REPORT

The role of beliefs, attitudes, values and psychological factors in the development of work disability with a focus on musculoskeletal pain

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This is a working document.

General introduction

Although it is often assumed that sick leave and various forms of work disability are directly related to the degree of injury or illness, the relationship is in fact quite complex. The relatively high levels of sickleave and work disability that are a prominent problem in many industrialized countries are difficult to explain in terms of the usual medical model. According to the medical model a disease is diagnosed and treatment is then focused on alleviating the disease. However, many people are on sick leave for problems like low back pain or fatigue where there is seldom a clear diagnosis showing disease. Therefore, a number of authors have pointed to other factors related to the illness itself, the patient, health-care providers, the work place, family, compensation systems and society in an attempt to explain why some people may be on sick leave or receive work disability while others with apparently similar symptoms are not (e.g. Coutu et al, 2007; SBU 2003). The biopsychosocial approach is therefore often considered since it provides insight into the individual's interactions with his/her environment (Coutu 2007). Among the factors in such models, the way in which individuals interpret their illness, i.e. their representations, beliefs, attitudes, thoughts and feelings they hold, are associated with the use of coping behaviors which in turn are related to how well the individual manages and adjusts.

This report deals with the impact psychological risk factors, with a special focus on beliefs, attitudes and values, have on sick leave and work disability. A perusal of a modern dictionary as well as the social psychological literature provides definitions of these rather intricate words and concepts. A belief is a cognitive representation that a statement or situation is true, even though this may not have been actually demonstrated. An attitude on the other hand is a complex mental state involving beliefs, feelings, values and dispositions to act in certain ways. Finally, values are considered to be deeply held beliefs about what is right or wrong. Thus, beliefs, attitudes and values concern cognitive perceptions, feelings and thoughts and are demonstrated via overt behavior like actions or verbal statements. While other types of variables e.g. the nature of the medical condition may be of significance, these

psychological factors have been put forward as some of the foremost determinants of the development of sickleave and work disability.

Attitudes, beliefs and values are obtained from social representations in the family, society and culture as well as from personal experience (Coutu, Baril, Durand, Côt'é, & Rouleau, 2007). These are related to other psychological factors and are important because they seem to predict/relate to actual behavior. Indeed, as will be seen with for example illness perceptions and expectations, various beliefs and attitudes are clearly related to sick leave, work capacity, and disability.

Psychological factors cover a realm of behavioral, cognitive and emotional factors. The research to date has mainly focused on these factors on an individual basis or in connection with the person's work environment. Individual factors suspected of influencing illness include behaviors (e.g. coping strategies employed or avoidance), cognitions (e.g. beliefs that work is harmful, attitudes towards work, catastrophizing), and emotions (e.g. feeling distressed, depressed or anxious). At the work place, factors like job satisfaction, affiliation with the workplace, and engagement have also been suspected as central factors.

Aim. The purpose of this report is to examine the scientific evidence on how attitudes, beliefs and values as seen in psychological factors may impact on sick leave and work disability. The psychological factors examined are cognitive, behavioral, and emotional variables on an individual level and as they are relevant in the work situation. Particular attention is given to studies that specifically deal with beliefs, attitudes, and values. The outcomes of interest are sick leave, work disability (e.g. early pension), and work capacity.

Overview of the report

This report begins with a background about the role of psychological variables in health and ill-health. It then proceeds to a general review of how various beliefs and attitudes may impact on sick leave and work capacity. Because a considerable amount of the literature on this issue falls in the area of musculoskeletal pain, the subsequent section presents a review of the psychological risk factors identified so far for this disorder. Finally, a discussion puts the findings into perspective.

Background

The high, and in some cases increasing, levels of sick leave and work disability in industrialized countries has been a reason for concern. For some complaints, the cost of compensating reduced work capacity is far higher than the cost of treatment (SBU—see study comparing back pain with others). Indirectly, reduced work capacity impacts negatively on the gross national product (SBU). Perhaps the most important reason for concern however, is that these illnesses reflect considerable suffering. Although the law in most countries requires that a disease/illness must be present and that this leads to clear reduced work capacity, this relationship is quite complex. This is particularly true when sick leave becomes extended and there is a development towards a long-term (chronic) problem. For musculoskeletal disorders, about 10% of those suffering back pain nevertheless consume more than 75% of the resources since they are receiving long-term compensation for reduced work capacity (Linton 200*?*). Consider a postal survey in Sweden to more than 40 000 individual(Eriksson, et al., 2008). It was found that more than two-thirds suffered both musculoskeletal pain and psychological symptoms e.g. as burnout or depression. And, of those with more than 3 months sick leave, more than a third nevertheless rated their health as “good” or very good (Eriksson et al, 2008). Thus, there does not appear to be a simple, direct relationship between sick leave and the extent of a single disease. Consequently, psychological and social factors have been investigated in order to understand the relationship.

In order to investigate psychological and social factors these may be considered from a theoretical model. The advantage of such models is that they provide a framework for organizing results and understanding the potential mechanisms involved. They may also generate hypotheses for research.

Models

A number of models that attempt to explain how psychosocial factors may impact on health and workability perceptions have been developed. The biopsychosocial model is perhaps the most well-known. However, the model simply postulates that all three of these entities (biological, psychological, and sociological) are involved in health and illness. It provides a way of organizing information, but it does not generate ideas about mechanisms or expected results.

Symptom perception model

A model of symptom perception and behavior has also been developed. One variety of this model shown in figure 1 relates to pain, but in fact it is relevant for a variety of different symptoms (Linton, 2005). The model highlights the impact of cultural, social and family factors as a framework from which symptoms are perceived. It also shows the relevance and interrelationship between *attention/vigalence, cognitive interpretation,* and actual *behavioral coping*. In essence it shows that psychological processes

involving emotional and cognitive aspects are essential in directing attention towards or away from a signal (e.g. a symptom) as well as in interpreting what that signal means (a dangerous symptom or just a “natural twitch”). This in turn, is associated with the coping strategy employed. Finally, the role of learning is underscored in that the consequences of the coping behavior influence not only the overt behavior but also the cognitive, emotional, and attention parts.

