IHE Report

Effectiveness of Organizational Interventions for the Prevention of Workplace Stress

January 2009

INSTITUTE OF HEALTH ECONOMICS
ALBERTA CANADA

Alberta Health Services
Alberta Mental Health Board

INSTITUTE OF HEALTH ECONOMICS

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EFFECTIVENESS OF ORGANIZATIONAL INTERVENTIONS FOR THE PREVENTION OF OCCUPATIONAL STRESS

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FOREWORD

This report represents the collaborative efforts of the Alberta Health Services - Alberta Mental Health Board (AHS-AMHB) and the Institute of Health Economics. The IHE and the AHS-AMHB* are committed to building capacity for creating and applying high quality evidence to inform questions facing policy and decision makers in Alberta's mental health care system. To bring this to fruition, a joint initiative was undertaken to provide a training opportunity based at IHE to build capacity for applied mental health research.

The questions of interest focused on the exploration of the effectiveness and safety of prevention strategies to reduce stress in the workplace. Issues of workplace mental health are one of the research priorities of the Alberta Mental Health Research Partnership Program. Briefly, the Alberta Mental Health Research Partnership Program is a multi-disciplinary and multi-sectoral collaboration of mental health service providers, research institutions, government ministries, non-profit organizations, and others who work together to advance mental health research and translate evidence into practice.

Workplace mental health has, for several years, been of particular concern in Alberta, where unemployment rates are particularly low and expectations of job productivity are high. While this is generally viewed as a positive situation, it brings with it a unique host of problems, including workplace stress, burnout, increased substance abuse, and other mental health issues, which may stem from such things as high physical and psychological demands, increased pressure on employees to work long hours, larger amounts of disposable income, and relocation and isolation of employees. In particular, this report examines the effectiveness of organizational-level interventions in preventing work-related stress and reducing the resulting losses in productivity.

Research like this is foundational to supporting the initiation, implementation, and rigorous evaluation of workplace mental health initiatives. Furthermore, it provides direction for continued research in this area, to explore the many unanswered questions that remain.

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* During the final stages of this report, a health system re-organization occurred in Alberta and the AMHB along with 11 other health entities merged to become Alberta Health Services. At the present time, the AMHB is known as Alberta Health Services – Alberta Mental Health Board (AHS-AMHB).

EXECUTIVE SUMMARY

Background

Worldwide, occupational stress (also referred to as stress in the workplace or job stress) has increased considerably over the past several years. Data from national surveys indicate that approximately one-third of employed Canadians report high stress levels. Workers in the healthcare industry are significantly more stressed than employees in general, with close to half (45%) reporting high levels of stress. Although not always directly related, job stress has been linked to psychological and physical illness, absenteeism (including disability claims), presenteeism, and turnover. Workplace stress is therefore costly for employers, which is why they are seeking to prevent the problem.

Objectives

To evaluate the effectiveness of organizational-level interventions for the prevention of occupational stress in terms of reducing stress, psychological symptoms, absenteeism, presenteeism, and turnover.

Results

According to the reviewed evidence, research methods in the area of occupational stress prevention have improved over the past 10 years. However, the need for more rigour remains. Six systematic reviews (SRs) assessed the effectiveness of organizational stress prevention interventions and met the inclusion criteria of this review. Three SRs focused on healthcare workers as their population of interest, whereas the remaining three included employees regardless of the industry or occupation in which they worked. In these studies there was considerable variability in how interventions were classified, the types of strategies employed, and the instruments used to measure outcomes.

The following points follow from the reviewed evidence:

- Stress: Two interventions of good methodological quality were associated with significant reductions in employee stress. One consisted of a psychological training program with theory, role playing, and experiential exchanges, whereas the other intervention consisted of "action teams," whereby employee representatives liaised with management and employees to improve team communication and cohesiveness, work scheduling, conflict resolution, and the recognition of good work.
- Burnout: Five interventions were associated with significant reductions in employee burnout, although only two received good methodological quality ratings. One consisted of an emotion-oriented care training program, including clinical lessons and supervision meetings, whereas the other, a participatory intervention, was based on "health circles," in which small groups of employee representatives met to identify psychosocial stressors and recommend solutions.

- Psychological wellbeing: Seven interventions were associated with significant improvements in psychological wellbeing. Four received good methodological quality ratings. Two interventions used a participatory approach to reduce stress, including the creation of committees with employee representatives. The other two involved policy or procedural changes: (a) the immediate transfer of control over production to employee work groups and (b) the introduction of flexible working hours.
- Sickness absence and absenteeism: Seven interventions were associated with reductions in absenteeism, three of which statistical significance was reported. These three interventions also received generally high methodological quality ratings. In addition to improving psychological wellbeing, the two participatory interventions mentioned above significantly reduced absenteeism. An intervention consisting of more teamwork, more personnel, role clarification, production goals, fewer supervisors, a partial change in the shift system, and increased feedback significantly reduced sick leave.
- Turnover: Four interventions were associated with a reduction in employee turnover, one of which statistical significance was reported. A change to a primary care nursing model with support from managers, advice on core skills, and promotion of effective interprofessional communication reduced turnover.

Conclusions

There is limited evidence that organizational-level interventions reduce stress, psychological symptoms, or absenteeism in the workplace when compared to no-intervention controls or other interventions. We have drawn no conclusions on the effectiveness of one intervention relative to another. Studies have not yet incorporated measures of presenteeism in their evaluation of stress prevention interventions. Implications for Alberta and considerations for further research are discussed.

