

Occupational Psychological Factors Increase the Risk for Back Pain: A Systematic Review

Steven James Linton^{1,2}

The purpose of this review was to summarize current knowledge concerning the role of psychological workplace variables in back pain. To this end the literature on psychological factors and back pain was systematically searched and analyzed. Psychological and medical databases and cross-referencing were used to locate 975 studies. To be included in this review, studies had to have a prospective design, include a psychological predictor variable, report on back pain, and be published in English. Twenty-one studies fulfilled the criteria for psychological workplace factors. The results showed a clear association between psychological variables and future back pain. There was strong evidence that job satisfaction, monotonous tasks, work relations, demands, stress, and perceived ability to work were related to future back pain problems. Further, moderate evidence was established for work pace, control, emotional effort at work, and the belief that work is dangerous. There was inconclusive evidence about work content. The attributable fraction indicated that substantial reductions in the number of cases of back pain could be achieved if the exposure to the psychological risk factor was eliminated. Although the methodological quality of the studies varied, they were deemed to provide "best evidence," and the consistency of the findings suggests that they are relatively robust. It is concluded that psychological work factors play a significant role in future back pain problems. However, there is still a lack of knowledge concerning the mechanisms by which these operate. These results suggest that a change in the way we view and deal with back pain is needed. Applying knowledge about psychological factors at work might enhance prevention as well as rehabilitation.

KEY WORDS: psychological risk factors; work; back pain; stress.

INTRODUCTION

There are several theories that implicate psychological variables at work in the development of long-term back pain and its associated disability. For example, stress is believed to increase the risk for a number of health problems (1,2). One theory describes stress in terms of the demands work places on the individual in relation to the amount of control the person has over her/his work (2). When demands are high and control is low, negative

¹Department of Occupational and Environmental Medicine, Örebro Medical Center, 701 85 Örebro, Sweden.

²Correspondence should be directed to Department of Occupational and Environmental Medicine, Örebro Medical Center, 701 85 Örebro, Sweden; e-mail: steven.linton@orebroll.se.

stress is said to occur and this produces health consequences. A factor that may either buffer or catalyze a problem is social support. Thus, relationships at work such as between workmates as well as between supervisors and employees has been theoretically linked to stress and health. Other factors linked to back pain include whether the work is stimulating rather than boring or monotonous. Finally, psychological aspects of the workplace may influence perceptions of back pain. Since most people will at some time experience back pain, this model underscores that the psychosocial work environment may affect how the pain is perceived as well as how the individual copes with the problem at work.

Early findings of a relationship between psychosocial work factors and back pain have spurred research and there is a rapidly growing literature. Given the large number of psychological variables and the multidimensional nature of back pain, there is a need to review this literature.

The purpose of this review is to examine the published evidence concerning the role of psychological workplace factors (those emanating from the workplace) on back pain. To this end the literature was systematically searched. To ensure quality, emphasis was placed on investigations employing a prospective design as this design allows stronger conclusions than, for example, cross-section designs.

METHOD

Overview

The scientific literature on workplace psychological risk factors for back pain was accessed systematically through computerized searches. In addition, review articles and key studies were perused for studies fulfilling the inclusion criteria. Based on the prospective studies located, a table was constructed to summarize the results for workplace factors. Based on the prospective studies, conclusions were drawn about the effects of psychological variables on back pain.

Literature Search

The computerized search included Medline (1985 to January 2000), PsychInfo (1967 to January 2000) and ArbLine (a Scandinavian database in occupational medicine) as these databases cover most of the literature. The search strategy was to include articles about psychological aspects of neck pain, back pain, or musculoskeletal pain. Therefore, the following words were employed in the search: prevention, risk factor, predictor, prognosis, adaptation, psychological, probability, self care, exercise therapy, back school, health education. The search was restricted to include prospective studies, evaluation studies, randomized controlled trials, review articles, comparative studies, follow-up studies, and clinical trials since all of these may include analyses of risk factors.

Subsequently, all reviews as well as all articles fulfilling the inclusion criteria were perused to identify additional relevant citations. In all, 975 articles were identified.