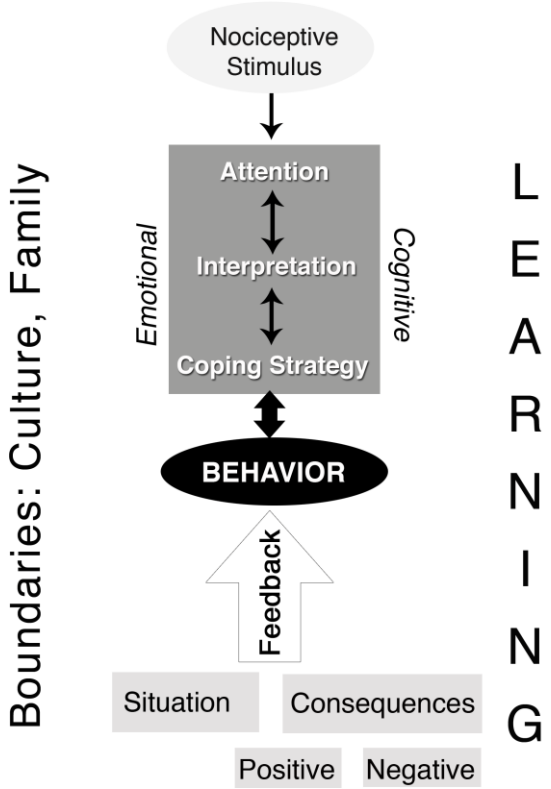

Figure 1; Symptom perception model in here

Misdirected problem solving model

This model is of special interest because it shows a possible mechanism for why some patients may (remain on sickleave and) persist to seek a solution e.g. a “cure” that is actually not viable (Eccleston & Crombez, 2007). Humans are amazingly gifted at solving problems and, according to this conceptualization, have an innate ability and propensity to do so. Figure 2 illustrates the model and shows that a symptom normally triggers some worry and vigilance that often leads to seeking help. In this process the symptom or “problem” will be framed. For example, it might be seen as a “medical” problem or it might be framed as an “ergonomic” problem. This is a vital step because the attempted problem solving is based on this frame. Indeed, the framing of the problem is easily understood in term of attitudes and beliefs. It is also clear that this framing might be influenced by family, the workplace, as well as health care professionals. Once the problem is framed, problem-solving is initiated. IF the problem has been correctly framed, then the problem solving may well be successful. However, in many modern disorders such as musculoskeletal pain, stress, chronic fatigue, and burnout, there is seldom a diagnosable disease nor is there a simply connection with factors e.g. ergonomics. Consequently, the attempted problem solving solution may well be unsuccessful. As the model shows this leads to more worry, vigilance, and a narrowing of the framing. Thus, problem-solving skills exist but they are misdirected and become inflexible.

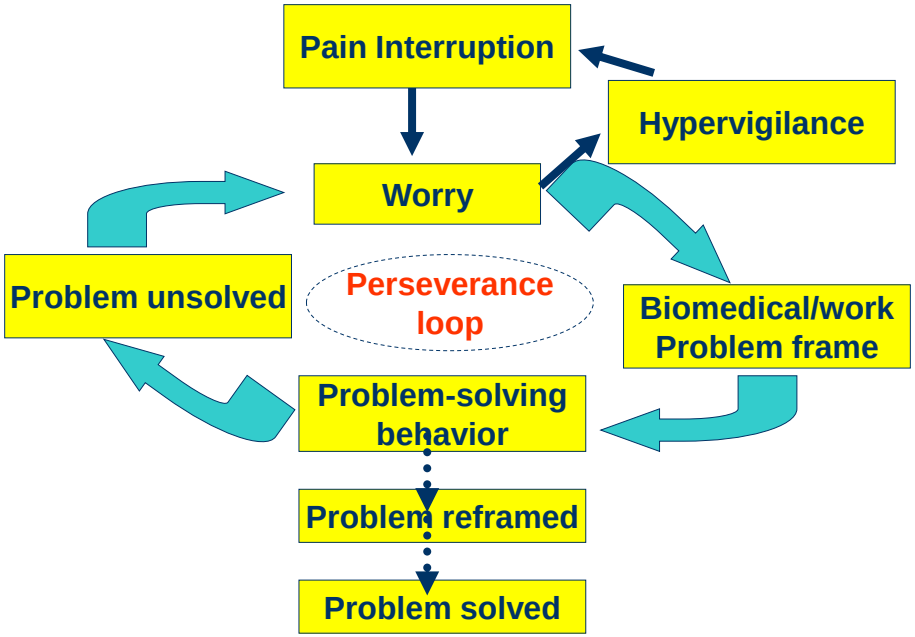

Figure 2; Misdirected problem solving in here

How do psychological factors influence ill-health?

One reason psychological factors have been studied as possible risk factors is that they may influence the need for sick leave and disability in a number of ways (e.g. Knardahl, 2005). First, they may have a direct impact on biological processes e.g. the secretion of hormones. Feeling stressed might result in higher levels of muscle tension which in turn causes the symptom of pain. Second, they may influence perceptions of health and illness. For example, depression might color our perception of a symptom and make it more prominent. Third, the biological and psychological processes above may result in altered work behavior that increases exposure. Fourth, there may be indirect effects e.g. on attention and memory that lead to biases that enhance symptom perception. Patients may be particularly vigilant for certain symptoms and might selectively remember negative episodes so that this in itself enhances symptom perception.

A model that incorporates a variety of variables and possible mechanisms will serve an example. The fear-avoidance model (Vlaeyen & Linton, 2000) was developed to stimulate research into biopsychosocial factors in the development of disability due to persistent pain. Figure 3 illustrates this model graphically. Although the model was first developed for back pain it has now been applied to a wide variety of symptoms including fatigue and cardiovascular symptoms (Jerone). In short, the model suggests that for a smaller number of people one may sometimes react to the symptom (e.g. pain) with catastrophic thoughts that are associated with fear and worry. Further, these might enhance vigilance for signs that the "catastrophe" might actual be coming true. This automatically results in an increase in muscle tension. Thus, there is an effect on attention and physiology both of which can increase the perception of the symptom. The thoughts, worries, and fears are associated with a belief system. Indeed, there are several measurement techniques to assess catatstrophizing (Pain Catastrophizing Scale) as well as fear avoidance beliefs for movement (Tampa Scale & FABQ) and work (FABQ-.w). The fear and catastrophizing then lead to behavioral avoidance. Avoidance would be specific to the thoughts, worries and fears e.g. avoiding bending if the fear is that a nerve might be severed if such a movement were done. In time this would generalize and result in a decrease in activity levels which in turn would invoke a depressed mood. The end result is a vicious circle that might catalyze the development of persistent disability due to pain.