Method

We selected systematic reviews (SRs) to formulate the evidence base for this review. We identified all SRs by conducting a systematic search of the health and business literature published in English between January 1997 and June 2008. The following databases were searched: The Cochrane Library, PubMed, CRD Databases (HTA, DARE), PsycINFO, Embase, CINAHL, ABI Inform, Econ Lit, Web of Science, and Business Source Complete. In addition, we searched the University of Alberta library catalogue, government websites, HTA agency websites, and the Google search engine.

The included systematic reviews were appraised independently by two assessors with respect to various methodological aspects using two quality appraisal tools. The same two assessors independently extracted data from the systematic reviews. The evidence was qualitatively synthesized and presented in summary tables.

Conflict of Interest

Conflict of interest is considered to be financial interest, either direct or indirect, that would be affected by the research contained in this report or creation of a situation whereby an author's or external reviewer's judgment, or the judgment of both could be unduly influenced by a secondary interest such as personal advancement.

Based on the statement above, no conflict of interest exists with the authors or the external reviewers of this report.

Reference

Bergerman L, Corabian P, Harstall C. Effectiveness of organizational interventions for the prevention of occupational stress. Institute of Health Economics, Edmonton AB Canada, Report January 2009; pp i-65.

ACKNOWLEDGEMENTS

The Institute of Health Economics (IHE) is grateful to the following people for reviewing and providing information and comments on the draft report:

—— Dr. Alberta Marine, Corporacio Sanitaria Parc Tauli de Sabadell, Catalonia, Spain

The authors wish to thank the Alberta Mental Health Board and the Institute of Health Economics for the opportunity to work on this project as a skills development learning program.

All information and input is appreciated. The views expressed in the final report are those of the IHE.

Information Service Support

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Competing interest

Competing interest is considered to be financial interest, either direct or indirect, that would be affected by the research contained in this report, or creation of a situation where an author's and/or external reviewer's judgment could be unduly influenced by a secondary interest such as personal advancement.

Based on the statement above, no competing interest exists with the author(s) and/or external reviewer(s) of this report.

One reviewer who provided information and comments on the draft report declared no competing interest, and requested to remain anonymous.

Production of this document has been made possible by a financial contribution from Alberta Health and Wellness. The views expressed herein do not necessarily represent the official policy of Alberta Health and Wellness.

ABBREVIATIONS

95% CI – 95% confidence interval

AACN – American Association of Colleges of Nurses

AHS-AMHB - Alberta Health Services - Alberta Mental Health Board

AMHB – Alberta Mental Health Board

AMSTAR – Assessment of Multiple Systematic Reviews (assessment tool)

BDI – Beck Depression Inventory

BIO – biofeedback

BOHRF – British Occupational Health Research Foundation

CRD – Centre for Reviews and Dissemination

IHE – Institute of Health Economics

CASP – Critical Appraisal Skills Program

CBA – controlled before-and-after study

CBC – Canadian Broadcasting Corporation

CBT – cognitive-behavioural therapy

CCHS – Canadian Community Health Survey

CCOHS – Canadian Centre for Occupational Health and Safety

CCT – clinical controlled trial

CFIB – Canadian Federation of Independent Business

COM – communication

CSG – coworker support groups

DARE – Database of Abstracts of Reviews of Effects

EAP – employee assistance programs

EXE – exercise

GHQ – General Health Questionnaire

HSE – Health and Safety Executive (UK)

HTA – Health Technology Assessment

ICN – International Council of Nurses

IRSST – Institut de recherche Robert-Sauvé en santé et en sécurité du travail

ISMA – International Stress Management Association

ITS – interrupted time series

JCQ – Job Content Questionnaire

JRD – job redesign or restructuring

LFS – Labour Force Survey

MA – meta-analysis

MBI – Maslach Burnout Inventory

MD – mean difference

MDE – major depressive episode

MED – meditation

MeSH – Medical Subject Headings

NIOSH – National Institute for Occupational Safety and Health

NPHS – National Population Health Survey

NSS – non-statistically significant

OIO – other individual- or organizational-level intervention

OTI – other individual-level intervention

OTO – other organizational-level intervention

PAR – participation and autonomy

PCS – prospective cohort study

PEC – physical and environmental characteristics

PEF – person-environment fit

QA – quality assessment

RCT – randomized controlled trial

REL – relaxation

RIS – role issues

SAP – selection and placement

SCL – Symptom Checklist-90-Revised

SR – systematic review

SS – statistically significant

TMT – time management

TRA – training and education program

WCB – Workers' Compensation Board

WMD – weighted mean difference

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SCOPE OF THE REPORT

This report was prepared in response to a roundtable of Alberta scientists, mental health service providers, and decision-makers who identified the need to examine the research evidence on workplace mental health interventions. Follow-up discussions with Alberta Health Services – Alberta Mental Health Board (AHS-AMHB) and a group of experts in workplace wellness further honed the research question.

This report is a systematic review and critical appraisal of the published secondary research literature concerning the effectiveness of organizational-level interventions for the prevention of occupational stress (also referred to as stress in the workplace or job stress). Our aim was to determine which organizational-level stress prevention and management interventions are effective in reducing stress, psychological symptoms, absenteeism, presenteeism, and turnover among psychologically healthy employees to assist Alberta employers and AHS-AMHB to implement effective interventions in the workplace.

INTRODUCTION

"Stress" is a term that can take on many meanings. Sonnentag and Frese[1] have highlighted four stress concepts:

1. the stimulus concept, whereby certain events or stimuli are considered stressful;
2. the response concept, whereby stress is a physiological reaction regardless of the situation;
3. the transactional concept, whereby stress is the result of the transactions between the person and the environment; and
4. the discrepancy concept, whereby stress is the incongruence between the person's desires and the environment.

Furthermore, other stress-related terms such as "stressors" and "strain" add to the complexity of the topic.