The inclusion criteria were as follows:

1. Focuses mainly on back pain;
2. Describes the measurement technique for a psychological factor that is used as a predictor variable;

3. Uses a prospective design;
4. Is published in English.

Of the articles located, 21 fulfilled the inclusion criteria. The main reason for excluding studies was the lack of a prospective design (935 reports did not fulfill this criterion), while the second most prevalent reason was that the study did not employ a measure of a psychological factor (618 reports did not fulfill this criteria). It should be underscored that most clinical trials were excluded under this criterion as they do not include information on a psychological predictor variable. The third most common reason for exclusion was that the study did not deal primarily with back pain (462 studies did not fulfill this criterion). Although relevant studies using other “nonprospective” designs provide important data, they are subject to a host of factors that may bias the findings. Thus, the criteria for inclusion ensure a minimum methodological standard.

Review Procedure

To evaluate the key studies, a table was constructed. Each reference was scrutinized by the author and crosschecked with the abstract and conclusion provided in the original paper. Information about the population, the outcome variables, the main psychological predictor variables, as well as the results was extracted. For predictor variables, information is provided as to whether the measurement technique was standardized. The method of measurement for the outcome variable is also provided. Whether the relation is statistically significant (S) or not significant (NS) is noted. The attributable fraction ($RR-1$ divided by RR , where RR is the relative risk) has been calculated where appropriate. This indicates the proportion of cases that would be reduced if the exposure were eliminated. Thus the attributable fraction was calculated for all studies that reported RR (or an estimate of it) and that found a significant relationship.

Conclusions are based on the results from the table of reviewed studies. Each conclusion has been evaluated with regard to the level of evidence supporting it. A grading system has been employed based on previous work (3,4) in which

1. *Strong evidence* is consistent findings (>75% of the studies investigating the variable) from three or more prospective studies.
2. *Moderate evidence* is generally consistent support (>50% of the studies investigating the variable) from two or more prospective studies.
3. *Inconclusive evidence* refers to less than three studies or mixed findings (<50% of the studies investigating the variable).

Conclusions are also compared to the results of the previous reviews in the Discussion section.

Limitations

Although my intent was to include all relevant articles and to appraise them in a fair and scientific way, there may be several limitations to the present review. First, the search may not have identified all articles. For example, since the area is not strictly defined, authors may not have used terms included in our search strategy. Second, no specific quality ratings

were made. Although some work has been done to establish a methodology for making quality ratings for epidemiological studies (4), currently there is no accepted standardized method available. Above all, the small number of studies in each category in the current review preempted further distinction based on quality. Third, summarizing studies can result in the loss of information. Thus, the investigation's aim and setting, for example, may become blurred even though these are important. Finally, there is a risk that the tables may be evaluated simplistically (e.g. "positive" or "negative") although reality is considerably more complex.

RESULTS

Table I provides an overview of the 21 studies that met the inclusion criteria for this review. These studies are quite heterogeneous concerning the population, predictor variables, measurement techniques, and outcome variables. Eleven of the studies dealt with participants from a work or general population (5–15), while nine employed a sample of people with some form of nonchronic back pain (16–24). One study concerned patients with chronic back pain problems (25). The outcome variable in 10 studies was some form of self-reported back pain (5,6,9,10,12–15,18,21). Return to work or sick leave was employed as the outcome variable in 12 studies (8,14–18, 20–25), while a reported injury was used in two studies (7,11). Three investigations used more than one outcome measure (14,15,18). All of the studies reported at least one significant relationship between the psychosocial work environment and back pain or disability. However, a wide range of predictor variables was used and a summary is therefore provided later. Predictor variables were measured with a multiplicity of self-report items ranging from a single question to various questionnaires. Most of these instruments were constructed for the investigation and were not standardized.

Job Satisfaction

Some form of job satisfaction was studied in 14 of the reports. Job satisfaction was measured with a wide variety of self-report instruments and sometimes limited to a single question. Thirteen of the investigations found a significant relationship (5–8, 10,11,14–17,21,23,24). The study that failed to find a significant relationship investigated 134 patients on Worker's compensation, but does not state how satisfaction was measured while the outcome variable was return to work (22). Applying the grading system, there is strong evidence as 13 of the 14 studies indicated that low job satisfaction was linked to future back pain.