Reviews of the literature show that this model has considerable support (Leeuw, et al., 2007; Lohnberg, 2007; Vlaeyen & Linton, 2002).

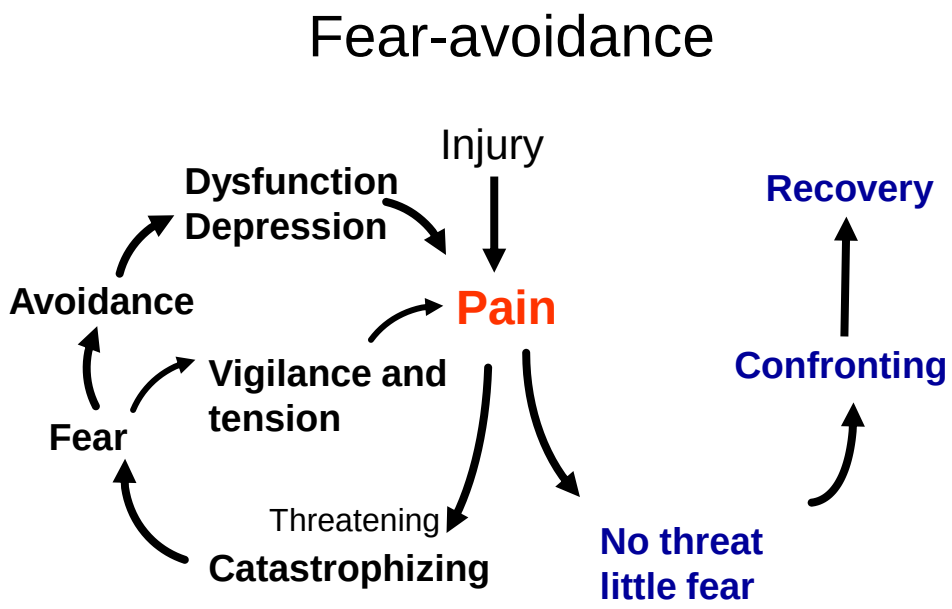

Figure 3; Fear avoidance in here

Review of the effects of beliefs, attitudes, and on sickleave and work disability

This section concerns risk factors for sick leave or other forms of work disability. Although this is not a systematic review given the time constraints for the report, the literature has been searched in PubMed, PsychInfo and Google Scholar with the words *risk factors, psychological, psychosocial, beliefs, attitudes, values* and the outcomes of *sickleave, sick absenteeism, disability, work disability*. One difficulty in locating the relevant literature is that studies are often symptom or disease specific. Thus, rather than dealing with sickleave per se, many studies are concerned with a specific problem and this is why there is a section specifically dealing with musculoskeletal problems. Further, some of the literature focuses on the risk factor rather than specifically on the outcome of work capacity also making it difficult to locate all of the pertinent investigations. Indeed, similar problems have been described earlier (Swedish Council on Technology Assessment in Health Care, 2003) and this is why the SBU also chose to describe sickleave in general and to then focus on specific disorders.

An additional difficulty that needs to be considered when interpreting these results is the problem of separating the effects of a factor on the illness from the effects of the factor on being sicklisted for the illness. In other words, some factors may be related to getting the illness, but not everyone with the illness will be off work because of it. In fact, for most diagnoses sufferers are not off work.

How do beliefs and attitudes affect sick absenteeism in general?

Being off work sick is a complex phenomena based on the judgments of several people including the patient, the patient's family as well as a doctor. Rules for being off work sick vary considerably between countries making comparisons across studies tedious. However, to be off work sick at first involves the patient's belief that (s)he has an illness/disease and that it affects work capacity. In most settings self-induced sick leave is limited to short term absence e.g. a maximum number of days. Then a doctor's

certificate is needed. Indeed, such a certificate is needed for all long-term sickleave as well as for receiving early pensions. Consequently, beliefs and attitudes might affect the judgment of the patient and their behavior in pursuing treatment and a sick certificate.

A comprehensive review of the literature on the causes and consequences of sickleave in general was conducted by the authorities in Sweden (Swedish Council on Technology Assessment in Health Care, 2003). They report that the most frequent reasons for being on sickleave are musculoskeletal and psychiatric disorders. Because of the limited data and quality of the studies only a few conclusions could be made concerning background factors and work. The data were too sparse to make any analysis of the effects of beliefs, attitudes, and values. However, attitudes toward fellow workers and leadership were mentioned. Eight studies dealt with the effects of support from co-workers or supervisors. The results were mixed: no correlation in two studies, one a correlation, two found a correlation for men but not women, and one found a correlation for women but not men. Finally, a study by Messing (Messing, Tissot, Saurel-Cubizolles, Kaminski, & Bourgine, 1998) reported a connection between sick absenteeism and conflicts with supervisors, but only for women. Because of the diversity in results, the report concludes that no clear connection could be deduced.

A recent dissertation has examined the factors associated with a patient being given a sick certification or not (Norrnén, 2010). These studies are based on 65 general practitioners and 642 consultations. The most common reasons for the consultation were infectious diseases (173), musculoskeletal complaints (137) and psychological disorders (24). The most important variable in the decision to provide a sick certificate was the patient's own belief about work ability. Particularly for the musculoskeletal consultations the work environment was often perceived as the "cause" of the problem. Indeed, worrying about the illness or possible risks when returning to work increased the likelihood of the patient being sick listed. The patient's beliefs were found to interact with the doctor's beliefs in the sick certification process. Thus, this work supports the idea that the attitudes and beliefs the

patient has about the cause (work related), work capacity (not able to do work) and ensuing worry about the illness and return to work are related to an increased likelihood of being provided with a sick certificate.

A systematic review has examined the literature on risk factors for long-term sick leave (Dekkers-Sanchez, Howing, & Sluiter, 2008). These authors systematically rated the quality of all the studies identified in the data bases Medline, EMBASE, PsychINFO and Web of Science. In all, 2527 articles were located of which a closer examination showed that 433 were relevant for quality rating. However, after quality ratings and full examination only five articles met the author's criteria for inclusion. From these articles 16 factors were found to be significantly associated with the long-term sick leave. Many of these were factors that are not modifiable such as history of previous sick leave, age, income, and a history of unemployment. However, two factors of relevance for the present report appeared. First, there was evidence that the individual's own prediction of not being able to return to work increased the risk for future long-term sick leave. This supports the findings in the section on *expectations.* Second, was the work place factors of low job satisfaction, and the perception of not being welcome back at work.

