# Review Article

# Modifiable worker risk factors contributing to workplace absence: A stakeholder-centred best-evidence synthesis of systematic reviews

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**Abstract.**
**BACKGROUND:** A challenge facing stakeholders is the identification and translation of relevant high quality research to inform policy and practice. This study engaged academic and community stakeholders in conducting a best evidence-synthesis to identify modifiable risk and protective worker factors across health conditions impacting work-related absence.
**OBJECTIVES:** To identify modifiable worker disability risk and protective factors across common health conditions impacting work-related absence.
**METHODS:** We searched Medline, Embase, CINHAL, The Cochrane Library, PsycINFO, BusinessSourceComplete, and ABI/Inform from 2000 to 2011. Quantitative, qualitative, or mixed methods systematic reviews of work-focused population were considered for inclusion. Two or more reviewers independently reviewed articles for inclusion and methodological screening.
**RESULTS:** The search strategy, expert input and grey literature identified 2,467 unique records. One hundred and forty-two full text articles underwent comprehensive review. Twenty-four systematic reviews met eligibility criteria. Modifiable worker factors found to have consistent evidence across two or more health conditions included emotional distress, negative enduring psychology/personality factors, negative health and disability perception, decreased physical activity, lack of family support, poor general health, increased functional disability, increased pain, increased fatigue and lack of motivation to return to work.
**CONCLUSIONS:** Systematic reviews are limited by availability of high quality studies, lack of consistency of methodological screening and reporting, and variability of outcome measures used.

Keywords: Disability prevention, risk and protective factors, occupational health

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## 1. Introduction

Workplace absence, prolonged disability, and associated costs of injuries and chronic disease, pose a significant burden to workers, employers, and society [1–3]. Given the serious negative consequences related to workplace absence and prolonged duration of disability, there has been a growing body of primary studies and systematic reviews investigating risk and protective factors contributing to work absence and prolonged disability.

### 1.1. Academic community partnership

The present synthesis was created by an academic community partnership (ACP). This partnership involved researchers from different fields and disciplines at three British Columbia (BC) universities, and three community partners, two occupational health and safety organizations and a not-for-profit health and welfare trust that administers group health and welfare benefits for over 100,000 employees in the health care and social service sector in BC.

From discussions during the planning phase of this study, it was clear that workplace practitioners were motivated to learn from current research, but found the literature difficult to understand and interpret into practical solutions, lacked access to relevant research articles, and required expert assistance in critical appraisal of the literature [4]. To address these concerns proactively, we engaged workplace stakeholders fully in the research synthesis process so that primary knowledge users participated in identifying the research question, selecting the search terms, refining the exclusion and inclusion criteria, providing oversight of the data abstraction processes, and participating in categorization of the findings and preparation of the final report.

Utilizing an iterative problem identification and clarification process, stakeholders reported that many small and medium size employers do not have a disability coordinator, or the capacity to consider appropriate preventive action to address risk or protective factors at the level of a specific chronic disease or injury; rather, they expressed interested in learning what factors might be more generalizable across injuries and chronic health conditions. These deliberations by the ACP led to a decision to conduct a stakeholder-centered best evidence synthesis of systematic reviews on disability risk and protective factors associated with work-related and chronic disease health conditions impacting work-related absences and disability duration.

The present article reports the methods and findings of the synthesis specifically, related to modifiable risk and protective worker factors. A previous article presented results on modifiable risk and protective workplace factors [5].

## 2. Methods

### 2.1. Partnership process

Stakeholder and academic researchers participated in an iterative systematic process involving face-to-face meetings, videoconferencing, review, reflective input regarding meeting minutes, and workflows and surveys, to define the purpose of the systematic review and participate as full research partners throughout the synthesis process. Full contribution included participation in the identification of the research question, refining inclusion-exclusion criteria, creation of the template for abstracting findings, validation of abstraction, categorization of factors and final report preparation for their constituents. We conducted a series of pilot searchers providing examples of literature found; we then circulated the interim results, and sought input on keywords to identify pertinent and stakeholder-relevant systematic reviews. This initial process allowed for effective review of search terms used in relevant studies and led to refinement of the research question, followed by development of stakeholder-centered appropriate inclusion/exclusion criteria that informed the final search strategy. MeSH terms (structure language for Medline) and keywords across other databases were reviewed by one or more external librarians with expertise in health sciences, social sciences, and business databases, during the pilot search process.

### 2.2. Inclusion/exclusion criteria

Our inclusion criteria were systematic reviews that included adults (age 15+) and a work-focused population (i.e. working or attempting to secure work); all systematic reviews that employed qualitative meta-analyses, quantitative meta-analyses, and non-meta-analytic systematic reviews of both qualitative and quantitative literature were considered for inclusion. Additionally, to be considered for inclusion, systematic reviews were required to address work absence related to workers presenting with personal illness, health condition, or illness as an outcome, including physical

Table 1
Methodological quality review

| Question | Answer choice | Score |
| --- | --- | --- |
| *Common criteria for both qualitative and quantitative methodological review* | | |
| Did the authors have a clearly focused question? | Yes | 1 |
| | No | 0 |
| Were inclusion/exclusion criteria used? | Yes | 1 |
| | No | 0 |
| | Not specified | 0 |
| Did the authors describe a search strategy that was comprehensive and reproducible? | Yes | 1 |
| | No | 0 |
| | Not specified | 0 |
| Please click the search strategies used | (selected/unselected) | a. Five or more databases: 2 |
| | | b. Two to four databases: 1 |
| | | c. One database: 0 |
| Did search strategy cover an adequate number of years? (10+ years) | Yes | 1 |
| | No | 0 |
| Does the data support the author's interpretation? | Yes, mostly | 1 |
| | No | 0 |
| Are there any concerns related to COI? | Yes | 0 |
| | No | 1 |
| *Specific criteria quantitative methodological quality* | | |
| Did the review assess the methodological quality of the primary studies? | Yes | 1 |
| | No | 0 |
| What methods did the authors use to combine or compare results across studies? | Meta-analyses | 2 |
| | Descriptive + quality weight | 2 |
| | Descriptive no weight | 1 |
| | Other | 0 |
| How strong was the level of evidence supporting the strongest conclusions of the study? | Level 1 (RCT) | 2 |
| | Level 2 (non-random) | 1 |
| | Level 3 (uncontrolled) | 0 |
| | Unclear | 0 |
| | | Total score possible: 13 |
| *Specific criteria qualitative and mixed methodological quality* | | |
| Did the review assess the methodological quality of the primary studies? (minimum of 4) | Yes | 1 |
| | No | 0 |
| ☐ suitability of methodology /paradigm to the research question | | |
| ☐ sampling (selection of participants/settings/documentation) | | |
| ☐ clear description of context, data collection, and data analysis | | |
| ☐ rigor (audit trail, some coding by 2 or more coders, deviant case analysis, respondent validation) | | |
| ☐ triangulation | | |
| ☐ reflexivity (researcher and research process) | | |
| ☐ relevance (credibility, consistency, applicability, transferability) | | |
| Was this methodological quality review incorporated in the data analysis (weighting of higher quality studies)? | Descriptive + quality weight | 2 |
| | Descriptive no weight | 1 |
| | Other | 0 |
| How strong was the level of evidence supporting the strongest conclusions of the study? | Level 1 (RCT) | 2 |
| | Level 2 (non-random) | 1 |
| | Level 3 (uncontrolled) | 0 |
| | Unclear | 0 |
| | | Total score possible: 13 |