Monotonous Work

Six studies reported on monotonous or boring work. Of these, four reported a significant relationship (15,20,23,24), while two found no association (6,13). Thus, there is strong evidence that monotonous work is associated with back pain.

Work Relations

This variable covers social relationships at work with supervisors as well as with work-mates. Measurement techniques were diverse ranging from standardized questionnaires to

single items constructed by the researchers. Of the six studies investigating this factor, five reported a significant link (7,9,13,19,24), while one did not (10). Applying the rating system it is concluded that there is strong evidence of an association between social relations at work and future back pain.

Perceived Demands/Load

Demands represent one dimension of a well-known model for stress at work (2). This variable includes a broad definition of self-rated demands at work. Three studies reported a significant relationship (19,22,24) fulfilling the requirement for strong evidence of a connection.

Work Content

Only one study specifically reported on work content and it reported a significant relationship (9). Some other studies examined this variable as a part of the demand–decision latitude model or as a measure of stress. However, it was not possible to ascertain the specific effect of work content in these studies. As a result, it is concluded that there is insufficient evidence to draw a conclusion.

Control

Although control is a key dimension in one model of stress at work (2), only two studies were located. Both reported a significant connection between control or decision latitude and back pain (8,9). Thus, there is moderate evidence that lack of control is related to future back pain.

Pace

Work pace has been suggested as an important aspect of subjective stress. Three studies report directly on the link between work pace and back pain; two found a significant association (13,24), while one did not (6). Therefore, there is moderate evidence that work pace is associated with back pain.

Self-Reported Stress

Three studies investigated the relationship between self-report measures of “stress” and back pain. The studies vary considerably in how they measure this entity. All three of the studies report a significant relationship (12,22,25) thus providing strong evidence of an association.

Perceived Ability to Work

Some studies employed participants who were receiving some form of care and who were absent from work. Consequently, it was of interest to examine the worker’s perception of his/her ability to return to work, for example, while in occupational rehabilitation, in

Table 1. Prospective Studies of Psychosocial Work Factors and Back Pain

Study population	Design	Outcome variables	Predictor variables	Attributable fraction	Comments	References
1,542 general population, 55 year olds (575 at follow-up)	Partly longitudinal, 45 years	Back pain report (yes/no)	Job satisfaction (self-report, nonstandardized item); S ^a Mentally demanding work (self-report, nonstandardized); S	NA	69% participation	(5)
928 general population	Prospective, 12 months	LBP report past 12 months (yes/no)	Work speed: NS ^b Monotony: NS Job satisfaction: S (measures were self-reports, nonstandardized)	NA	99% participation	(6)
1,223 men and women 21-67 aircraft industry, 22% female	Longitudinal, 12 month f-u	Reported injury (injury claim or treatment at occupational health service)	Enjoy work: S Work relations: S (both measured: Modified Work APGAR)	41% (satisfaction)	The study controlled for other factors; MMPI also significant predictor	(7)
252 patients with new episode of LBP % Female not stated	Prognostic, 3 and 6 months	Reported return to work (not employed and attributed to LBP)	Job satisfaction (self-report, standardized): S	NA	Psychosocial factors correctly classify 89%	(16)
103 primary care patients, pain <72 h	Prospective, 5 assessment during 3 months	Recovery and return to work (no reported pain, VAS, or disability, Roland and Morris, not on sick leave)	Job satisfaction (self-report, not stated how measured): S	NA	Low job satisfaction one of significant factors (others = pain, previous disability, compensation, male)	(17)
128 patients with back pain >6 months, 57% female	Prospective 30 months	Work status (insurance and medical records = normal employment)	Intent to work: S Job stress: S Belief work is dangerous: S (self-reports, nonstandardized items)	NA	54% participation rate; 75% correctly classified	(25)