Two final reviews deserve mention. First, is a review of the determinants of the duration of disability (Krause, Frank, Dasinger, Sullivan, & Sinclair, 2001). They found that there was some evidence for two a belief of interest to this report. The perception of an inability to change work was associated with longer duration of sickleave. Second, a review concerning the determinants of sick leave found that workers' opinions of their supervisor affects sick leave where higher regard was linked with less sick leave (Beemsterboer, Stewart, Groothoff, & Nijhuis, 2009).

Taken together the above studies show that there is some evidence that beliefs about the illness can be related to sick leave and disability. The next section focuses on such perceptions more specifically.

Illness perceptions

A sizeable literature exists concerning how different perceptions of illness affect health care utilization and work capacity. In general, these beliefs have been found to be determinants of behavior such as function (Petrie & Weinman, 1997)(ref++). Illness perceptions are the organized cognitive representations or beliefs that patients have about their illness (petrie). They include the following components:

- **Identity.** The name and range of symptoms the patient believes are associated with the condition
- **Causes.** Beliefs about the factors that cause the condition
- **Illness duration and time pattern.** The length of the disorder (e.g. chronic) as well as the pattern of symptoms (e.g. coming and going or constant)
- **Personal consequences.** Beliefs about how the illness affects the patient specifically and his/her family. The consequences include affects on work.
- **Control.** This involves how much the patient and treatment can control or cure the problem.

Two important factors about these beliefs have been pointed out (Petrie, Jago, & Devcich, 2007). First, patient's beliefs about their condition are often at variance from those who are treating them. This may be because the staff are seldom aware of a patient's beliefs since they rarely ask about them in consultations. Second, patient perceptions vary widely.

The following items are included in a brief measure of illness perceptions and serve as examples of the beliefs involved.

1. **How much does your illness affect your life?**
2. **How long do you think your illness will continue?**
3. **How much control do you feel you have over your illness?**
4. **How much do you think your treatment can help your illness?**
5. **How much do you experience symptoms from your illness?**
6. **How concerned are you about your illness?**
7. **How well do you feel you understand your illness?**
8. **How much does your illness affect you emotionally? (e.g. does it make you angry, scared, upset or depressed?**
9. **Please list in rank-order the three most important factors that you believe caused your illness. *The most important causes for me:-***

1. _____

2. _____

3. _____

Several studies have found that three illness perceptions predict future health care utilization and function. These are associating more symptoms with their illness, believed longer timeline and believed more severe consequences (Petrie, et al., 2007). For example a series of studies in Denmark showed that the presence of these beliefs at pretest were associated with more health care use and poorer function at a two year follow-up (Frostholm, et al., 2007).

Recedntly the role of illness behavior perceptions was studied in a group of patients undergoing cardiac surgery (JUergens (petrie, et al 2010). A large number of variables were assessed before the surgery including illness perceptions and physical factors. After the surgery patients improved dramatically on key medical variables such as cardiac functioning. However, psychological well being and disability did not. While cardiac risk factors were unrelated to outcome at the three month follow up, patients' beliefs

about their illness predicted disability and depressive symptoms even when controlling for demographic variables and baseline levels of outcome measures. Indeed, illness beliefs independently explained a sizeable (22%) proportion of the variance in the analysis of disability. The authors conclude that patient's beliefs about their illness strongly influence disability after cardiac surgery.

In this line it is also interesting to note that beliefs about what constitutes a modern health concern may be related to health care utilization and disability. Health worries are highly related to illness perceptions, but this area of work highlights what current things people may be worried about. A questionnaire to capture these worries contains four subscales covering *toxic interventions*, *environmental pollution, tainted food, and radiation* (Filipkowski, et al., 2009). In a study of university students it was found that these worries and beliefs were associated with the number of health symptom complaints as well as actual reported health care visits and medication use (Filipkowski). While disability was not recorded given the young and healthy nature of the sample, the authors speculate that these health worries and beliefs might well be a driver in the development of work incapacity.

Taken together there is a large literature indicating that when patients hold generally negative perceptions of their illness, this is associated with increased future disability and a slower recovery *independent of the medical severity of the condition. (Petrie & Weinman, 2006).*

The role of values

Stress and burnout are so-called modern day illnesses where the role of values has been clearly studied. Burnout was coined in the 1970s and although this problem was first seen as a fad, it remains today and is a leading cause of work disability in some

western countries (schaufeli 2009). It is sometimes viewed as fatigue, exhaustion, stress or depression. In any case, while a lowered energy level is one aspect of the problem, another contributor concerns values. Modern workers may hold values that differ from the organizations. At issue is the correspondence of two distinct sets of values. One set involves the individual values of employees. Each person develops a set of values about their work through personal experience, cultural background, or professional training (Leiter, 2008). While some may have difficulty articulating these values, others have a well developed framework and can assign importance to different activities from this framework. On the other hand, the corporate values of the organization directly contrast the employees' personal values. These are expressed via statements of vision, mission and values. For example, a salesperson may be more interested in the quality of customer service, while the organization's vision is to increase sales. In some situations clearly articulated corporate values may conflict with the worker's personal values. Several studies show a strong link between incongruence in values and the development of burnout (Siegall & McDonald, 2004; Verplanken, 2004).

Recent work has culminated in a two factor conceptualization of burnout (Leiter, 2008). The first factor is the balance between work demands and resources where an imbalance is said to promote exhaustion. The second factor is the congruence between individual and organizational values. Leiter found that this two factor model is valid and helps explain why some people suffer only exhaustion while others suffer all the components of burnout. Thus, congruence might be an important factor influencing an individual's sick leave and work disability

Values appear to be important in directing actions. Indeed, values are a vital aspect of engaging patients when behavioral change might be needed (Linton & Flink, 2010, in press). The process of valuing has been delineated in psychotherapy research as a method of helping patients to direct their behavioral change (Dahl et al). It is associated with an increased likelihood of making positive, goal-directed, changes. Consequently, it is consistent with the idea that conflicts in value would decrease the likelihood of continuing/returning to work and therefore is a relevant factor.

The research on values is limited almost exclusively to the burnout literature. Yet, it is a consistent and significant factor. While value conflict was NOT one of the original factors in the early work on burnout it was later added. The factor includes the idea of "fairness" at work as well. Today the conflict between values (personal vs organizations) is viewed as one of the two most basic factors that drive burnout and its associated work disability (schaufeli et al, 2009).