and/or mental conditions, and also were required to discuss predictive factors of work absence. Our exclusion criteria included reviews where the primary illness was a mental and/or extremely rare condition, a severe physical condition, or reviews that focused on a specific specialized occupation, such as police, firefighters or air traffic controllers. Also excluded were systematic reviews which focused only on interventions, with no identification or discussion of risk or protective factors.

## 2.3. Search strategies

All search strategies were originally written by an information specialist and were reviewed by one or more of her peers. Search results were uploaded to RefWorks and then exported to Excel. Removal of duplication was completed manually. Other sources of records included scoping searches, expert input, grey literature searches of health-evidence.ca, Rehab, National Rehabilitation Information Center (NARIC), and Institute of Work and Health (IWH). Hand-searching of the proceedings of a relevant conference (found in the EMBASE search) was also completed. After the initial search results were reviewed, the MEDLINE search strategy was reviewed and modified by a second information resource officer to simplify logic and ensure congruency with search terms. A copy of the MEDLINE search strategy is available online.

## 2.4. Evaluation of quality and relevance

Methodological quality of eligible studies was evaluated using principles and procedures congruent with recommendations discussed in The PRISMA Statement and the Institute of Medicine's Standards for Systematic Reviews [6]. This included (i) use of multiple information resource people, researchers and stakeholders in the development of search strategy, (ii) pilot-testing search strategy to identify stakeholder-relevance of articles, search terms used in relevant retrieved articles, (iii) validation procedures to assess comprehensiveness of Medline search strategy, (iv) assessing retrieved titles and abstracts for relevance, (v) selecting articles for more in-depth review, (vi) obtaining full text copies of these potentially eligible reviews, and assessing these reviews for relevance and quality (using independent assessment by at least two members of the review team), (vii) pilot testing abstraction process (for relevance and comprehensiveness) with stakeholders, and (viii) attention to production of final report relevant to stakeholders' needs and their organizational context.

The original methodological criteria were based on a quality assessment tool developed by researchers at McMaster University for Health-evidence.ca, a website supporting knowledge translation relevant to public health nursing. Researchers compared the original criteria with EBM Glasgow Checklist for Systematic Reviews, and assessed for congruency with AMSTAR methodological quality recommendations for critical appraisal of systematic reviews [7]. Methodological

criteria were reviewed and refined by the ACP using a process of sharing (email distribution), discussion, reflection and consensus. Changes were made in scoring and standardizing questions across quantitative, qualitative and mixed methodological criteria (see Table 1).

The nature of the studies included in the present analysis was heterogeneous in nature and precluded the use of meta-analysis as a primary method of evaluation. Best-evidence synthesis was therefore chosen to be our main method of critical appraisal [8,9]. Best-evidence synthesis bases analysis on three aspect of evaluation: quality, quantity and consistency of available evidence [10].

Our results are reported based upon our team-developed evaluation model (see Table 4) indicating the fit with the criteria for a given factor in relationship to the methodological quality of the review. Importantly, this framework was discussed with the stakeholder members and reflected team perceptions and understanding regarding categorization and ranking of evidence. Effect size and/or assessment of variance were not able to be calculated across reviews given the different outcome factors, types of studies and level of reporting. Therefore, the terms strong, moderate, and weak are not indicative of the degree to which a given factor will influence the workplace; rather, they reflect the quality, quantity and consistency of a respective factor.

The following additional questions/issues were asked of reviewers during the scientific review process: relevance to small employers, research strengths/weaknesses, implementation recommendations from authors, implementation recommendations from reviewers, and whether the systematic review met the inclusion/ exclusion criteria for this study. Preliminary data abstraction formats were prepared by the research associate, and were reviewed and modified by two researchers before circulation to ACP members. The forms for data abstraction consisted of Researcher Tables (Methods Results, Conclusions) and Stakeholder Synthesis Tables (Worker /Workplace Factors categorized by Modifiable and Non-Modifiable factors); the present article addresses modifiable worker factors only. After initial deliberations with stakeholders, it was decided to pilot the data abstraction forms by having the research associate abstract findings from 10 relevant articles. Copies of these articles were provided to the stakeholders; these team members were then asked to select two or more articles of interest that could be used to assess whether the abstraction forms had encompassed the required information or rather, had missed relevant findings.