111 acute disc prolapse, 38% female	Prognostic, 6 months	Pain intensity (self-rated, numerical scale), recurrence (surgeon's rating yes/no), early retirement (application made)	Daily hassles at work (self-reports, standardized): S	NA	Hassles was one of two best predictors (other = depression) for early retirement	(18)
166 LBP injury report, % female not stated	Prospective, 3 months f-u	Return to work (self-report, not working due to LBP)	Perceived job demands: S Relations at work: S Perceived chance work: S Perceived blame: S (Vermont Disability Prediction Questionnaire)	NA	11 items were good predictors producing 94% sensitivity; 84% specificity; poor participation rate (37%)	(19)
121 acute back pain, 48% female	Prospective, 12 months	Sick leave (number of sick days, National Insurance Authority)	Monotonous work (self-report, nonstandardized): S	NA	Found function and pain intensity not to be related	(20)
6,894 male and 3,414 female office workers	Prospective, average 4 years	Sick leave ≤ 7 days; Sick leave > 7 days (workplace records)	Work control: S Job satisfaction: S Pace: S (self-report, nonstandardized)	< 7 days sick: Control: 55% m/32% f Satisfaction: 49% m/25% f Pace: 52% m/44% f Support: 31% m/7% f Conflict: 1% m/38% f > 7 days sick: Control: 38% m/48% f Satisfaction: 33% m/20% f Pace: 32% m/0% f Support: 33% m/17% f Conflict: 28% m/31% f	Controlled for other variables; all psychological factors S before adjustment; job satisfaction S only in age adjusted models	(8)
188 female patients with back pain < 1 year	Prospective not clear, 6 months	Return to work (self-report) Spontaneous recovery (Oswestry LBP Questionnaire)	Job satisfaction (self-report, standardized): S	NA	92% participation; included guidance, influence, learning new, feedback, communication etc.	(21)
134 patients on worker's compensation	Prospective, 6 months	Return to work (not stated how measured)	Stress: S Job satisfaction: NS Perceived load: S (self-reports, nonstandardized)	NA		(22)

(Continued)

Table I. (Continued)

Study population	Design	Outcome variables	Predictor variables	Attributable fraction	Comments	References
902 workers, 32% female	Prospective, 10 year f-u	LBP (1. rated frequency, 2. examination)	Work content: S Work control: S Social relations: S (self-report, standardized)	NA	Men = all; women = S for white collar, blue collar only work control S	(9)
142 acute spinal pain, 65% female	Prospective, 6 months	Sick leave (reported number of days)	Monotonous work: S Perceived work function: S Job satisfaction: S Belief should not work with pain: S (self-report, standardized)	NA	Adjusted for confounders; five best predictors were fear-avoidance beliefs, perceived future pain, perceived work function, stress, and previous sick leave	(23)
4,501 general population, 55% female	Prospective, 12 months	New episode of back pain (LBP > 1 day, yes/no)	Job satisfaction: S Social relations: S Sufficient money: S (self-report, nonstandardized)	Satisfaction: 41% Social relations: 29%	Dissatisfied twice as likely to experience a new episode	(10)
131 nurses	Prospective, 18 months	Back injury (claims at work)	Job satisfaction (RR = 2.29, 1.08-4.85; self-report, nonstandardized): S	56%	91% participation rate	(11)
167 concrete workers, 161 house painters	Longitudinal, 5 years	Sciatic pain (self-report, pain radiating to a leg)	Job stress (self-report, nonstandardized): S	17%	The effect was relatively small	(12)
From 2,222 male longshoremen, construction, carpenters, and office workers selected 1,149 without pain	Prospective, 36 months	Cumulative incidence (3 years) of sciatic pain (self-report, pain radiating to a leg)	Work pace: S Monotonous work: S Problems with workmates/supervisors: S (self-report, nonstandardized)	48%		(13)