As an example, consider a study of more than 2500 Canadian physicians (Leiter, Frank, 2009). This investigation looked at levels of burnout in conjunction with work demands and values. They found that both workload and values congruence predicted exhaustion and cynicism for men and women and were distinct contributors to burnout.

Attitudes and values about utilizing sick leave in itself has raised considerable debate. In Sweden a large study was conducted by the authorities (Försäkringskassan) investigating the attitudes of individuals, doctors, work supervisors, and national insurance authority adjustors completed the same questionnaire (Palmer, 2006). The main findings were that all four groups had similar views. Further, it was found that attitudes towards utilizing sick leave was an important contributor to the actual level of sick leave. Indeed, in one analysis it was found that an individual's attitude toward sick leave accounted for 11% of the variation in actual sick leave observed between individuals. While this report has been criticized, the authors have also defended the methodology (Palmer, 2007). Since the study considers the contribution of other factors (e.g. work place and individual) and since it found that all four groups completing the questionnaire had similar views, the results appear to illustrate that attitudes and values concerning the utilization of sick leave may play a significant role in the actual use of sick certifications.

Expectations about the impact of illness on work

A particular form of attitude or belief is the expectation people have concerning the future effects that an illness will have on work capacity. These beliefs consist of predictions about the effects of the illness on being able to work. One review concerning the duration of sick leave found evidence that expectations that the disability would continue was associated with prolonged disability (Krause, et al., 2001). Most often the questions center on a self-rating of the likelihood of being able to work/return to work within a given time frame. Although these expectations overlap conceptually with "illness perceptions" above where expectations about illness duration and personal consequences are relevant, considerable work has examined expectations from other frameworks and above all as a single entity. Self-rated expectancies are often assessed with simple questions e.g. "How likely is it that your health problem will develop into a chronic problem?" or "All things considered, what do you believe your chances of working in three/six months are?" Thus, the items provide a rough estimate that the patient makes of being able to work in the future. This variable may be a "sponge" variable that picks up on a number of other factors that influence work capacity. For example, one study found that expectations were in turn related to psychological factors like catastrophizing and fear avoidance (Boersma & Linton, 2006).

REVIEW OF THE EFECTS OF PSYCHOLOGICAL FACTORS ON MUSCULOSKELETAL PAIN

An area extensively researched is risk factors for musculoskeletal pain (MSP) such as back, neck and shoulder pain. This provides a good source for harvesting information about the effects of beliefs, attitudes and values on function and work disability. This

section then, focuses on musculoskeletal pain as an important and specific example of how psychological factors may impact on work disability.

Various psychological factors have been brought forward as likely mechanisms in the development of long-term MSP problems and the consequent sick absenteeism and work disability involved. The term “yellow flags” was used to capture the idea that various psychological factors may influence recovery from an episode of pain (Kendall, Linton, & Main, 1998). Yellow flags refer to essentially “normal” but unhelpful psychological reactions to pain symptoms that are associated with the development of persistent pain problems and they include emotional (e.g. mood, fear), cognitive (beliefs, catastrophizing), and overt behaviors (activity levels, coping). The idea of yellow flags fits conceptually into the so-called biopsychosocial model which postulates that pain problems have biological, psychological, and sociological roots. Yellow flags originally encompassed perceptions of work and working conditions, and such factors relevant to this report will be considered separately below. Such psychological work factors might include the belief that work is dangerous, fear of re-injury, attitudes about work and leadership.

Psychological risk factors may be categorized into emotional, cognitive and overt behavioral variables. This is helpful in analyzing the possible effects on the development of pain problems since it increases specificity of the variables. As a result, the following might be included in a review.

Overview of the Evidence

In this section the accumulating evidence as to whether Yellow flags are related to future pain and disability is reviewed. To this end, I have searched the literature in MedLine and PsychINFO for review articles published between 2000 and 2009. The aim was

to provide a representative picture of the existing literature rather than to provide an exhaustive systematic or methodological review. Table I compiles the main results for the 12 reviews located and it evaluates the conclusions with regard to yellow flags.

Table I in about here

Before examining the reviews it is important to consider two aspects of musculoskeletal pain that may impact on our understanding of the studies: the recurrent, episodic nature of the pain, and the problem of confusing pain intensity with disability as outcome measures. It is well established that musculoskeletal pain is recurrent in nature (Linton, et al., 2005). To illustrate, a systematic review of 15 prospective studies revealed that 73% of patients presenting with acute low back pain had at least one recurrence of low back pain (LBP) in the following year and most continued to have episodes of significant pain and disability (Pengal et al., 2003). This has implications for the idea that chronicity is a continuous development and therefore risk might be determined by the number of weeks since onset, e.g. using 4 or 12 weeks as a point for determining risk. The recurrent nature of the pain may make time judgments unreliable since the point of onset is difficult to determine and because there is considerable clinical variation.

A second issue is defining the outcome point to be predicted where the literature provides a mix between pain intensity and functional outcome variables. Pain and disability are often treated as equivalent, but this is at odds with epidemiological research findings which indicate that significant proportions (at least 40%) of people in the community who report having chronic pain do ***not*** report significant levels of disability due to that pain (Blyth et al., 2001)**.** Similar problems arise in trying to distinguish outcomes in return-to-work rates since this is known to also be influenced by a host of work and system factors. There is evidence, for example, that many injured workers return to work despite their persisting pain (van Leeuwen et al., 2006). This tendency to confuse outcomes from what may be different domains has made it more difficult to draw clear conclusions about predictors and risk

factors.

Do Yellow flags predict clinical and occupational outcomes?

A perusal of the reviews identified in the search show that a large number of prospective studies have examined the relationship between various Yellow flag variables and future clinical outcomes. A first review focusing on prospective investigation located 37 such studies that examined the development of back and neck pain (Linton, 2000). A consistent relationship between certain psychological factors and the onset, as well as, the transition from acute to chronic pain problems was found. These factors included stress, distress and anxiety, as well as measures of depressed mood. Linton also found that certain beliefs, including fear-avoidance beliefs and catastrophic thoughts, were strongly associated with the development of disability following onset of pain. Passive coping strategies, such as waiting for someone else to help or resting, were also associated with poor outcomes and pain behaviors coupled with disability were a risk factor for future back pain problems. Four additional early reviews also conclude that psychological variables are important determinants of future pain and disability (Truchon & Fillion, 2000; Crook et al, 2002; Pincus et al 2002; Shaw et al, 2001).