Table 2
Characteristics of studies included in synthesis

| Study citation | Number and type of studies included in review | Number of relevant studies | N Total and range of N | Results: Populations included in reviewed studies; N total/N range |
|---|---|---|---|---|
| [13]Dujts et al. J Clin Epidemiol, 2007; 60: 1105-1115. | 20 articles: prospective cohort studies, in English, all except 1 from Europe. | 20 studies. | N total = Not provided. Range of N = Not provided. | 4 studies on non-specified employees; 3 studies on hospital/health care staff; 2 studies on electricity firm employees; 2 studies on municipal employees; 2 studies on manufacturing employees; 2 studies on civil servants; 2 studies on industrial employees. 1 study on nurses; 1 study on truck drivers; 1 study on nurses' aides |
| [14]Davey et al. J Nurs Manag, 2009; 17: 312-330. | 16 articles met inclusion and quality criteria – representing 14 studies: 7 prospective, 7 not prospective. | 16 | N total = 4,915 Range of N = 71 to 1107 | Hospital nurses |
| [15]Lagerveld et al. J Occup Rehabil, 2010; 20: 275-292. | 25 studies: 16 cross-sectional studies; 9 longitudinal studies. | 19 studies focused on work participation. 11 studies focused on work functioning. | Work participation: N total=28,130 Range of N = 49 to 13,359 Work functioning: N total = 5,611 Range of N = 49 to 2,341 Overall N total: 29,703 | Work participation: 15 studies described as "non-specified groups of workers"; 2 studies with workers in finance and insurance industry; 1 study with workers in manufacturing; 1 study with workers in call centers. Work functioning: 10 studies described as "non-specified groups of workers"; 1 study with workers in call centers. |
| [16]Blank et al. J Occup Rehabil, 2008; 18: 27-34. | 15 studies: 9 cohort, 5 retrospective interviews/questionnaires | 15 studies. | N total = 21,617 Range of N = 95 to 10,308 | 5 studies on non-specified workers; 2 studies of civil servants; 2 studies of finance/insurance workers; 1 study of contract workers; 1 study on mine workers; 1 study of supervisors; 1 study of recently unemployed; 1 study of teachers; 1 study of steel and automotive workers (blue collar); 1 study of student nurses. |
| [17]Lidal et al. Disabil Rehabil, 2007; 29(17): 1341-1375. | 123 studies. | 123 studies. | N total = 69,115 Range of N = 12 to 20,143 | Occupations not given. |
| [18]O'Neil et al. Health Qual Life Outcome, 2010; 8: 95. | 12 articles met inclusion criteria. | 12 articles | N total = 2795 Range of N = 88 to 620 | Employed at time of myocardial infarction, no occupational details. |
| [19]Detaille et al. Scand J Work Environ Health, 2009; 35(4): 261-281. | 43 studies: 32 high quality; 11 medium quality. No studies for diabetes; Not enough studies for COPD to allow synthesis; 3 studies for asthma; 20 studies for rheumatoid arthritis; 21 studies for ischemic heart disease | 43 studies; all cohort studies. | N total = 15,883 Range of N = 25 to 633 | Occupational characteristic not provided. |
| [20]Truchon et al. J Occup Rehabil, 2000; 10(2): 117-142. | 18 studies met the inclusion criteria. | 18 studies. | N total = 23,290 Range of N = 78 to 11,762 | 10 studies of clinical populations; 3 studies general worker populations; 2 studies of blue collar workers; 1 study of workers' compensation registers; 1 study of military workers. |

Table 2, continued

| Study citation | Number and type of studies included in review | Number of relevant studies | N Total and range of N | Results: Populations included in reviewed studies; N total/N range |
|---|---|---|---|---|
| [21]Côté, D. et al. Disabil Rehabil, 2010; 32(2): 87-102. | 31 studies: 21 qualitative, 10 quantitative | 31 studies. | Range of $N$ = 3 to 1,827 $N$ total = 5,302 | Details of occupational groups not provided. |
| [22]van den Berg et al. Occup Environ Med, 2009; 66: 211-220. | 20 studies: 14 cross-sectional and 6 longitudinal. | 20 studies. | $N$ total = 18,747 Range of $N$ = 88 to 5,622 | 4 studies on non-specified workers; 6 studies of municipal workers; 2 studies on office workers; 2 studies on home care workers; 1 study on care givers; 1 study on firefighters; 1 study on metal and retail workers; 1 study on physicians. |
| [23]Iles, RA et al. Occup Environ Med, 2008; 65(8): 507-17 | 24 prognostic studies | 24 studies | $N$ total = 6,242 Range of $N$ = 55–1,068 | Occupational categories not described. |
| [24]Hansson and Jensen. Scand J Public Health, 2004; 32: 109-151. | 28 studies met inclusion criteria and were of sufficient quality | 28 studies | $N$ total = Over 54,283 (one study includes all retail, construction, and manufacturing employees in Ontario, sample size not included). Range of $N$ = 98 to 13,962 (at least, see comment above) | Occupations typically not reported. |
| [25]Kuijer et al. J Occup Rehabil, 2006; 16: 439-467. | 17 studies (28 papers): 4 prognostic cohort studies, 13 randomized controlled trials. | 17 studies. | $N$ total = 2,046 Range of $N$ = 49 to 253 | Details of occupational categories not provided. |
| [26]Shaw et al. Disabil Rehabil, 2001; 23(18): 815-28. | 22 studies (7 Patient Survey, 6 Claims Database, 1 Chart Review/Claims Database, 1 Clinic Database/Claims Database, 4 Physician Exam/Patient Survey, 2 Chart Review, 1 Physician Exam | 22 | | Insured populations/occupational health clinics |
| [27]Fadyl et al. Disabil Rehabil, 2010; 32(14): 1173-1183. | 23 articles met quality criteria. | 23 articles. | $N$ total = Not provided Range of $N$ = Not provided | Details of included studies not provided. |
| [28]Spelten et al. Psycho-oncology, 2002; 11: 124-131. | 14 studies met the inclusion criteria. | 14 studies. | $N$ total = 2,433 Range of $N$ = 12 to 403 | Occupational categories not described. |
| [29]Steenstra et al. Occup Environ Med, 2005; 62: 851-860. | 14 studies: 6 prospective; 8 retrospective | 14. | $N$ total = 104,676 Range of $N$ = 120 to 89,190 | 1 general population; 3 workers' comp populations; 3 insurance settings; 2 occupational physician settings; 1 occupational setting; 1 orthopaedic clinic; 1 work injury database; 1 clinical setting. |
| [30]Darr and Johns. J Occup Health Psych, 2008; 13(4): 293-318. | 115 published studies and 22 dissertations. | 137 studies, total. | $N$ total = N/A Range of $N$ = Not provided | Occupations covered: Medical profession: manufacturing, production; social work; blue-collar workers; administration; government; retail: security-related fields. |

Table 2, continued

| Study citation | Number and type of studies included in review | Number of relevant studies | N Total and range of N | Results: Populations included in reviewed studies; N total/N range |
|---|---|---|---|---|
| [31]De Croon et al. Ann Rheum Dis, 2004; 63: 1362-1367. | 13 studies met inclusion criteria and were rated high or medium quality | 13 studies. | N total = Not provided Range of N = Not provided | Details of studies not provided. |
| [32]Turner et al. Am J Indust Med, 2000; 38: 707-722. | 20 studies: 13 on low back injuries only, 7 on other injuries in addition to low back. | 20 studies. | N total = 85,285 Range of N = 47 to 25,093 | 10 studies of claimants; 9 studies of workers with LBP; 1 study of nurses |
| [33]Nash et al. J Fam Pract, 2004; 53(9): 706-12. | 49 studies met the inclusion criteria | 49 studies | N total = 3,366 | Details of included studies not provided. |
| [34]Dahm et al. Cochrane Database Syst Rev, 2010; 6(6): CD007612. | 10 studies met the inclusion criteria | 10 studies | N total = 1,923 Range of N = 42 to 459 | General workers with LBP |
| [35]Michie et al. Occup Environ Med, 2003; 60: 3-9. | 49 studies met the inclusion criteria | 49 studies | N total = 99,716 Range of N = 26 to 15,530 | 22 studies of health care workers; 11 studies of general workers; 3 studies of office workers; 1 study of engineers; 1 study of blue collar workers; 1 study of police and firefighters; 1 study of white collar workers; 1 study of teachers |
| [36]Peters, J. et al. J Occup Rehabil, 2007; 17(2): 317-26. | 5 studies met the inclusion criteria; 4 cohort studies and 1 observational study | 5 studies | N total = 797 Range of N = 55 to 251 | 4 studies of general worker; 1 study of mental workers and office clerks |

## 2.5. Data abstraction

A preliminary categorization of findings was developed following agreed upon concepts in the data abstraction forms. Once the abstraction tables were 90% complete, stakeholders were requested to appraise the initial categorization of factors. This review led to significant changes in the placement and naming of psychosocial and mental health factors. Following abstraction of the data into table format, the table data was interpreted into meaningful factor-level messages as presented below.