The stimulus and response concepts of stress ignore the importance of individual factors such as an individual's thoughts and attitudes towards the situation.[2] Lazarus and Folkman's definition of psychological stress (as cited in Sonnentag and Frese[1]) is more comprehensive in that it takes into account both individual (e.g. perception and cognitive appraisal of the situation, or coping skills) and environmental factors. Representing the transactional concept described above, Lazarus and Folkman have defined psychological stress as "a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being." This definition seems to translate well to the workplace; for example, an employee may experience stress if (s)he perceives his/her workload to be high and if (s)he does not have the coping skills necessary for the situation. Thus, many of the most commonly used definitions for occupational stress encompass these concepts.[3,4]

Determinants

Sometimes referred to as "stressors" or "sources of stress," the determinants of occupational stress are numerous. Many of the factors that can affect the occupational stress process are non-work-related variables and include a wide range of modifying variables (social, psychological, biophysical, and behavioural factors).[5]

Results from the 2005 National Survey of the Work and Health of Nurses in Canada indicated that "poor mental health is associated with working evening shifts, high job strain, low supervisor and low co-worker support, low autonomy, low control over practice, poor nurse-physician working relations, a lack of respect from superiors or co-workers, and high role overload".[6] Generally, the stressors named above are similar to the sources of occupational stress in all workplaces (Table 1).[7] Together, many of the common stressors encompass the psychosocial work environment.[8]

Table 1: Examples of workplace stressors (Canadian Centre for Occupational Health and Safety (CCOHS, http://www.ccohs.ca/oshanswers/psychosocial/stress.html)

Category of job stressor	Examples
Factors unique to the job	• Workload (overload and underload) • Pace, variety, and meaningfulness of work • Autonomy (e.g. the ability to make decisions about one's job or about specific tasks) • Shift work and hours of work • Physical environment (noise, air quality, ergonomic exposures, etc.) • Isolation at the workplace (emotional factors or working alone)
Role in the organization	• Role conflict (conflicting job demands, multiple supervisors or managers) • Role ambiguity (lack of clarity about responsibilities, expectations, etc.) • Level of responsibility
Career development	• Under- or overpromotion • Job security (fear of redundancy either from economy or a lack of tasks or work to do) • Career development opportunities • Overall job satisfaction
Relationships at work (interpersonal)	• Supervisors • Coworkers • Subordinates • Threat of violence, harassment, etc. (threats to personal safety)
Organizational structure and climate	• Participation (or nonparticipation) in decision-making • Management style • Communication patterns

Models

Two popular theories, the demand-control-support model and the effort-reward imbalance model, have emerged to explain how a few key psychosocial characteristics may lead to stress and illness.[9] The demand-control model is based on the premise that a combination of high job demands (workload) and low decision latitude (amount of control or decision-making power) causes mental strain that is detrimental to an employee's health and wellbeing.[8,10] The balance between a job's demands and the amount of control it allows is an indication of the level of job strain that the employee experiences.[11] Jobs in which employees have low decision latitude and heavy job demands are therefore considered to result in high job strain.[10,12] Social support was later added to the model[8] such that the combination of high demands, low control, and low social support create the highest level of strain.[8]

The effort-reward imbalance model is another occupational stress model that has received attention over the past decade. According to this model, employees who expend high effort but receive little reward (high "cost," low "gain") experience high levels of strain, which may lead to various physical and psychological illnesses.[13]

A few decades ago, French et al.[4] introduced the theory of person-environment fit. According to this theory, strain occurs when there is a poor fit between the characteristics of the employee (person) and those related to the job (environment), resulting in reduced wellbeing. Poor person-environment fit has been linked more to psychological strain than to physiological strain.

Quite recently, the concept of work-life balance has emerged in the literature. Work-life conflict "occurs when the cumulative demands of many work and non-work roles are incompatible in some respect so that participation in one role is made more difficult by participation in the other role".[14] Although not a formal model of occupational stress, the concept's underlying framework implies that work-life conflict can result in various adverse organizational, family, employee, and societal outcomes.[14] According to data collected from a national work-life balance survey, one in four employed Canadians experiences high levels of caregiver strain.[14] A national study of more than 30,000 people conducted in 1991 and 2001 found that workers with dependent care responsibilities had higher levels of work-life conflict than other workers, and this was linked to declines in employee physical and mental health. The authors pointed out that employees with dependants likely have higher demands and lower control than those without such responsibilities.

Prevalence of occupational stress

According to a survey on attitudes towards physical and mental health, 19% of Canadians cite work pressure as their top stressor.[15] This may stem from the significant increase in work demands that occurred between 1991 and 2001.[14]

In that same time period, the number of Canadians reporting high levels of job stress increased significantly, from 13% to 35%.[14]

Data from the 2002 voluntary Canadian Community Health Survey (CCHS), conducted by Statistics Canada, revealed that 28% of employed Canadians stated that most work days were "quite a bit" or "extremely" stressful.[16] This increased to 31% in the 2003 CCHS survey.[17] When comparing the sexes, women had significantly higher psychological demands and lower scores for decision latitude (job control), meaning that women (27%) were more likely to experience high job strain than men (19%) were. This finding persisted even after controlling for differences in occupation, work schedule, working hours, and personal income.[18]

Healthcare workers are significantly more likely to report that their jobs are highly stressful than other employees (45% versus 31%).[17] Factors associated with high work stress among healthcare providers included work schedules other than regular daytime shifts, working longer hours per week, and being between the ages of 35 to 54 years. In addition, healthcare workers who reported high levels of day-to-day stress (78%), life dissatisfaction (75%), and "fair" or "poor" health (55%) were more likely to report high work stress. After adjusting for influences outside of the workplace (day-to-day stress, life satisfaction, general heath, sex, and age), physicians (including specialists and general practitioners) and registered nurses (excluding head nurses and supervisors) were more likely to report high work stress than other healthcare providers. In contrast, nurse aides and orderlies, dental hygienists, and medical laboratory technicians were less likely to report high work stress.

