships between prognostic variables must be taken into account when building a multivariate model.^{19–20} However, these studies

Table 5 Multivariate Cox PH regression analyses with total days on benefit during 12 months follow-up being the outcome variable, and work related and non-work related factors as independent variables; basic model adjusted for age, gender and the variables that showed confounding effects on the basic variables depressive symptoms, fear-avoidance and/or self efficacy (n = 160)

Variables*	Multivariate analysis with non-work related factors		Multivariate analysis with all factors	
	HR (95% CI)	p value	HR (95% CI)	p value
Age (years)	0.99 (0.97–1.01)	0.32	0.99 (0.98–1.01)	0.55
Gender (F v M)	1.05 (0.70–1.56)	0.83	1.11 (0.74–1.67)	0.62
Depressive symptoms	0.98 (0.97–1.01)	0.05	0.98 (0.95–1.01)	0.04
Fear-avoidance	0.99 (0.94–1.04)	0.57	0.98 (0.92–1.04)	0.50
Self-efficacy	0.96 (0.90–1.01)	0.12	0.96 (0.91–1.02)	0.23
Physical health	1.03 (1.01–1.05)	0.02	1.03 (1.01–1.05)	0.02
Pain	0.97 (0.89–1.07)	0.57	0.98 (0.89–1.07)	0.62
Family income†	1.26 (0.87–1.83)	0.22	1.23 (0.85–1.79)	0.28
Fear of income loss‡	0.74 (0.47–1.16)	0.18	0.70 (0.44–1.11)	0.13
Heavy loading	–	–	0.99 (0.96–1.03)	0.75
Decision latitude	–	–	0.98 (0.95–1.01)	0.13
Psychosocial demands	–	–	1.00 (0.98–1.03)	0.91

*Variables units used in the analysis are described in table 2.

Dummy variables: † < \$60'000; ‡ often.

were directed at finding associations between work related physical and psychosocial variables. Few studies, if any, have studied the interrelationship between individual psychological variables and potential prognostic variables for the number of days on total benefit, and subsequently studied their confounding effect in a prognostic model with total days on total benefit during one year as outcome.

Lower family income of the worker was highly associated with more depressive symptoms, and subsequently had a substantial impact on the coefficients of all psychological variables in the Cox PH regression model. This suggests that within the work disability process, depressive symptoms are highly associated with workers' socioeconomic status, which is consistent with earlier findings.³⁶ Despite the confounding effect of physical health on depressive symptoms, both constructs were significant prognostic factors for days on total benefit during 12 months follow-up. This is in agreement with findings of earlier studies.^{37–38} However, it should be noted that these studies did not use a comprehensive way of selecting and including confounding variables for the psychological variables of interest as was done in the present study.

The fact that high perceived physical workload, poor physical health, and perceived pain were strongly associated with fear-avoidance for work can easily be interpreted within the "fear-avoidance" model.⁶ Pain related fear is characterised by escape and avoidance behaviours of which the immediate consequences are that work activities, expected to produce pain, are avoided. Physical health is perceived as poor and avoidance of work activities results in work disability.³⁹ Furthermore, our data indicate that one can expect fear-avoidance for work to be higher in workers with high physical and psychosocial work load. Psychosocial workload showed a confounding effect on fear-avoidance in the Cox PH regression model. The effect of fear-avoidance found in the basic model (with only the psychological variables included) was diminished in the multivariate model, which is probably due to the high association of physical health with this variable. This association has also been found in other studies.^{11–39} Hence, it may remain difficult to disentangle the effects of perceived physical health and fear-avoidance as they are so intertwined.²

Both decision latitude and psychosocial demands were associated with self-efficacy towards work. Surprisingly they hardly showed a confounding effect on the prognostic value

of self-efficacy with regard to the number of days on total benefit.³⁴ In contrast, perceived physical health was moderately associated with self-efficacy whereas its confounding effect on the prognostic value of self-efficacy for days on benefits was strong. Fear of income loss due to work disability could influence the return to work decision. Although not statistically significant, the effect of fear of income loss indicated that workers who feared income loss were likely to return to work sooner than those who did not. In a study by van der Giezen *et al* it was found that being the main bread winner shortened the duration of work disability,³² whereas other studies found prolonged work disability in workers with a high level of wage replacement benefits.¹ The foregoing suggests that the perception of some financial and/or economic threat probably acts as an economic incentive to regain work activities earlier in time.

Limitations of the study

The comparison of the participants with potential participants on select WSIB variables revealed several differences that may limit generalisability of results. The participants had more days on benefit during the 12 months follow-up than the average lost claimant. This is partly due to our inclusion criteria (i.e. at least 7 days off work during the first 14 days post-injury). Hence, our sample probably reflects those workers at risk for prolonged benefit duration. Participants in our sample were older. This is not surprising as younger workers change jobs more frequently, are more difficult to contact, and are commonly under-represented in worker surveys. In this respect, our sample is likely to be more work disabled than the population of potential participants since work disability has been shown to increase with age.⁴⁰ The final sample also had fewer upper extremity disorders than the non-participants. Further, we found that in terms of gender, employment classification and firm size, our sample was similar to the population of interest, increasing the generalisability of the study results.

Although self-report measures, as opposed to observational measurements, have been criticised as being inaccurate⁴¹ or as overestimating exposures,⁴² recent studies provide support for their use.^{28–43}

Due to the cross-sectional measure of the prognostic variables at baseline, it remains unclear whether the occurrence of a depressive state is due to being work disabled, or if instead it precedes work disability and might

actually be a risk factor for work related injury claims. Hence, depressive symptoms might already be present prior to injury.

For the purpose of this study, an explorative measure of self-efficacy was developed. A factor analysis confirmed its factor structure; however, its complete psychometric properties are not established yet. Although we determined its construct validity, from a methodological point of view, cross-validating the instrument with another population sample would be optimal to determine its general validity. To develop an adequate measure of self-efficacy for return to work, the theoretical construct of self-efficacy beliefs within the work disability process needs further exploration.⁴⁴

Conclusions

The present study clearly shows that the presence of depressive symptoms in workers on total compensation benefit due to musculoskeletal disorders significantly increases the number of days on benefit. Although the group of potential participants did not differ significantly from the final sample, the relatively small sample size in relation to the number of potential participants hampers a generalisation towards all workers with musculoskeletal disorders.

Although an increased emphasis on psychological factors is being placed in current occupational guidelines,⁴⁵ a comprehensive picture of the role of individual psychological factors on development and duration of work disability is still lacking. Our study makes a significant contribution to clarification of the role of psychological factors in the work disability process, in view of its rigorous control of confounding variables. This has implications for policies and interventions: work disabled individuals could benefit from early identification of depressive symptoms and from interventions which target psychological factors such as depressive symptoms.

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