## 3. Results

### 3.1. Search results

There were 2,467 unique records identified and 142 full text articles were reviewed. Thirty-seven systematic reviews (quantitative, qualitative and mixed) met our eligibility criteria and methodological quality review for risk and protective factors associated with workplace absence. A subset of 24 systematic reviews from this overall search strategy addressed worker factors. As shown in Table 2, the 24 studies that met the synthesis inclusion criteria varied considerably in sample characteristics and size, data sources, and outcome measures.

### 3.2. Validation of search strategy

Records of database search strategies, de-duplication, other sources searched, and exclusions were recorded in VonVille's "Excel workbook to track systematic review search results" [11] and the final PRISMA flowchart [12] (Fig. 1) was generated using this workbook. Validation of the search strategy was performed by re-running the final MEDLINE search updated to August 31, 2011. Of the final included records (vide infra) for all factors (workplace, worker and societal factors), 36 had records in MEDLINE and 32 of these (86%) were found using the final MEDLINE search.

### 3.3. Methodological quality criteria

A weighted scoring system was created to address quality of primary studies informing the systematic review as well as methods employed in combining and reporting results (see Table 3). The highest methodological score possible was 13 with the range of scores being between 8 and 13 (these scores were subsequently translated into percentages). Fifteen studies were considered higher methodological quality systematic reviews (greater or equal to 85%), three were considered medium quality reviews (between 75%–84%), and six were considered lower quality reviews (between 50–74%). All 24 systematic reviews were deemed to be of sufficient quality to contribute to evidence synthesis, with some of the lower quality scores resulting from limitations of the quality of primary studies informing the respective synthesis. To assess inter-rater reliability, methodological results were downloaded into MS Excel from Fluid Surveys, with responses recoded to reflect the scoring system employed. Kappa statistics were used to calculate the chance-adjusted between-reviewer agreement and disagreements per item and number of responses between sets of reviewers. This was calculated using an online kappa calculator (http://justusrandolph.net/kappa/). The overall inter-rater reliability score for the synthesis of the original 36 articles was 0.75.

Using a best-evidence synthesis process it is important to note the terms strong, moderate, weak are not indicative of the predictive value of a given factor on workplace factors, as effect size or assessment of variance were not able to be calculated across reviews given different outcome factors, types of studies and level of reporting. Consequently, we used a team-developed framework to indicate the consistency of a given factor in relationship to the methodological quality of the review (see Table 4). Importantly, this framework appeared to fit with the subjective feeling of the team and also provided a method of categorizing our evidence.

### 3.4. Modifiable worker factors

#### 3.4.1. Emotional distress and depression
Five systematic reviews considered the impact of emotional distress on work disability. Duijts et al. [13] provided a high-quality review demonstrating strong evidence that increased level of burnout was associated with increased risk of sick leave of three days or less (adjusted OR = 1.28) and of more than three days (adjusted OR = 2.34) in workers with mild illness or injury. Davey et al. [14] also provided a high-quality review and found that the presence of burnout and job stress were associated with increased risk of unplanned, short-term work absences in workers with
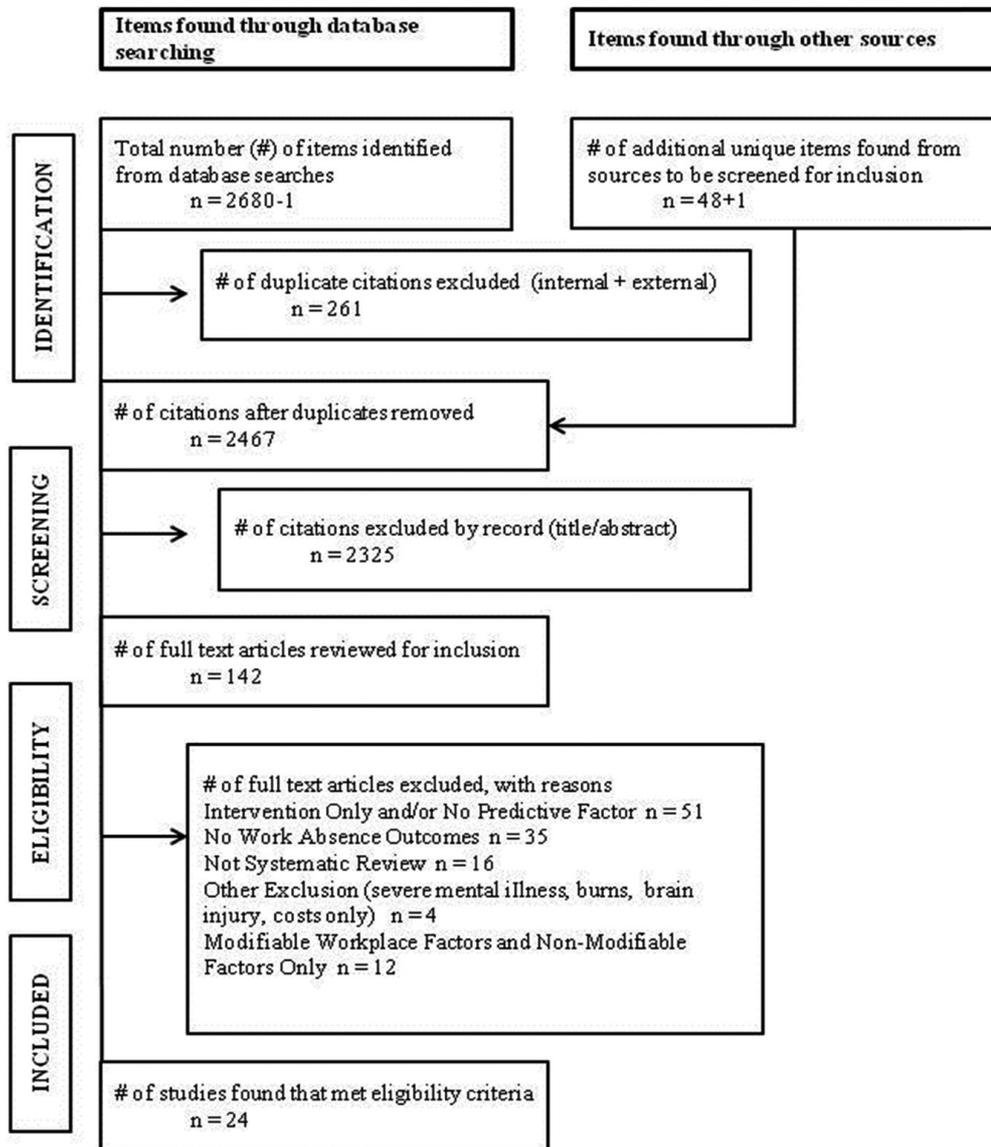
Fig. 1. Results of search strategy PRISMA chart.