269 aircraft assembly workers	Longitudinal, 12 months	1. Compensation past year (worker's compensation) 2. Absenteeism past year (company records) 3. Work limitation past week (rating) 4. Back symptom past week (duration, quality, frequency)	Boredom: NS Job satisfaction: NS Outcome 1 (OR ≥ 3.0) (self-report, nonstandardized)	66%	76% participation	(15)
142 workers on sick leave > 10 days for LBP, participation = 85%	Prospective, 3 and 12 months	1. Functional disability (Roland and Morris Disability Questionnaire) 2. Time to return-to-work (computerized records, days to return)	12 months for function: Lack of work variation: S Emotional (work) effort: S Lack of energy at work: S Social isolation at work: S Job satisfaction: S For time to work: Relations with colleagues: S Work tempo: S Work quantity (self-report, nonstandardized): S	Lack of variation: 23% per 10 units (0-100 scale) Satisfaction: 69%	The main factors found were radiating pain, functional disability at pretest, relations with colleagues, and high work tempo/quantity	(24)
238 males with heavy work	Longitudinal, 12 months	1. New episode LBP (self-report, yes/no) 2. Sick leave, LBP (self-report, number of days)	Job satisfaction (self-report, standardized): S	New episode: 17% Sick leave: 17%	Controlled for earlier back pain, age, etc.	(14)

Note. *m* for males; *f* for females.

^aS = significant.

^bNS = not significant.

relation to actual return-to-work at the follow-up. Three investigations included the patient's own rating of his/her ability to perform work or return to work as a predictor variable. These three investigations all reported a significant relationship (19,23,25). They deserve some description. In the Linton (23) report, participants were asked to rate their perceived chance of being able to return to work as well as their ability to perform work (function) and both were significant predictors. Similarly, Hazard (19) asked participants to rate how certain they were that they would be working in 6 months and this was related to actual return. However, Fishbain (25) asked patients about their intent to return to work during a rehabilitation program and also reported the relationship to be significant. Thus, the results of these studies provide strong evidence that perceived ability to work is associated with future back pain disability.

Belief That Work is Dangerous

Two studies evaluated the relationship between self-ratings of the belief that work is dangerous for back pain and disability. These studies were conducted with participants having pain problems and both found an association between such beliefs and back pain disability (23,25). Applying the rating scheme it is concluded that there is moderate evidence of a relationship.

Perceived Emotional Effort

Emotional effort at work is an interesting variable since it may be related to modern forms of stress. Two research papers reported significant relationships between emotional effort and back pain disability (18,24). Hasenbring (18) employed a measure of daily hassles at work, while van der Weide (24) used "emotional effort" at work as the predictors. Thus, there is moderate evidence that perceived emotional effort at work is related to back pain disability.

Others

One study reported on perceived blame for a back injury and found a significant relationship with back pain disability (19). There is therefore insufficient data to draw any conclusion.

Attributable Fraction

The degree to which the back pain problem might be reduced is estimated with the attributable fraction. This provides an indication of the proportion of cases that would be reduced if exposure to the "risk factor" were entirely eliminated. Nine of the studies reported sufficient data so that this factor could be calculated. However, it is not possible to average these across studies since the attributable fraction is specific to the risk and outcome variable in any given study. Nevertheless, a perusal of Table I indicates that the attributable fraction ranges from 0% with specific regard to the effect of pace on sick leave (>7 days) for females (8) to 66% for job satisfaction (15). In general, the broader the measure of a risk factor

(e.g. job satisfaction as opposed to pace), the higher the attributable fraction. The majority of the studies reported attributable fractions in the upper 30s or lower 40s. Taken as a whole the data are variable, but indicate that the number of cases of back pain might be significantly reduced if the exposure to these risks were eliminated.

Relative Influence of Psychological Factors

The relationship between psychological factors and future back pain might be confounded by other factors such as physical aspects of work (e.g. ergonomics or workload) or the demographic aspects of the population. However, 18 of the 21 studies in some way attempted to control for factors that might bias the results. Generally, potential confounding variables were measured and adjusted for statistically. These factors often included demographic variables such as age, gender, and smoking habits. Other workplace factors, for example, physical workload were included less frequently.