Physical and psychological effects of occupational stress

Short-term responses to occupational stress (such as elevated blood pressure, anxiety, and smoking as a form of coping) can lead to long-term adverse health outcomes of physiological (e.g. hypertension, coronary heart disease), psychological (e.g. depression), and/or behavioural (e.g. smoking, alcoholism) nature.[5] The impact of occupational stress on mental health may be greater among lower socio-economic or occupational status groups. A higher prevalence of occupational stress was reported among lower status occupations.[19]

Organizational effects of occupational stress

Absenteeism

Absenteeism refers to employees being absent from (or not present at) work. Although not all absenteeism is caused by occupational stress, researchers have demonstrated a weak association between the two.[6,20-25] Some authors have proposed that psychological or physical illness may act as a mediator in the stress-absence association.[20,26] For example, individuals who suffer from physical pain are more likely to be absent from work than those without pain.[26-28] In addition, data

from the CCHS and the National Population Health Survey (NPHS) have shown that people who experienced depression in the previous year were absent from work far more often than those without a history of depression.[19]

In an investigation of the association between chronic work stress, psychiatric disorders, and chronic physical conditions with disability, Dewa et al.[29] found that on its own, the presence of work stress significantly increased the likelihood of total disability days (days spent entirely in bed) among workers. Furthermore, their results indicate that work stress may intensify the disability linked to both psychiatric disorders and chronic physical conditions. This suggests that preventing or managing stress may help to reduce absenteeism related to psychological and physical health problems.

However, approximately 70% of absenteeism cannot be explained either by stress or by psychological or physical illness.[20] Other variables that can moderate the stress-absence association include an individual's attribution processes, disposition and personality, gender, and occupational status; the organizational culture or the absence of it; and social change.[20,26]

The Canadian Labour Force Survey (LFS) indicated that, in general, higher absence rates are found among women (excluding absence due to maternity leave) and individuals aged 45 to 64 years.[30] The industries that experience the highest absence rates are healthcare and social assistance, utilities, and federal and provincial public administration: 14.4, 12.4, 14.1, and 11.7 days lost per worker per year, respectively, compared to Canada's average of 9.7 days.

The direct cost to Canadian employers of absenteeism caused by high work-life conflict was estimated to be between CN$3 and CN$5 billion in 2001.[14] When indirect costs were included, the estimate rose to between $4.5 and $10 billion per year.

Presenteeism

Presenteeism has been defined as "lost productivity from attending work when unwell".[31] Poor working conditions, ineffective management or leadership, and work-life imbalance are significantly associated with increased presenteeism ($P < 0.0001$), even after adjusting for age, gender, number of risks, and number of medical conditions.[32]

The largest economic burden associated with depression stems from lost work performance.[33-35] Although many other health conditions, such as asthma, migraine or chronic headache, diabetes, and back or neck disorders, may contribute to productivity losses, depression causes the greatest work impairment.[34,36] There is evidence to suggest that presenteeism is more frequent and therefore more costly than absenteeism when it comes to depression.[35,36]

Turnover

According to the data collected from a national work-life balance survey, 28% of Canadian workers considered leaving their organization daily, several days

a week, or weekly.[14] The most common reason cited was frustration with the work environment (53%). An additional 31% of respondents reported that their work environment was not supportive, whereas 26% felt that their work expectations were unrealistic.

Employee turnover can be costly to organizations because of the loss of experienced workers as well as the costs associated with separation (exit interview, administration, severance pay), replacement, and training.[14] Morale among the remaining employees may wane (Vanderkolk and Young 1991, cited in Duxbury and Higgins,[14]), particularly if extra work is created, thereby causing stress and possibly a decline in their performance.[37,38]

Cost to the employee

High levels of occupational stress contribute to both physical and psychological illness.[11,39-41] Both the demand-control-support and effort-reward occupational stress models have demonstrated that occupational stress is a risk factor for heart disease and common mental conditions such as neurotic, depressive, and phobic anxiety, and obsessive-compulsive and persistent mood disorders.

Economic burden

Workplace mental health is increasingly becoming a topic of interest among the media, government, researchers, and employers.[20,42-45] Cultivating this interest is the economic burden that results from psychological disorders. Stephens and Joubert[46] estimated that Canada's total economic burden of depression and distress was CN$14.4 billion in 1998. More recently, Lim et al.[47] calculated the economic burden of mental illness in Canada, which totalled $51 billion in 2003. In their new measure, costs related to healthcare resources, lost productivity, and health outcomes were taken into account, resulting in a more comprehensive measurement of economic burden. In the United States, workers with depression cost employers approximately US$44 billion per year in lost productivity, excluding the labour costs associated with short- and long-term disability.[33]

A large contributor to this estimate is the loss in work productivity.[33-35] Absenteeism, presenteeism, increased turnover rates, and short- and long-term disability all contribute to decreased productivity, which translates to lost dollars for employers.[40] In addition, employers bear the economic costs of depression long after an employee experiences a depressive episode.[19] Furthermore, a severe case of depression may be so debilitating that the employee is forced to take a leave of absence and claim disability insurance. In 2006, according to the Sun Life Assurance Company of Canada, psychological illness (including stress leave and burnout but excluding addictions) accounted for 17% of all short-term disability claims and 33% of long-term disability claims (D. Kallay, personal communication, April 2007).