psychosocial health concerns. The final high-quality study by Lagerveld et al. [15] found limited evidence that less clinical improvement of depressive symptoms predicted increased risk of poor work participation outcomes, including return to work and work status in workers. Blank et al. [16], in a moderate-quality review, reported that the presence of psychological disturbance resulting from work injury was associated with longer disability for workers with emotional distress arising from work injury. Finally, Lidal et al. [17], in a lower-quality review, reported that higher work stress was associated with the reduced rate of return to

work in workers with spinal cord injury.

Two high-quality systematic reviews considered the impact of depression on work disability. Specifically, Lagerveld et al. [15] provided strong evidence that longer duration of depression increased risk of poor work participation outcomes, including return to work and work status, for individuals with depression. These authors also reported strong evidence that increased severity of depressive symptoms was associated with decreased return to work, and moderate evidence that increased severity was associated with as poor productivity and performance at work. O'Neil et al. [18]

found similar outcomes and reported that more severe symptoms of depression were associated with decreased work resumption after myocardial infarction. There is *strong* evidence that emotional distress and increased depressive symptoms should be considered a predictor for work disability.

### 3.4.2. Enduring psychological/personality factors

Seven systematic reviews considered the impact of psychological/personality factors on work disability. A lack of studies regarding specific psychological/personality factors required that this category include all aspects of this domain. Of the available seven systematic reviews, five of the reviews were considered of high quality. Detaille et al. [19] found moderate evidence that internal locus of control predicted reduced work disability in workers with cardiovascular conditions. Truchon et al. [20] found that negative attitudes about low back pain or other health problems and preoccupation with health were both associated with reduced return to work rates in individuals with low back pain. Duijts et al. [13] reported that excessive commitment was associated with increased risk of sick leave of more than three days (crude OR = 1.15) in individuals with psychosocial health complaints. Cote and Coutu [21] found that changes in self-identity due to illness or injury may result in poor fit with pre-injury job or with rehabilitation unit objectives for workers with persistent musculoskeletal pain, especially women. Lagerveld et al. [15] reported limited evidence that external locus of control predicted increased risk of poor work participation outcomes, including return to work and work status for individuals with depression. These authors also reported limited evidence that external locus of control and low self-esteem predicted increased risk of poor work functioning outcomes, including productivity or performance at work. Two lower quality reviews were also available. van den Berg et al. [22] found strong evidence that a lack of autonomy and low self-confidence both predicted poorer WAI scores (three out of four studies). The second lower-quality rated review by Lidal et al. [17] reported that higher levels of self-esteem and optimism were associated with increased return to work for individuals with spinal cord injury. There is *strong* evidence that enduring negative psychological/personality factors should be considered a predictor for work absence.

### 3.4.3. Health and disability perceptions and expectations

Ten systematic reviews considered the impact of health and disability perceptions on work disability. Similar to psychological/personality factors, specific factors within this category were often evaluated in only a single systematic review. The single exception was with respect to recovery expectations for which four high-quality and one lower-quality systematic reviews were available. As a result, all factors, except recovery expectations, were reviewed together. Of the ten included systematic reviews, eight were deemed to be of high quality. Detaille et al. [19] in one high-quality rated review found strong evidence that increased feelings of subjective vocational disability were associated with increased risk of work disability for individuals with cardiovascular conditions. Duijts et al. [13] in a second high-quality rated review reported that, for those with psychosocial health concerns, a high need for recovery was associated with increased sick leave of three days or more (adjusted OR = 2.15). Iles et al. [23] found moderate evidence that fear avoidance beliefs or behaviors were associated with decreased likelihood of return to work for those with non-chronic, non-specific low back pain. O'Neil et al. [18] found that unspecified perceptions of health and/or work were associated with reduced work resumption after myocardial infarction. Truchon et al. [20] found that lower subjective ability to work was associated with lack of return to work outcomes for individuals with low back pain. High-quality rated reviews demonstrating low or limited evidence included Hansson and Jensen [24] who found low evidence that higher perceived functional impairment predicted increased risk of sick leave greater than three months. Kuijer et al. [25] reported limited evidence that lower health transition score increased risk for sickness absence at follow-up and increased number of days of work for individuals with low back pain; these authors also found that increased musculoskeletal complaints increased number of days of work absence. Lagerveld et al. [15] reported limited evidence that hopelessness about future increased risk of poor work participation outcomes for workers with depression. A lower-quality rated review showing a similar relationship included Shaw et al. [26] who found strong evidence that higher perceived functional impairment predicted longer disability duration for individuals with low back pain (5 out of 7 studies). These authors also reported strong evidence that fear avoidance beliefs or behaviours increased disability duration (5 out of 5 studies). Fadyl