In relation to risk factors for long term work disability, a review by Sullivan et al (Sullivan, Feuerstein, Gatchel, Linton, & Pransky, 2005) found evidence for both Yellow flags (fear, beliefs in severity of health conditions, catastrophising and poor problem solving), and Blue flags (workplace factors; low return to work expectancies and lack of confidence in performing work-related activities). They also found evidence of pain severity and level of depressive symptoms contributing to the *transition* to chronicity. To be sure, the role of depression was found to be related to a number of negative outcomes in a review that focused on the role of depression in pain (Bair, Robinson, Katon, & Kroenke, 2003). Pincus et al (2006) concur that distress is important, but on the other hand found

only limited in evidence for the role of fear-avoidance beliefs in the early development of pain and disability. A systematic review of 7 prospective studies meeting stringent criteria found that prognostic factors for duration of sick leave after the onset of low back pain (<6 wks sickleave) were higher disability levels, specific LBP, older age, female gender, more social dysfunction and more social isolation, heavier work, and receiving higher compensation.

Three recent reviews provide insight into the most current investigations where more sophisticated designs have been employed. A narrative review examining the evidence to support the components and propositions in the "fear-avoidance model" found mounting, but not exclusive, evidence that fear-avoidance beliefs, catastrophizing, avoidance behavior, distress, and pain behavior are important in the development of pain, disability, and lowered performance (Leeuw, et al., 2007). Second, a comprehensive systematic review of 45 studies found that higher pain severity at baseline, longer pain duration, multiple-site pain, previous pain episodes, anxiety and/or depression, higher somatic perceptions and/or distress, adverse coping strategies, low social support, older age, higher baseline disability, and greater movement restriction were significant prognostic indicators for poor outcomes (Mallen et al., 2007). Finally, Melloh et al (Melloh, et al., 2009) extracted variables from 13 studies which might predict work status. They found that depression and function were predictive of all three of their outcomes. However, **work status** was best predicted by fear-avoidance beliefs about work and the perceived chance of returning to work, while **functional limitations** was best predicted by poor sleep and fear-avoidance beliefs. On the other hand, **pain** was best predicted by baseline pain intensity, pain duration, and coping strategies.

Taken as a whole, the evidence compellingly shows a relationship between psychological Yellow flags and future outcome. Some factors such as depression, catastrophizing, pain intensity, and beliefs are quite consistently observed. This does not mean that every study has found them to be powerful risk factors or that all authors agree as to their importance. For example, one review of previous review articles questions the role of fear-avoidance beliefs (Lakke, Soer, Takken, & Reneman, 2009, in press), while

another such review concludes that they probably are good predictors (W. S. Shaw, Linton, & Pransky, 2006). Moreover, while these factors may have relevance on the group level, they may not be reliable on the individual level and therefore an important question is whether our knowledge about psychological risk factors can be applied to individual cases in the clinic.

Workplace risk factors

Recent reviews of occupational factors in back pain and disability

A growing number of prospective cohort studies of back pain have evaluated the effects of various factors on the progression from acute to chronic LBP. Most studies have included some combination of predictive factors comprised of demographic variables, workplace concerns, psychosocial variables, and clinical exam findings. Results have shown a trend for psychosocial variables (both individual and workplace) to be overall better prognostic indicators than either demographic or clinical exam findings; however, methodological differences among studies have led to some discordant conclusions among reviewers. Clearly more work is necessary to sort out the unique and overlapping effects of various workplace and psychosocial variables on the risk of chronic pain and disability.

As mentioned above, It is beyond the scope of this report to conduct an updated systematic literature review to synthesize results across existing patient cohort studies. However, to define a core set of occupational factors the results of several existing literature reviews on this topic were utilized with the help of a recent paper of which I am a co-author (W. Shaw, van der Windt, Main, Loisel, & Linton, 2009). Several systematic reviews have been conducted in recent years to summarize prognostic factors in back

disability, and five of these have included workplace factors within their scope of review (Crook, Milner, Schultz, & Stringer, 2002; Hartvigsen, Lings, Leboeuf-Yde, & Bakketeig, 2004; W. S. Shaw, Pransky, & Fitzgerald, 2001; Steenstra, Verbeek, Heymans, & Bongers, 2005; Waddell, Kurton, & Main, 2003). The scope, methodology and conclusions of these five systematic reviews are shown in Table 2. All five reviews were based on systematic keyword searches of the (English language) medical and psychological literature, but variable criteria led to inclusion of from 10 to 26 overlapping studies. The published reviews also applied different methods for synthesizing results, and this may have contributed to variable conclusions, as shown in the last three columns of Table 2. For example, job satisfaction was supported in two reviews (Crook, et al., 2002; Waddell, et al., 2003), not supported in one review (W. S. Shaw, et al., 2001), and had insufficient evidence in a fourth review (Hartvigsen, et al., 2004). Another notable difference was that job stress and social support were supported in some reviews and not by others. Only one review took magnitude of effect (relative risk) into account when drawing conclusions (Hartvigsen, et al., 2004). When methodological rigor of studies was given greater emphasis, the reviewers tended to conclude weaker associations or concluded insufficient evidence.

Though not conclusive, these literature reviews provide a tentative shortlist of workplace variables that might be included in the further development of patient screening methods. If all factors supported by at least one review are included, then the preliminary core set of workplace factors would include the following seven variables: heavy physical demands, ability to modify work, job stress, social support, job satisfaction, RTW expectation, and fear of re-injury. These variables suggest that occupational factors in back disability include physical and psychological demands, as well as social/managerial factors and worker perceptions and beliefs.

Reviews of prognostic factors in LBP chronicity have also noted heterogeneity/variety across studies in the selection of prognostic variables, assessment methodology, and choice of outcome measures, and this has limited the ability to pool results across

studies. Several variables (e.g., monotonous work, conflicts at work) have been assessed in only one or two prospective cohort studies; thus, these variables have had insufficient evidence in most systematic reviews. Other notable problems include differences in statistical modeling techniques, duration of follow-up, population setting and sampling strategy, and the inclusion of different sets of covariates when testing independent associations with outcomes (Linton, et al., 2005). Research in this area might be strengthened by adopting greater consistency in variable selection and methodology among researchers designing future patient cohort studies.