DISCUSSION

Based on the studies reviewed here there is mounting evidence that psychological workplace factors are related to future episodes of back pain and its related disability. Of the 11 types of psychological risk factors at work that were investigated, there was strong evidence for six including job satisfaction, monotonous work, work relations, work demands, stress, and perceived ability to work. In addition, moderate evidence was found for control, work pace, emotional effort at work, and the belief that work is dangerous. Only one factor, work content, had inconclusive evidence supporting its relationship to back pain. The strength of the relationships varies considerably between studies, but appears to be moderate. Yet, the results suggest that eliminating psychosocial risk factors at work could reduce the number of cases of back pain by as much as 40%. Despite huge disparities between investigations and some methodological problems outlined later, these studies may be regarded as providing “best evidence” since they employed prospective designs and have good rates of participation. Thus, the basic design of these studies is relatively strong. However, the studies do not provide a clear understanding of the mechanisms or of the developmental process whereby “normal” acute pain becomes chronic.

The robustness of the association between psychological factors and back pain is basically supported by the findings of previous reviews. Weiser and Cedrashy (26) reviewed 16 longitudinal studies on chronic pain and conclude that the impact of job satisfaction and work stress may be significant. Similarly, in a review of 59 studies with various designs (27) work demands, control, monotonous work, work load, pace, and social support were found to be significant risk factors. Bernard and associates (28) examined 14 longitudinal and cross-sectional studies and found a connection between back injury and perceived workload as well as job satisfaction. However, they only found limited support for control and monotonous work. The size of the relationships was characterized as modest. Vingård and Nachemson (29) reviewed 13 studies and also found satisfaction to be consistently related to back pain. Moreover, they specifically examined job strain (the combination of high demands and low control). Eight studies reported a relationship between job strain and back pain. On the other hand, they found only weak evidence for a relationship between back pain and monotonous work or job stress. Finally, Teasel and Bombardier (30) found

evidence of a relationship between job satisfaction and back pain, while Hoogendoorn (4) found strong evidence that social support at work and job satisfaction are risk factors, but insufficient evidence for work pace, perceived demands, content, and job control. Some of the discrepancies in findings may be explained by methodological factors such as the composition and size of the population, severity of the problem, measures of predictors, time of outcome, outcome criteria, study design, and possible treatment received between initial assessment and outcome.

The general quality of the studies appeared to be acceptable. By selecting prospective investigations a minimum standard was set. Moreover, the only review that has employed methodological ratings found that 69% of the articles meeting their inclusion criteria were of high quality (4). Nevertheless, there is great diversity in the methodology and several prominent problems. Assessment methods are important as the same concept has been measured in many different ways opening the door for blurred interpretations. The measures used in the investigations under review usually lacked psychometric studies of reliability and validity. Consequently, two studies claiming to measure the same entity may in fact be measuring quite different aspects. Another concern is the definition and measurement of the outcome variable. Again, there was considerable variation from study to study and this may have considerable consequences on the results obtained. Consider, for example, the difference between the simple report of having had back pain during the past year with dysfunction, health-care visits, or sick leave.

Thus the relationships reported on may be quite dependent on the risk and outcome variables selected. Some examples may suffice to illustrate the point. A given risk factor might, for instance, interact with the outcome variable employed. The belief that work is dangerous would seem to be relevant for the outcome variable of return to work, but possibly not for the onset of back pain. Similarly, some risk factors may only be relevant for certain types of work. As an illustration, for assembly line employment, work pace may be strongly related to future back pain complaints, while for professionals it may have less relationship.

In a related way, few investigations have amply treated the temporal aspects of the problem. The data reviewed suggest that certain factors are important very early on while others may be important at first consultation or a recurrence. Moreover, the reciprocal nature of pain and psychological variables was almost always treated as unidirectional such as depression causing pain rather than pain affecting depression.

Even though all studies were prospective, methodological shortcomings were frequently observed. In addition to the problems just noted, these ranged from selection bias and inappropriate use of psychological measures to the intercorrelation of measures. The use of self-ratings as both the dependent and independent variable is a particular problem that may inflate risk estimates (4,29). Although the methodological quality is acceptable, there is a need to improve the quality of prospective studies in this area.