Table 3
Methodological quality review rating

| Ref # | Author | Year | Clearly focused question? | Inclusion/exclusion | Comprehensive | # of search strategies | # of years | Methodological quality | Methods weighting | Strength of evidence | Congruence data and author interpretation | COI | Quality score |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | Duijts, S.F. et al. | 2007 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 11 |
| 14 | Davey, M.M. et al. | 2009 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 11 |
| 15 | Lagerveld, S.E. et al. | 2010 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 11 |
| 16 | Blank, L. et al. | 2008 | 1 | 1 | 1 | 2 | 1 | 1 | 0 | 1 | 1 | 1 | 10 |
| 17 | Lidal, I.B. et al. | 2007 | 1 | 1 | 1 | 2 | 0 | 0 | 1 | 1 | 1 | 1 | 9 |
| 18 | O'Neil, A. et al. | 2010 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 12 |
| 19 | Detaille, S.I. et al. | 2009 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 11 |
| 20 | Truchon, M. et al. | 2000 | 1 | 1 | 1 | 2 | 0 | 1 | 2 | 1 | 1 | 1 | 11 |
| 21 | Côté, D. et al. | 2010 | 1 | 1 | 0 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 11 |
| 22 | van den Berg, T.I. et al. | 2009 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 9 |
| 23 | Iles, R.A. et al. | 2008 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 12 |
| 24 | Hansson, T. et al. | 2004 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 11 |
| 25 | Kuijer, W. et al. | 2006 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 1 | 1 | 13 |
| 26 | Shaw, W.S. et al. | 2001 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 8 |
| 27 | Fadyl, J.K. et al. | 2010 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 9 |
| 28 | Spelten, E.R. et al. | 2002 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 8 |
| 29 | Steenstra, I.A. et al. | 2005 | 1 | 1 | 1 | 0 | 1 | 1 | 2 | 1 | 1 | 1 | 10 |
| 30 | Darr, W. et al. | 2008 | 1 | 1 | 1 | 2 | 1 | 0 | 2 | 1 | 1 | 1 | 11 |
| 31 | De Croon, E. et al. | 2004 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 11 |
| 32 | Turner, J.A. et al. | 2000 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 8 |
| 33 | Nash, C.E. et al. | 2004 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 12 |
| 34 | Dahm, K.T. et al. | 2010 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 1 | 1 | 13 |
| 35 | Michie, S. et al. | 2003 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 2 | 1 | 1 | 10 |
| 36 | Peters, J. et al. | 2007 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 11 |

et al. [27] provided a low-quality rated review and reported that higher self-perceived rates of physical functioning were associated with increased work ability for individuals with work-related injury. There is *strong* evidence that negative health and disability perceptions should be considered a predictor of work disability.

*Recovery expectations*: Five systematic reviews considered the impact of recovery expectations on work disability. Four of these available systematic reviews were deemed to be of high quality. Iles et al. [23] provided strong evidence that positive recovery expectations increased likelihood of return to work in individuals with low back pain. Detaille et al. [19] found strong evidence that recovery expectations reduced risk of work disability in individuals with cardiovascular conditions. Kuijer et al. [25] provided consistent evidence of positive recovery expectations as associated with decreased risk of sickness absence at follow-up in workers with low back pain. O'Neil et al. [18] found consistent evidence (> 50% of studies that positive preoperative expectations increased likelihood of RTW with individuals with ischemic heart disease). Finally, Lidal et al. [17], in a low-quality rated review, looked at this relationship and found that positive expectations of reintegration in to work were associated with an increased return to work for individuals with spinal cord injury. There is *strong* evidence that negative recovery expectations should be considered a predictor of work disability.

### 3.4.4. Health behaviour

*Physical activity*: Three high-quality and one lower-quality studies considered the impact of physical activity on work disability. Duijts et al. [13] found that no leisure time physical activity was associated with risk of sick leave of three days or less (adjusted OR = 1.43) and with sick leave of more than three days (crude OR = 1.32) for individuals with psychosocial health complaints. O'Neil et al. [18] reported that decreased number of footsteps per day was associated with reduced work resumption after myocardial infarction. Kuijer et al. [25] found limited evidence that higher levels of physical activity were associated with a decrease risk of sickness absence at follow-up. Finally, the single lower quality rated review (van den Berg et al. [22]) reported strong evidence (4 out of 5 studies) that a lack of leisure time physical activity predicted poor work ability. There is *strong* evidence that decreased physical activity should be considered a predictor for work disability.

*Sleep*: Two high-quality systematic reviews considered the impact of sleep on work disability. Davey et

al. [14] found that the presence of sleep problems was associated with increased risk of unplanned, short-term work absences in workers with mild illness or injury. Similarly, Kuijer et al. [25] reported that better sleep quality was associated with decreased risk of sickness absence at follow-up for individuals with low back pain. There is *moderate* evidence that sleep difficulties should be considered a predictor for work disability.

*Substance use*: Three systematic reviews were available regarding the use of alcohol, drugs and smoking; one high-quality, one moderate-quality, and one low-quality systematic review addressed the issue of substance use as a predictor for work disability. Duijts et al. [13] provided a high-quality rated review demonstrating that, for workers with mental health complaints, high levels of alcohol consumption was associated with increased risk of sick leave of over three days (adjusted OR = 1.24). These authors also demonstrated that any level of smoking was associated with a decreased likelihood of return to work and that smoking behavior resulted in an additive interaction with overweight status. Likewise, in a moderate-quality rated review, Blank et al. [16] found that smoking and/or any level of drug dependence was associated with a decreased likelihood of return to work for individuals with mental health conditions and, similar to Duijts et al. [13], their results suggested that smoking and drug use both demonstrated an additive interaction with overweight status. The final study, by van den Berg et al. [22], was a low-quality study that provided limited evidence that alcohol increased risk of poor WAI scores, regardless of health condition. There is *moderate* evidence that substance use should be considered a predictor for work disability.

### 3.4.5. Non work time

One high-quality and one low-quality systematic review considered the impact of time away from the workplace on work disability. Kuijer et al. [25], in a high-quality rated review, found that additional leisure time was associated with decreased risk of sick sickness absence at follow-up for individuals with low back pain. Fadyl et al. [27], in the single low-quality study, found that stronger routines outside of the workplace were associated with increased work ability for individuals with work-related injury. There is *weak* evidence that lack of or poorly planned non-work time should be considered a predictor for work disability.

Table 4
Level of evidentiary support across systematic reviews

Strong
  A minimum of 3 high-quality
  A minimum of 2 high-quality AND 2 moderate-quality or low-quality
  A minimum of 1 high-quality AND 3 or more of moderate-quality or low quality

Moderate
  A minimum of 2 high-quality
  A minimum of 1 high-quality AND 2 moderate-quality or low-quality
  A minimum of 4 moderate-quality or low-quality

Weak
  A minimum of 1 high-quality AND 1 moderate-quality or low-quality
  A minimum of 3 moderate-quality of low-quality

Inconsistent*
  The studies do not meet the criteria for any level of evidence and there is no consistent agreement in reported outcomes.

Insufficient*
  Information is not inconsistent but does not meet the criteria for weak evidence

*The focus of this synthesis was the identification of risk factors, not the impact of interventions on work absence. Due to diversity of both clinical and occupational interventions and respective integrative conclusions, a summary statement cannot be made and thus evidence is labeled "inconsistent." However, factors identified in the included intervention studies may represent emerging or promising data for further investigation.