The Alberta context

Alberta's current economic boom has created worker shortages in almost every industry.[48] This is particularly true for nurses where the worker shortage is likely to worsen over the next few years as approximately 20% of Alberta's registered nurses are eligible to retire.[49,50] Alberta has the second-highest incidence of depression among Canadian nurses.[51] As well, both female and male nurses are significantly more likely to suffer from depression than all other workers are.[51] Although Alberta's absence rates are slightly lower than the national average, they continue to rise every year.[30]

In addition to the employers' costs mentioned above, Alberta employers incur the fees associated with Workers' Compensation claims. In Alberta, the Workers' Compensation Board (WCB) compensates claimants for chronic onset psychological injury or stress.[52]

PREVENTING OCCUPATIONAL STRESS

Types of prevention

The link between work stress and depression is one reason why some employers have implemented stress prevention interventions in the workplace.[53] Various primary, secondary, and tertiary stress prevention interventions have been developed and used with the aim of avoiding the physical, psychological, and organizational effects of occupational stress.[54-57]

Primary

Primary prevention strategies and interventions are attempts to prevent the exposure to stressors in the workplace and the occurrence of occupational stress-related illness among healthy employees by modifying aspects of the work environment.[54] Primary prevention strategies are also known as "stress reduction strategies."[55] The term "stress management," however, most often refers to secondary and tertiary prevention interventions.[54]

Secondary

Secondary prevention strategies are attempts to prevent the health concern from progressing and causing major symptoms by modifying an affected employee's response to or perception of workplace stressors and helping the employee better manage or cope with stress.[54,56] The responsibility therefore rests with the individual employee, who must learn how to manage or cope with stress, regardless of the source.

Tertiary

Tertiary prevention is aimed at managing or treating the symptoms of existing stress-related problems or diseases.[54] An employee assistance program (EAP) is an example of a tertiary prevention intervention. It enables employees to seek

advice or counselling services to address an existing problem.[57] These employer-sponsored programs provide confidential services to employees and their families. Employees who already suffer from depression or other mental illnesses would therefore benefit the most from tertiary prevention interventions.

Level of focus

Different terms are used by different authors to describe stress prevention interventions. The way in which these terms are defined and utilized results in interventions being classified differently, which highlights the importance of a framework for classifying the different types of interventions. The most commonly used classification of intervention strategies is DeFrank and Cooper's[58] terminology of individual, individual-organizational, and organizational interventions.[56,59-63] We used this classification system in this review because of its frequent appearance in the occupational stress literature and the ease with which the reviewers were able to use it to classify interventions. Specifically, we used the classification table by Jordan et al.,[56] which uses DeFrank and Cooper's framework (Table 2).

Table 2: Types of stress prevention interventions

Organizational-level interventions	
SAP	Selection and placement
TRA	Training and education program
PEC	Physical and environmental characteristics
COM	Communication
JRD	Job redesign or restructuring
OTO	Other organizational-level intervention
Individual/organizational-level interventions	
CSG	Coworker support groups
PEF	Person-environment fit
RIS	Role issues
PAR	Participation and autonomy
OIO	Other individual- or organizational-level intervention
Individual-level interventions	
REL	Relaxation
MED	Meditation
BIO	Biofeedback
CBT	Cognitive-behavioural therapy
EXE	Exercise
TMT	Time management
EAP	Employee assistance program
OTI	Other individual-level intervention

Organizational-level interventions

Organizational-level interventions target policies and practices to prevent employee stress across the entire organization.[62] Generally these interventions, which use primary prevention strategies, have been termed organizational,[64] work-directed,[65] work-environment-directed,[62] work-related,[56] environmental,[64] or environmental management.[66] Organization-focused approaches include the following:[62,65]

- **Selection and placement:** As part of the recruitment process, selection and placement strategies ensure that the employee possesses the right combination of skills to complete work tasks effectively.
- **Training and education programs:** Employee skills and knowledge are updated regularly.
- **Physical and environmental characteristics:** Occupational hazards are identified, and action is taken to reduce their presence in the workplace.
- **Communication:** This involves opening the lines of communication, improvement of communication skills, or both.
- **Job redesign or restructuring:** This includes increasing job autonomy, control, or both by allowing employees to make more decisions around their work; enhancing skill discretion by allowing workers to use their skills, knowledge, and abilities to perform complex tasks; and redistributing power among all employees to create a more democratic workplace and increase an employee's sense of control.

Individual/organizational-level interventions

Individual/organization-level interventions "typically target particular issues relating to the interface between individuals and their work and generally tend to concentrate on ensuring that employees can carry out their work tasks adequately".[62] They include the following:[62,67]

- **Coworker support groups:** Coworkers and supervisors are encouraged to support each other.
- **Person-environment fit:** As part of ongoing human resource management, regular appraisals are performed to ensure that there is congruence between (a) the employee's expectations and the environmental supplies available or (b) the environmental demands placed on an employee and that employee's abilities to meet those demands.
- **Role issues:** Employees' roles are clarified, and their job tasks are clearly delineated to reduce role ambiguity and role conflict.
- **Participation and autonomy:** Employees participate in the organization's problem-solving or decision-making processes, or both.