Given the prospective designs, it is tempting to conclude that the observed relationships are causal, but this may be flagrantly incorrect. Although the relationships may be temporal, they need not necessarily be causal in nature. For example, although job dissatisfaction may occur before the back pain (temporal relationship) a third factor such as heavy work or poor relations with supervisors might be the actual cause. In addition, it may be likely that several factors in conjunction are the cause of the problem. Caution in drawing conclusions concerning causality does not lessen the value of the reviewed findings, but points to the need for experimental or other designs to advance our understanding.

Considerable research has examined the blatant relationship between psychosocial variables and back pain, but few have penetrated the reasons why these variables might be important. A challenge for future research is therefore to devise studies that include a theoretical perspective as to why a variable might be important. Too often studies have simply employed a convenience measure of a “psychological” variable, without considering why or how the variable might work. With a theoretical model, stronger designs might be used that would provide answers to specific questions.

OVERALL CONCLUSIONS

Based on the review of these studies it is concluded that there is strong evidence that job satisfaction, monotonous work, work relations, job demands, stress, and perceived ability to work are related to future back pain. Moreover, there is moderate evidence that control, work pace, the belief that work is dangerous, and emotional effort at work are associated with future back pain, while there is only inconclusive data concerning the role of work content and back pain.

Given these findings, significant changes in the way we view and deal with back pain might result in enhanced prevention and treatment. For example, including occupational psychological factors might significantly improve the assessment of patients. In fact, the identified variables might help us identify people at risk for developing long-term problems and thereby enhance the possibility of initiating early, preventive interventions. There is also a need to determine more exactly the mechanisms by which these factors operate. If occupational psychological factors play a role in back pain, then interventions might be designed that *specifically* deal with these problems. Utilizing such interventions would be expected to result in more effective care and prevention.

REFERENCES

1. Sauter SL, Murphy LR. *Organizational risk factors for job stress*. Washington DC: American Psychological Association, 1995.
2. Karasek R, Theorell T. *Healthy work: Stress, productivity, and the reconstruction of working life*. New York: Basic Books, 1990.
3. van Tulder MW, Assendelft WJJ, Koes BW, Bouter LM. Method guidelines for systematic reviews in the Cochrane collaboration back review group for spinal disorders. *Spine* 1997; 22(20): 2323–2330.
4. Hoogendoorn WE, van Poppel MNM, Bongers PM, Koes BW, Bouter LM. Systematic review of psychosocial factors at work and in the personal situation as risk factors for back pain. *Spine* 2000; 25(16): 2114–2125.
5. Bergenuud H, Nilsson B. Back pain in middle age: Occupational workload and psychologic factors: An epidemiologic survey. *Spine* 1988; 13: 58–60.
6. Biering-Sörensen F, Thomsen CE, Hilden J. Risk indicators for low back trouble. *Scand J Rehab Med* 1989; 21: 151–157.
7. Bigos SJ, Battié MC, Spengler DM, Fisher LD, Fordyce WE, Hansson TH, Nachemson AL, Wortley MD. A prospective study of work perceptions and psychosocial factors affecting the report of back injury. *Spine* 1991; 16(1): 1–6.
8. Hemingway H, Shipley MJ, Stansfeld S, Marmot M. Sickness absence from back pain, psychosocial work characteristics and employment grade among office workers. *Scand J Work Environ Health* 1997; 23(2): 121–129.
9. Leino PI, Hänninen V. Psychosocial factors at work in relation to back and limb disorders. *Scand J Work, Environ Health* 1995; 21(2): 134–42.
10. Papageorgiou AC, Macfarlane GJ, Thomas E, Croft PR, Jayson MIV, Silman AJ. Psychosocial factors in the workplace: Do they predict new episodes of low back pain? *Spine* 1997; 22(10): 1137–1142.