Table 5
Evidentiary support for modifiable worker factors

| Strong | Moderate | Weak | Inconsistent | Insufficient |
|---|---|---|---|---|
| Emotional distress and Increased Depressive symptoms [13–19] | Sleep difficulties [14,25] | Lack of, or poor planned, non-work physical activity [25,27] | | Fiber intake [22] |
| Negative enduring psychology/ personality factors (e.g., neuroticism) [13,15,17,19–22] | Substance use [13,16,22] | | | Experience of violence [13] |
| Negative health and disability perception/negative recovery expectations [13,15,17–20,22–27] | | | | Increased health concerns [18] |
| Decreased physical activity [13,18,25] | | | | Psychosomatic health concerns [13] |
| Lack of family support [13,21,25–28] | | | | Absence duration [18] |
| Poor general health [14,17,18,24,29,30] | | | | Injury at work [16] |
| Increased functional disability factors [17–19,24,25,29,31,32] | | | | Work unit separation [14] |
| Increased pain [17,19,20,25,26,32] | | | | Compassionate leave [14] |
| Increased fatigue [13,17,19,25] | | | | Lesser duration of employment [17,36] |
| Lack of motivation to return to work [13,14,17,19,32,35] | | | | Transportation access [17] |
| | | | | Positive role models [17,36] |

### 3.4.6. Family support

*Family support*: Three high-quality and three low-quality systematic reviews considered the impact of family support on work disability. Kuijer et al. [25], in one high-quality review, reported that more negative opinions or expectations from relatives about the illness/condition were associated with increased total number of sick leave days for workers with low back pain. A second high-quality review by Duijts et al. [13] found that, for individuals with psychosocial health complaints, low social support was associated with increased risk of sick leave of more than three days (crude OR = 1.22). Cote and Coutu [21], in the final high-quality review in this area, found that greater domestic strain related to the injury/illness may negatively impact rehabilitation, especially for women with persistent musculoskeletal pain and increased family/home demands. Shaw et al. [26] provided a low-quality review with limited consistent evidence that increased domestic strain was associated with increased risk of longer disability for workers with low back pain. Spelten et al. [28] also provided a low-quality re-

view that found increased mobilization of social support was associated with good return to work outcomes for individuals with cancer. Finally, Fadyl et al. [27] provided a low quality review that found better family support was associated with increased work ability for individuals with work-related injuries. There is *strong* evidence that a lack of family support should be considered a predictor for work disability.

### 3.4.7. Health, psychosomatic and general health concerns

*General health level*: Six systematic reviews considered the impact of general health level on work disability. A single moderate-quality review by Steenstra [29] reported strong evidence that poor general health level was associated with decreased likelihood of return to work for individuals with low back pain. Other evidence of this relationship was provided by four high-quality reviews. Specifically, O'Neil et al. [18] found that reduced general health level was associated with reduced work resumption after myocardial infarction. Davey et al. [14] reported that general health level was associated with increased risk of unplanned, short-term work absences in individuals with mild injury or illness. Darr and Johns [30] found that physical illness was associated with increased risk of absenteeism in individuals with work stress. The final high-quality by review Hansson and Jensen [24] looking at this relationship found low evidence that more positive general health level was associated with decreased risk of sick leave of greater than three months. Lidal et al. [17], in a single low-quality review, also found that poor general health level was associated with decreased likelihood of return to work in individuals with spinal cord injury. There is *strong* evidence that poor general health level should be considered a predictor for work disability.

### 3.4.8. Functional disability

Seven systematic reviews considered the impact of disability factors on work disability. De Croon et al. [31] provided a high-quality review with strong evidence that additional activity limitations were associated with increased risk of work disability for individuals with rheumatoid arthritis. Detaille et al. [19] also provided a high-quality review with strong evidence that increased disability scores on the Health Assessment Questionnaire predicted increased risk of work disability for individuals with rheumatoid arthritis. Kuijer et al. [25] found limited evidence that for workers with non-specific chronic low back pain, low muscle endurance predicted increased number of days

of work absence. Similarly, O'Neil et al. [18] provided a high quality report that physicians' perceptions of disability were associated with reduced work resumption after myocardial infarction. Steenstra et al. [29] in a single moderate-quality review considered this relationship and found strong evidence that disability at inception point predicted longer duration of sick leave (Pooled RR = 2.39). A low-quality review by Turner et al. [32] provided evidence of a similar relationship such that disability at inception was found to be associated with poor return to work outcomes for workers with work-related back injuries. Finally, Lidal et al. [17] provided a low-quality review suggesting that greater community mobility and independent living was associated with increased return to work rates for individuals with spinal cord injury. There is *strong* evidence that increased functional disability factors should be considered a predictor for work disability.

### 3.4.9. Pain and fatigue

*Pain*: Six systematic reviews considered the impact of pain on work disability. One high-quality review by Detaille et al. [19] found moderate level evidence suggesting that higher patient rating of pain was associated with increased risk of work disability for workers with rheumatoid. Other high-quality studies looking at this relationship included Truchon et al. [20] who found that persistent pain and/or difficulty coping with pain was associated with lack of return to work for individuals with low back pain. Kuijer et al. [25] reported limited evidence that pain in the cervical and thoracic region prior to injury was associated with increased risk of sickness absence at follow-up for individuals with low back pain. These authors also reported limited evidence that any bodily pain predicted increased number of days of work absence. Three low-quality systematic reviews also considered this relationship. Lidal et al. [17] found that increased neuropathic pain was associated with a decreased risk of return to work for workers with spinal cord injury; however, this relationship was found only in men. Turner et al. [32] reported that more severe pain, pain at more sites and increased pain related behaviors were associated with poorer return to work outcomes in individuals with work-related injury. Finally, Shaw et al. [26] found limited evidence that any bodily pain was associated with increased number of days of work absence for individuals with low back pain. There is *strong* evidence that pain should be considered a predictor for work disability.

*Fatigue*: Four systematic reviews considered the impact of fatigue on work disability. Three of these four

reviews were deemed to be of high quality. Detaille et al. [19] reported moderate evidence that increased fatigue was associated with increased risk of work disability for individuals with rheumatoid arthritis. Duijts et al. [13] found that perpetual feelings of fatigue were associated with increased risk of sick leave over three days (adjusted OR = 1.32) for individuals with psychosocial health concerns. Kuijer et al. [25] reported limited evidence that less fatigue at the end of the day was associated with decreased risk of sickness absence at follow-up for individuals with low back pain. In addition, Lidal et al. [17] provided a low-quality study that reported greater levels of fatigue as associated with decreased likelihood of return to work for individuals with spinal cord injury, especially in older workers. There is *strong* evidence that fatigue should be considered a predictor for work disability.