Reviewers also noted the absence of a conceptual framework for creating meaningful and uniform categories of workplace variables.

Beliefs attitudes and values

Table 3 summarizes the results of the above mentioned review by categories (W. Shaw, et al., 2009). This is helpful since it isolates attitudes and beliefs. Although the evidence is limited, five such factors are listed:

- The belief that work is dangerous
- The beliefs that disability will be prolonged
- Fear and avoidance beliefs that work will result in re-injury
- Belief that work is not satisfying (Low job satisfaction)
- Belief (worries) that returning to work will be problematic

While these “beliefs” do overlap somewhat with conceptualizations above, this review does indicate that beliefs and attitudes may be linked to sick leave and work disability.

Recapitulation and conclusions

This review indicates that psychological factors including beliefs, attitudes, and values are suspected of being rather potent risk factors for prolonged sick leave and work disability. Although a systematic review was not conducted, the literature reviewed suggests that, in general:

- Sick leave and disability are related to illness perceptions e.g. beliefs about the cause or consequences of the problem
- That expectations about the outcome of a problem is strongly linked with actual outcome e.g. the length of sick leave
- That personal values regarding the utilization of sick leave might influence actual use, although there is only limited data regarding this question
- Congruency between the individual’s personal values and those of the organization are associated with burnout and its related disability

A more indepth perusal of the literature on psychological factors and disability due to back pain showed that psychological factors are clearly linked to future problems, sickleave and disability. Important variables isolated include:

- Fear and avoidance beliefs
- Catastrophizing
- Distress (depressed mood, worry and anxiety)
- Perceived pain intensity
- Expectations of poor outcome
- Self-perceived functional limitations

In terms of beliefs involving the work place, the following were specifically isolated although the level of evidence supporting the findings is limited:

- The belief that work is dangerous
- The beliefs that disability will be prolonged
- Fear and avoidance beliefs that work will result in re-injury
- Belief that work is not satisfying (Low job satisfaction)
- Belief (worries) that returning to work will be problematic

There are some limitations that should be noted. First, it is quite possible that some important literature has inadvertently been overlooked since this is not a formal systematic review. Second, the concepts under review do overlap. This makes it more difficult to determine their independent contribution to sick leave and disability and it also makes it more difficult to

conceptualize how the variables impact on actual disability. Third, this review has not formally weighed the evidence to make statements about the level of evidence for each conclusion.

Despite the limitations, considerable evidence has been brought forward that demonstrates the impact of beliefs, attitudes, values and other psychological variables on outcomes like sick leave and disability. Theoretically there are also models that aid in understanding how such factors as fear-avoidance beliefs or illness perception might influence an outcome e.g. being off work. Taken together the literature supports the idea that these factors may be instrumental in the decision to be off work because of an illness.

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Table I. Yellow flags as prognostic factors for disability in musculoskeletal pain

Review article	Scope	Main Findings	Comments	Conclusions
Linton, 2000	Critical review of 37 prospective investigations (11 pre-onset of back/neck pain; 18 acute/subacute patients; 8 chronic); 29 studies included here (not chronics)	29 studies pertained to pre-onset to subacute pain. Psychological variables were related to pain onset, and particularly to the transition from acute to subacute/chronic. Emotional variables (distress, anxiety, stress, and mood), cognitive variables (e.g. fear avoidance beliefs, catastrophizing, expectations to get better), and behavioral variables (e.g.coping, function) were related to future	This review also looked at the risk factors in relation to the setting and time point and found good generality.	Emotional, behavioral and cognitive variables Are related to the transition from acute to chronic pain. *Support
Truchon & Fillion, 2000	18 studies	Predictors of chronic disability included a previous history of LBP, results of certain clinical tests (SLR, range of motion, neurological deficits), a subjective negative appraisal of one's ability to work, and job dissatisfaction. The role of certain psychological variables, including catastrophic beliefs about LBP, were promising. Distress and pain severity in first 3-weeks were not good predictors of long-term disability.	Noted limited number of suitable, prospective studies but some of the early findings appear at variance with more recent studies, especially distress and pain severity.	Some yellow flags were found as predictors while distress and pain severity were not *partial support
Shaw et al, 2001	22 Prognostic investigations of workers of patients with back pain.	*self-perceived function *pain reports *coping strategies *pain behavior Found to be related to future	Focused on a large number of prospective studies.	Good evidence for perceived function and pain intensity. Limited evidence for coping

		work status.		(avoidance) and pain behavior *support
Crook et al 2002	Systematic search and methodological evaluation. Included 19 prospective studies of people within 6 mo of injury.	*Psychological distress *self-perceived dysfunction *pain Were risk factors for future sick absenteeism.	A rigorous review with clear criteria for inclusion and of the factors.	Found distress, dysfunction and pain to be risk factors. *support
Pincus et al 2002	Systematic review of 25 prospective articles on patients with acute or subacute pain.	*moderate effect; depression or distress *small effect; somatization On future pain and disability problems	Selected studies based on prospective design and acute or subacute pain, estimates size of the effect.	Distress (moderate effect) and somatization (small effect) *partial support
Bair et al, 2003	Narrative review of 10 clinical trials examining the relationship between depression and back pain	Depression was found to be related to the onset of back pain, higher levels of pain intensity reports, more dysfunction, poorer treatment outcome, and chronicity.	A very exhaustive review focusing on depression and pain.	Concludes that depression is a very important, but often overlooked aspect. *support
Sullivan et al, 2005b	Selective review. 8 studies with psychological variables	*pain-related fears *self-perceived health *pain catastrophizing *poor problem solving skills *expectations concerning recovery All found to be related to future work disability	A selective review of worker-related psychosocial risk factors for work disability. Selection of studies may lead to bias in conclusions. Emphasizes the	Worker-related psychological variables do increase risk for future work disability. *support