11. Ready AE, Boreskie SL, Law SA, Russell R. Fitness and lifestyle parameters fail to predict back injuries in nurses. *Can J Appl Physiol* 1993; 18(1): 80–90.
12. Riihimäki H, Wickström G, Hänninen K, Luopajarvi T. Predictors of sciatic pain among concrete reinforcement workers and house painters: A five year follow-up. *Scand J Work Environ Health* 1989; 15: 415–423.
13. Riihimäki H, Viikari-Juntura E, Moneta G, Kuha J, Videman T, Tola S. Incidence of sciatic pain among men in machine operating, dynamic physical work, and sedentary work: A three year follow-up. *Spine* 1994; 19(2): 138–142.
14. van Poppel MNM, Koes BW, Devillé W, Smid T, Bouter LM. Risk factors for back pain incidence in industry: A prospective study. *Pain* 1998; 77: 81–86.
15. Rossignol M, Lortie M, Ledoux E. Comparison of spinal health indicators in predicting spinal status in a 1-year longitudinal study. *Spine* 1993; 18(1): 54–60.
16. Cats-Baril WL, Frymoyer JW. Identifying patients at risk of becoming disabled because of low-back pain: The Vermont Rehabilitation Engineering Center predictive model. *Spine* 1991; 16: 605–607.
17. Coste J, Delecoeuillerie G, Cohen de Lara A, Le Parc JM, Paolaggi JB. Clinical course and prognostic factors in acute low back pain: An inception cohort study in primary care practice. *Br Med J* 1994; 308: 577–580.
18. Hasenbring M, Marienfeld G, Kuhlendahl D, Soyka D. Risk factors of chronicity in lumbar disc patients. A prospective investigation of biologic, psychologic, and social predictors of therapy outcome. *Spine* 1994; 19(24): 2759–2765.
19. Hazard RG, Haugh LD, Reid S, Preble JB, MacDonald L. Early prediction of chronic disability after occupational low back injury. *Spine* 1996; 21(8): 945–951.
20. Hellsing AL, Linton SJ, Källemark M. A prospective study of patients with acute back and neck pain in Sweden. *Phys Ther* 1994; 74(2): 116–124; discussion 125–128.
21. Hurri H. The Swedish back school in chronic low back pain II. Factors predicting the outcome. *Scand J Rehabil Med* 1989; 21: 41–44.
22. Lancourt J, Kettelhut M. Predicting return to work for lower back pain patients receiving worker's compensation. *Spine* 1992; 17: 629–640.
23. Linton SJ, Halldén K. Can we screen for problematic back pain? A screening questionnaire for predicting outcome in acute and subacute back pain. *Clin J Pain* 1998; 14(3): 209–215.
24. van der Weide WE, Verbeek JHAM, Sallé HJA, van Dijk FJH. Prognostic factors for chronic disability from acute low-back pain in occupational health care. *Scand J Work Environ Health* 1999; 25: 50–56.
25. Fishbain DA, Cutler RB, Rosomoff HL, Khalil T, Steele-Rosomoff R. Impact of chronic pain patients' job perception variables on actual return to work. *Spine* 1997; 13: 197–206.
26. Weiser S, Cedraschi C. Psychosocial issues in the prevention of chronic low back pain—a literature review. *Baillieres Clin Rheumatol* 1992; 6(3): 657–684.
27. Bongers PM, de Winter CR, Kompier MA, Hildebrandt VH. Psychosocial factors at work and musculoskeletal disease. *Scand J Work Environ Health* 1993; 19(5): 297–312.
28. Bernard BP. Work-related musculoskeletal disorders and psychosocial factors. In: Bernard BP, ed. *Musculoskeletal disorders and workplace factors: A critical review of epidemiologic evidence for work-related musculoskeletal disorders of the neck, upper extremity, and low back*. Washington, DC: U.S. Department of Health and Human Services, 1997, pp. 7-1;7-16.
29. Vingård E, Nachemson A. Work-related influences on neck and low back pain. In: Nachemson A, Jonsson E, eds. *Neck and back pain: The scientific evidence of causes, diagnosis and treatment*. Philadelphia: Lippincott, William & Wilkens, 2000, pp. 97–126.
30. Teasell RW, Bombardier C. Employment-related factors in chronic pain. Chronic pain initiative: Chronic pain expert advisory panel report. Toronto: Ontario Workplace Safety Insurance Board, 2000.