### 3.4.10. Early clinical intervention approaches

Six systematic reviews considered the impact of early interventions on factors believed to be predictive of work disability. Of the six available reviews, four were deemed to be of high quality. Nash et al. [33] provided strong evidence (13 of 14 studies) that use of early mobilization after acute limb injury was associated with an earlier return to work. Kuijer et al. [25] found that positive recommendations of rehabilitation by a team member were associated with decreased sickness absence at follow-up for individuals with low back pain. Dahm et al. [34] reported that use of bed rest as an intervention was predictive of longer sick leave for individuals with acute low back pain, whereas, staying active predicted reduced usage of sickness leave; however, interestingly, these authors also reported a reversed relationship among combat trainees (army). Detaille et al. [19] provided a high-quality review reporting weak evidence that for those with Rheumatoid Arthritis, less time to treatment was associated with a reduction of work disability. A moderate-level review provided by Blank et al. [16] found that any attempt to return to work within 505 days of absence was associated with an increased likelihood of return to work in workers with stress in contrast to workers with mental illness or mental conditions there was a decreased likelihood of return to work. Turner et al. [32], in a single low-quality review, found weak evidence that less time to treatment was associated with poor return to work outcomes for workers with work-related back injuries. There is *strong* evidence that more time till intervention (or lack of recommendations for early movement) should be considered a

predictor for work disability. However, there was contradictory evidence presented by Blank et al.'s [16] moderate-quality review with respect to workers with mental illness as well as by a low-quality review in situations of work-related back injuries. Therefore, this relationship should likely be considered dependent on type of injury.

### 3.4.11. Work motivation

Three high-quality reviews, one moderate-quality review, and three low-quality reviews considered the impact of work motivation on work disability. For thehigh-quality reviews, Davey et al. [14] found that higher job involvement was associated with reduced risk of unplanned, short-term work absences in workers with mild illness or injury. These authors also reported that higher commitment to the organization/workplace as well as personal accomplishment at work were both associated with reduced risk of unplanned short-term work absences. Duijts et al. [13] reported limited evidence that low level of functioning at work was associated with increased risk of poor work participation outcomes, including return to work and work status, for individuals with depression. The final high-quality review by Detaille et al. [19] found weak evidence that higher perceived importance of work, satisfaction with working conditions, and a desire to remain employed were associated with a reduced risk of work disability for individuals with rheumatoid arthritis. These authors also reported moderate evidence that a desire to remain employed was associated with reduced work disability in workers with ischemic heart disease. Michie et al. [35], in a single moderate-quality study, also considered this relationship and found that a lack of participation at work was associated with increased risk of sickness absence for individuals with psychological ill health. In addition, three low-quality studies considered this relationship. Specifically, Spelten et al. [28] found that changing attitudes towards work (in particular, reduced importance of work and decrease in aspirations related work) were associated with poor return to work outcomes for individuals with cancer. Turner et al. [32] found that a lack of confidence regarding ability to work in the future was associated with poorer return to work outcomes in individuals with work-related back injury. Finally, Lidal et al. [17] reported that positive attitudes towards work and achievement orientation were both associated with an increased return to work rate in individuals with spinal cord injury; similarly, these authors also reported that a lack of work motivation was associated

with lesser return to work. There is *strong* evidence that a lack of work motivation should be considered a predictor for work disability.

## 4. Discussions

### 4.1. Review of findings

The present data consider the impact of modifiable worker variables on development of workplace disability. Psychological, physical and social support factors were found to have strong evidence for being considered as a predictor of disability across health conditions. Specifically, psychological factors including emotional distress and depression, psychological characteristics (e.g., locus of control, self-esteem), and health and disability perceptions (e.g., work ability, functional ability, hopefulness) have strong evidence for being considered a predictor of disability across health conditions. Additionally, lack of worker motivation was revealed as having strong evidence for being considered a risk factor to greater incidence of disability across health conditions. Generally, employees with more work commitment and desire to remain at work resulted in better reported return to work and stay at work outcomes. Physical factors with strong evidence for being considered predictors for work absence across health conditions included physical activity, general health and functional disability. Specifically, workers with greater reported rates of physical activity and better overall health were reported to have a lower risk of work-related disability; in contrast, increased issues with tasks of daily functioning (e.g., mobility) predicted poorer workplace outcomes. With respect to social support, only family support was considered in this current review; other forms of workplace-related support (e.g., supervisory support) are discussed in other reviews arising from the same project that assessed workplace, rather than worker-related factors. For family support, strong evidence was found to suggest that high quality family support, with limited domestic strain, predicted better worker outcomes.

The final strong-evidence modifiable worker factor we considered to be related to each of psychological, physical and social support variables. That is, positive recommendations for early movement/return to work was seen as relating to workers' psychological interpretation of the disability event, but also impacting physical recovery and perceptions of social support for return to work. Consistent with the perceived complexity of this factor, the data suggested that recommendations for early movement are supported in the literature, but that these recommendations may vary across health conditions. That is, some evidence was available suggesting that early mobilization may not be helpful in all types of disability events.

In addition to the factors with strong evidence, our review found moderate evidence that substance use and sleep difficulties should be considered as predictors for disability. Specifically, for sleep only two high quality reviews were available substantially limiting the amount of interpretation possible from the available research. For substance use, three reviews were available; however, these reviews included one strong, one moderate and one low quality review limiting the overall strength of evidence. Additionally, limitation of interpretability for this factor was further hampered by diversity for the variable of interest (e.g., alcohol, drugs, smoking).

The present study found moderate to strong evidence for many modifiable worker variables that could contribute to unnecessary work absence and disability within the workplace. Consequently, employers may wish to consider these research-informed factors when considering workplace-supported interventions intended to improve employee health and well-being, and ultimately to reduce disability costs. However, interventions for worker variables may be futile if introduced in isolation or without consideration of current literature investigating successes and failures for workplace interventions directed at these factors.

## 5. Implications and conclusion

### 5.1. Limitations

Our first limitation was related to quality of original research; as is the case in all systematic review work, the quality of our review is limited by the quality of the primary source studies and the lack of consistency of functional and workplace outcome measures. Our second limitation was created through our choice of inclusion/exclusion criteria. That is, given our requirement that all included reviews be presented in the English language, we may have missed important and meaningful studies presented in other languages. Third, given the diversity of research designs and literature available for inclusion in this study, our analysis was limited to the weighing and reporting of findings

based on methodological quality. Finally, this variability rendered us unable to determine the potential impact of any single or group of risk factor on work absences (i.e., overall estimate of variance-accounted-for effect size).

The academic community partnership provided a forum for researchers to better understand the information needs of end users and resulted in an active exchange that led to creation and refinement of the research question, and addressed a pragmatic need of small and medium sized employers who may not have the human resource capacity to consider individual worker risk or protective factors for a specific injury or chronic health condition. This best evidence synthesis will provide an opportunity to conduct a future synthesis on workplace interventions targeting these factors to provide research-evidence guidance on interventions to address factors relevant to their organization.

## Acknowledgments

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