Individual-level interventions

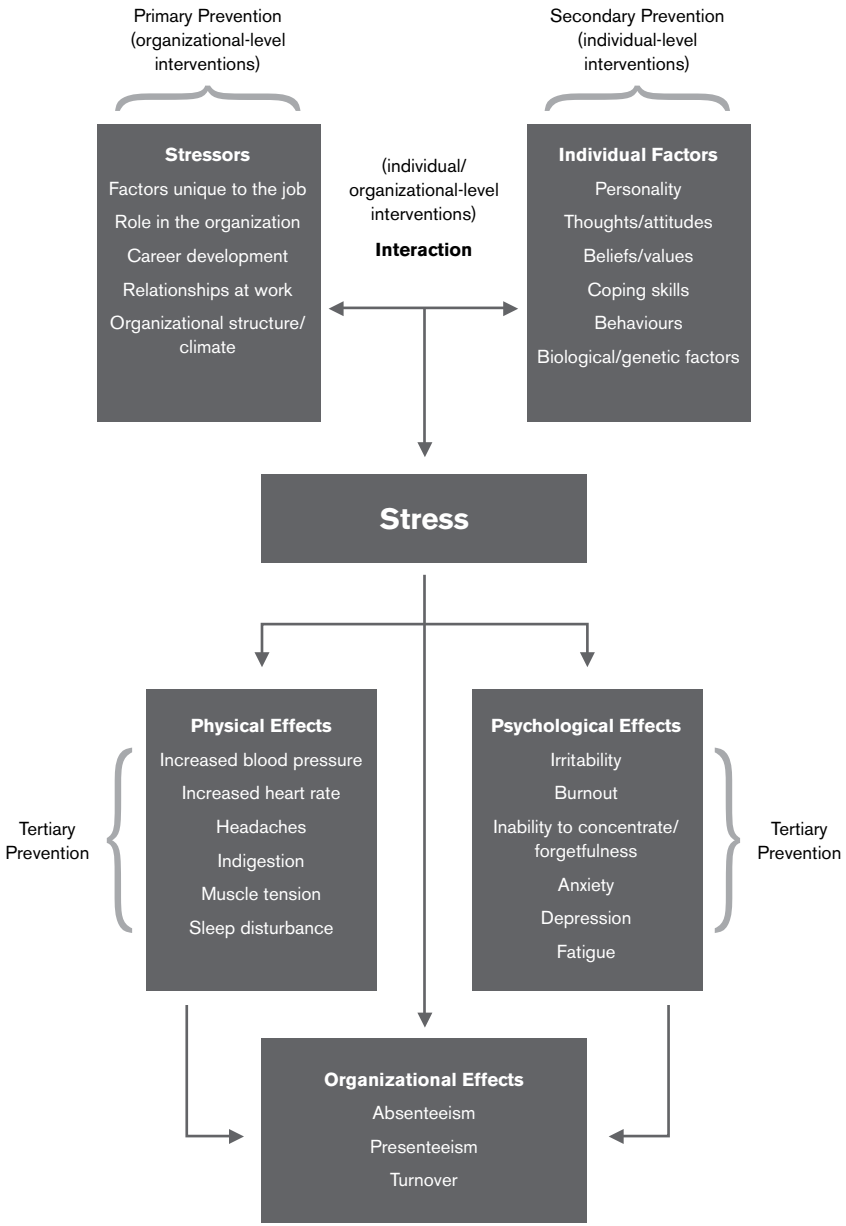
Individual-level interventions are generally aimed at secondary prevention and therefore focus on providing employees with coping skills. These strategies have been called individual,[54] worker-directed, worker-related,[56] person-directed,[65] person-based,[68] or personnel support.[66] Individual-focused approaches include the following:[62]

- **Relaxation or meditation:** Employees learn relaxation or meditation techniques to release tension.
- **Biofeedback:** This is a measurement tool for learning, recognizing, and responding to information such as muscle and skin activity.
- **Cognitive-behavioural therapy:** Employees learn to change their way of thinking and use active coping skills.
- **Exercise:** Cardiovascular training, weight training, or both helps to protect employees from the harmful physical and mental effects of stress.
- **Time management:** Employees are taught various skills aimed at improving their ability to delegate, negotiate, and set goals.
- **Employee assistance programs:** Counselling, advice, or referral services are offered to employees.

Theoretical occupational stress framework

To demonstrate how the information provided in the previous sections of this report is interconnected, a proposed occupational stress prevention and management framework is depicted in Figure 1. The figure shows the occupational stress process, work- and non-work-related stressors, and intervention points. Examples are provided under each component of the framework but are in no way meant to be exhaustive. As shown, the work-related stressors interact with individual factors (non-work-related factors) to produce occupational stress, which, in turn, produces physical, psychological, and organizational effects. The figure accounts for the possibility of physical and psychological symptoms acting as mediators between stress and organizational effects. The types and levels of stress prevention interventions and the factors at which they are aimed are also represented.

Figure 1: Theoretical occupational stress framework



EVIDENCE FOR THE EFFECTIVENESS OF INTERVENTIONS FOR PREVENTING OCCUPATIONAL STRESS

In this review we focus solely on organizational-level interventions because they have the "greatest potential to affect the performance of the entire work group,"[55] not just the employees who have been trained in and have mastered stress management techniques. Most organizational and individual/organizational strategies are concerned with reducing stress by modifying aspects of the work environment or the nature of the work and, as such, are considered primary prevention interventions. However, it is important to note that organizational-level strategies are not always aimed at primary prevention. For example, the coworker support group strategy, which is classified as an individual/organizational strategy, may be viewed as a coping mechanism and therefore would be considered a secondary prevention strategy. For the purposes of this review, an intervention was deemed to be organizational if it employed an organizational or individual/organizational strategy as presented in Table 2, regardless of how the study authors categorized the intervention and regardless of the type of prevention at which it was aimed. The full method for this review is detailed in Appendix A.