			need to integrate work-place risk factors.	
Steenstra etal, 2005	Systematic review. Includes 7 studies with psychological variables and recruitment between 1 and 42 days of sickleave.	*Self-perceived function (ES=2.4) *pain intensity (ES=1.1) *severe depression (ES=2.47) All found to predict duration of sickleave. Anxiety (2 studies) not found to be reliable predictor	Included only 7 studies. Strict inclusion criteria of only six weeks sickleave duration.	Function, pain, and depression found to have rather large effects. *support
Pincus et al 2006	9 prospective studies where patients were recruited <3 wks from onset.	*3 of 7 relevant studies found fear-avoidance beliefs to have a small effect on future pain and disability.	Only 7 studies. While focus is on fear, points out the role of distress.	This article concludes that fear beliefs may not be as relevant in the early stages as later on. *not support
Leeuw et al, 2007	Narrative, critical review of studies of relevance to the "fear-avoidance" model.	*****fear-avoidance beliefs *catastrophizing *avoidance behavior *pain intensity Found to be important for future pain, disability and performance	Extended review that places studies in relation to the fear-avoidance model. Discusses dysfunction as avoidance behavior	Concludes that there is mounting evidence to support the main features of the F-A model. *support
Mallen et al 2007	Systematic review of 45 studies of prognostic factors in primary care	Eleven factors at baseline found to be associated with poor outcome: Pain severity, pain duration, multiple pain sites, previous pain, anxiety and/or depression, distress, coping strategies, social support, age, dysfunction, movement	An exhaustive review with special relevance for primary care services.	Conclude that 11 factors, including yellow flags, may be generic prognostic indicators. *support

		restriction.		
Melloh et al 2009	Screening instruments published between 1970-2007 predicting work status, function, and pain. Extracted variables from studies to determine what predicts outcome. 13 studies included	**work status* best predicted by fear-avoidance beliefs about work and perceived chance of being able to work. Occupational factors also important **Functional limitations* best predicted by sleep and fear-avoidance **Pain* best predicted by intensity, duration, and coping Depression and function are predictive of all three outcomes	Review focuses on actual screening instruments and thus is a relevant test of the yellow flags utility to predict.	Concludes that psychological and occupational variables are good predictors and should be included in early identification - screening. Depression and function predict all three while fear, sleep, and expectations about outcome were more specific. *support

Table 2. A comparison of five systematic literature reviews summarizing occupational factors in back disability.

Review	Data source	Inclusionary criteria	Articles reviewed	Review Methodology	Conclusions (occupational factors only)		
					Supported	Not supported	Insufficient evidence
Shaw et al. [12]	MEDLINE (1970-2000).	Prospective cohort studies of prognosis for RTW within 6 months after onset of work-related LBP.	22 of 340 studies met inclusion criteria; quality of study methods was not assessed.	For factors assessed in at least 3 studies, conclusions were based on a majority of studies showing supporting evidence.	Co-worker support; self-reported physical demands; recent hire; delayed report of injury; RTW expectations; fear of re-injury.	Objective measurement of physical demands; job satisfaction.	Company size, availability of modified work, unscheduled breaks.
Crook et al. [11]	MEDLINE, PsycINFO, EMBASE (1965-2000).	Prospective cohort studies of prognosis for RTW within 6 months after onset of non-specific, work-related LBP.	68 of 2,170 abstracts met initial screening criteria; 19 met criteria for high quality studies.	Conclusions based on supporting evidence from any of the 19 high-quality studies.	Job satisfaction, co-worker support, unscheduled breaks, work tempo, work quantity; recent hire; availability of modified work.	(not reported)	(not reported)
Waddell et al. [29]	MEDLINE, PsycINFO, EMBASE, subject experts, citation tracking.	Large (n > 500) longitudinal studies assessing prognostic factors for RTW or work incapacity for any health reason (majority of studies focused on LBP).	18 literature reviews and 8 prognostic studies were consulted to assess overall level of evidence.	Strong, moderate, or weak evidence was determined from number and overall quality of studies.	Strong evidence for job satisfaction, RTW expectations, type of occupation. Weaker evidence for job stress, co-worker support, physical demands.	(not reported)	(not reported)
Hartvigsen et al. [31]	MEDLINE, PsycINFO, OSHROM (1990-2000).	Prospective cohort studies assessing risk factors for consequences of	40 of 1,005 titles met inclusionary criteria; 10 met criteria for high	Strong, moderate, or insufficient evidence was determined from	None supported.	Strong evidence for organizational aspects (e.g., job demands);	Perception of work (e.g., job satisfaction)

		non-specific LBP in a working population.	quality studies.	consistency of results, relative risk, and study quality.		moderate evidence for social support, job stress.	
Steenstra et al. [30]	MEDLINE (1966-2003).	Prospective cohort studies of prognosis for sick leave duration within 6 months of initial work absence.	18 of 1,063 titles (14 studies) met inclusionary criteria.	Strong, moderate, or insufficient evidence was determined from consistency of results and study quality.	Strong evidence for heavy work; Moderate evidence for availability of modified work.	Strong evidence for occupation type, company size, overtime work.	Vibration, work tempo or quantity, awkward postures, job difficulty, sitting and walking.

Table 3. Workplace factors affecting back disability within four domains as indicated by past literature reviews and patient screening methods.

Variables by domain:	Shaw [12]	Crook [11]	Waddell [29]	Hartvigsen [31]	Steenstra [30]	OMPQ [41]	PRODI [42]	FLAGS [23]	WoDDI [44]	ORQ [45]	BDRQ [43]	PE [47]
Psychological demands												
Monotonous work						X		X	X			
Job stress	X			(no effect)			X	X	X			
Lack of control		X					X		X			
Emotional effort of work							X					
Poor work environment								X	X			
Social/managerial factors												
Social support/dysfunction	X	X	X	(no effect)	X			X	X	X		
Short job tenure	X	X							X		X	
Frequent job changes								X	X			
Delayed notice to employer	X								X			
Lack of vocational direction								X				
Inflexible work schedule								X	X			X
Night shift/ unsociable hours								X				
No gradual RTW pathways								X	X			X
Absence of employer interest								X				
Negative employer response							X	X			X	
Small firm size					(no effect)				X			
Overtime work					(no effect)							
Workplace beliefs												
Job satisfaction		X	X		(no	X		X	X	X	X	

			effect)							
Belief work is dangerous						X		X		
Expectation for RTW		X		X	X	X		X	X	
Fears of re-injury	X	X		X		X	X	X	X	X
Worries about work absence								X		
Barriers/facilitators for RTW							X			X

Notes: OMPQ = Orebro Musculoskeletal Pain Questionnaire; WoDDI = Work Disability Diagnosis Interview; PRODI = Psychosocial Risk for Occupational Disability Instrument; ORQ = Obstacles to Return-to-Work Questionnaire; BDRQ = Back Disability Risk Questionnaire; FLAGS = Yellow flags assessment method; PE = Participatory Ergonomics approach; RTW = return to work.