The literature search identified 47 citations of published secondary research studies that potentially met the inclusion criteria of this review. Six additional studies were identified, retrieved, and examined to determine whether they met the inclusion criteria of this review (see additional reviews, Appendix A). To ensure the inclusion of the most recent literature, the search was updated a second time, 10 months after the first update. Seven studies in addition to those already identified potentially met the inclusion criteria. Full-text articles were retrieved for all 60 citations. On closer examination of these articles, 54 of these studies (one of which was a duplicate publication) were excluded and the reasons documented (see Table C1, Appendix C, for excluded studies).[69-71]

In total, six SRs[64-66,69,70,71] assessing the effectiveness of organizational stress prevention interventions met the inclusion criteria of this review (see Table 3). Details of the included SRs are summarized in Appendix B.

Description of the included systematic reviews

Inclusion criteria varied across the six SRs. As a result, there was little overlap among the primary studies included in this review. All of the SRs recognized the various levels at which stress prevention interventions are targeted. One SR made a distinction between educational, psychosocial, and environmental/organizational interventions and examined the effectiveness of these interventions in terms of improved staff morale and reduced burnout.[64] The Cochrane Review uses the terms "worker-directed" and "work-directed" interventions to distinguish individual-level from organizational-level interventions, respectively.[65] One SR aimed to determine the effectiveness of two approaches, personnel

and environmental, in reducing workplace stress,[66] whereas another examined prevention, retention, and rehabilitation programs to address the issue of mental ill health in the workplace.[69] The two most recent reviews[70,71] focused solely on organizational-level interventions, one specifically on task restructuring[70] and the other on interventions aimed at increasing employee control.[71]

Table 3: Summary of included systematic reviews

Review	Quality		No./type of primary studies	No./ type of workers	Follow-up
	AMSTAR	QA Checklist			
Bambra et al.[70] 2007	5/11 **Medium**	4/6 **Poor**	PCS w/ comparison (n = 8) PCS w/o comparison (n = 6) Prospective repeat cross-section w/o comparison (n = 3) Retrospective cross-section (n = 1) Retrospective cross-section w/ comparison (n = 1)	No restriction to type of workers (n = 3,597)	1 month to 2 years
BOHRF[69] 2005	5/11 **Medium**	3/6 **Poor**	SR (n = 2) RCT (n = 1) Quasi-experimental controlled (n = 2) Randomized (n = 1) Action research (n = 1) Feasibility study (n = 1)	No restriction to type of workers (n = 398+)	1 week to 2 years
Egan et al.[71] 2007	5/11 **Medium**	4/6 **Poor**	PCS w/ comparison (n = 5) PCS w/o comparison (n = 3) Prospective controlled repeat cross-section (n = 1) Prospective repeat cross-section with nested cohort study w/ comparison (n = 1) Prospective repeat cross-section w/ comparison (n = 1) Retrospective repeat cross-section (n = 1) Retrospective cohort (n = 1) Qualitative retrospective panel study (n = 1)	No restriction to type of workers (n = 3,563)	1 week to 2 years and 3 months

Table 3: Summary of included systematic reviews (continued)

Review	Quality		No./type of primary studies	No./ type of workers	Follow-up
	AMSTAR	QA Checklist			
Gilbody et al.[64] 2006	4/11 **Medium**	5/6 **Average**	RCT (n = 2) Cluster RCT (n = 2) CCT (n = 2) CBA (n = 1)	Psychiatric unit staff (n = 2,551+)	Immediately postintervention to 2½ years
Marine et al.[65] 2006	8/11 **High**	5/6 **Average**	RCT (n = 5) Cluster RCT (n = 2)	Healthcare employees (n = 2,141)	Immediately postintervention to 12 months or longer
Mimura and Griffiths[66] 2003	3/11 **Low**	2/6 **Poor**	RCT (n = 2) PCS (n = 3)	Nurses (n = 401)	Not reported

Abbreviations: CBA – controlled before-and-after study; CCT – controlled clinical trial; PCS – prospective cohort study; RCT – randomized controlled trial; SR – systematic review; C/A – can't answer; N/A – not applicable

Study designs

The selected SRs included designs such as clinical controlled trials, controlled before-and-after studies, prospective cohort studies, and retrospective cohort studies because of the dearth of research in the area of occupational stress reduction and management and the difficulty of conducting randomized controlled trials in the workplace. The reviews by the British Occupational Health Research Foundation (BOHRF),[69] Bambra et al.,[70] and Egan et al.[71] had the least restrictive inclusion criteria for study design. They also included studies such as retrospective cross-sectional studies and feasibility studies.

Participants

Three SRs specifically focused on healthcare workers as their population of interest,[64-66] whereas the other three included employees regardless of the industry or occupation in which they worked (see Table 4). Several SRs included studies that focused on nurses.[64-66] Of the 49 primary studies included in the six SRs, 22 focused on healthcare workers. All of the studies that focused on factory workers came from two reviews that looked at two types of workplace reorganization: task restructuring[70] and increasing employee control.[71] The SRs reported results on a total of 10,346 workers, with sample sizes ranging from 6 to 2210.

Overall, approximately half of the SRs included studies that used sample sizes of less than 100. About one-third had sample sizes between 100 and 500, whereas two studies had exceptionally large sample sizes, both over 1000 participants (Heaney 1995, in Gilbody et al.[64] and Marine et al.;[65] Park 2004, in Egan et al.[71]).

Table 4: Target populations of the SRs' primary studies

Population	No. of primary studies
Factory workers	13
Nurses	10
Other healthcare staff	4
Government employees	4
Healthcare units (all staff)	3
Professional caregivers	3
Postal office employees	3
General practitioners	2
Customer service, sales representatives	2
Human resources staff	1
Social workers	1
High-tech corporation employees	1
Teachers	1
Police officers	1

Interventions

Four SRs[64,69-71] did not specify that their interventions of focus would be based on stress prevention. Two of these[70,71] were based on the demand-control-support model.[8] One included "all interventions designed to improve the working environment, working experience, and staff morale of inpatient staff,"[64] thus implying the inclusion of organizational-level interventions. The systematic review by BOHRF[69] included prevention, retention, and rehabilitation programs for the workplace and therefore included stress prevention interventions; only preventative and retention programs that could be classified as having an organizational-level focus were included (rehabilitation programs were excluded on the basis of being reactive as opposed to preventive in nature).

Table 5 shows which intervention strategies were used in the primary studies included in all of the reviewed SRs. As shown, the most frequently used strategies were job redesign or restructuring (JRD) and participation and autonomy (PAR). The only two strategies not assessed were person-environment fit (PEF) and selection and placement (SAP).

Table 5: Intervention strategies used in the SRs' primary studies

Intervention strategy	No. of primary studies
Job redesign or restructuring (JRD)	29
Participation and autonomy (PAR)	17
Training and education (TRA)	13
Coworker support groups (CSG)	8
Physical and environmental characteristics (PEC)	5
Communication (COM)	5
Role issues (RIS)	4

Comparators

Three of the SRs[65,66,69] had determined a priori the comparators (the comparison groups' interventions) that would be included. More specifically, the experimental interventions were compared to other interventions with the same purpose or to no intervention at all. The other three SRs[64,70,71] did not specify which comparator(s) would be included in their review; however, the comparison groups were frequently no-intervention controls.

Outcome and outcome measures

The outcomes that were included in the SRs could be categorized as follows: stress, burnout, psychological wellbeing, sickness or absenteeism, and turnover or retention. All six SRs reported on the stress of participants, using a wide variety of self-report measures (e.g. Occupational Stress Indicator, Nursing Stress Scale, Weyer questionnaire, Teacher Stress Inventory, Job Stress in School Setting, DeVilliers Carson Leary Stress Scale). Similarly, psychological wellbeing was measured with a variety of instruments, some of which measured psychological symptoms specific to certain mental disorders (e.g. Warr Job Related Anxiety Scale, Zung Self-rating Depression Scale). Other instruments used to measure general psychological wellbeing included the General Health Questionnaire and the Symptom Checklist-90-Revised. Burnout was measured primarily with the Maslach Burnout Inventory. Details were not provided on how absenteeism and turnover were measured, although it is likely that organizational records were used to determine absence or turnover rates.

Methodological quality of the included systematic reviews

The methodological quality of the SRs was assessed using two tools: AMSTAR and the Quality Assessment Checklist (see Appendix B for the tools and their corresponding guidelines). The degree of the difference or equivalence between the two reviewers was calculated for both the white rows and the grey rows of the Quality Assessment Checklist as well as the AMSTAR tool. The kappa coefficients were 0.71, 0.38, and 0.68, respectively. Methodological quality varied depending on the tool used to critically appraise the reviews (see Tables B2 and B3, Appendix B).

Marine et al.'s study[65] met 8 of the 11 criteria used by the AMSTAR tool and therefore received a high quality rating. Four SRs[64,69,70,71] received medium quality ratings with the AMSTAR tool, scoring between 4 and 7. With the Quality Assessment Checklist, Marine et al.[65] and Gilbody et al.[64] both received average quality ratings, scoring 5 out of 6. The remaining SRs received poor ratings, ranging from 2 out of 6 to 4 out of 6. A description of the tools' rating systems is provided in the Methodological Quality Assessment section of Appendix A.

According to the scores from both critical appraisal tools, Marine et al.[65] was the best-conducted SR, whereas Mimura and Griffiths[65] was the most poorly conducted.

All six SRs used multiple electronic databases in their search, and all but one[64] used other sources such as handsearching, scanning reference lists, and consulting experts.

Four SRs[64-66,69] mentioned in their inclusion criteria that the outcomes should be measured using validated or standardized instruments or that such studies would be given primacy.

Four of the SRs[64,65,70,71] reported that two reviewers had independently assessed the quality of the included studies, whereas only two[64,65] reported using two reviewers to independently extract data.

Because of the large degree of heterogeneity (in interventions and outcome measures), most of the reviews analyzed and synthesized the evidence qualitatively. The one exception was Marine et al.,[65] who performed a meta-analysis for a subgroup of primary studies that used the same outcome measures.

The conclusions of the SRs appeared to follow from their results and it was appropriate that all of the reviews had highlighted the need for further research and more rigorous evaluations of workplace interventions. In their concluding sections, the authors of only half of the SRs[65,66,69] mentioned the comparators when commenting on the effectiveness of the interventions studied.

Two SRs[66,69] did not provide statements on whether there was a conflict of interest, and one review[66] did not list its sources of funding. None of the SRs reported the sources of funding of their included studies and therefore all scored "no" on AMSTAR's question 11.

Findings reported by the included systematic reviews

The primary studies that resulted in positive outcomes are summarized in Table 6.

Stress

Two of the SRs[65,71] reported that two interventions were associated with significant reductions in employee stress, whereas nine did not have a significant effect (JRD × 2, CSG/TRA × 2, JRD/TRA, TRA, CSG × 2, PAR/TRA). The two successful interventions both received good methodological quality ratings and are described below.

A psychological training program with theory, role playing, and experiential exchanges (Delvaux 2004, in Marine et al.[65]) significantly reduced stress immediately following the intervention (MD −0.34, 95% CI −0.62 to −0.06), but the difference was nonsignificant at six months (MD −0.19, 95% CI −0.49 to 0.11). This training program (TRA) was implemented in Belgium with 115 oncology nurses participating in the randomized controlled trial (no-intervention control). Stress was measured using the Nursing Stress Scale.

In the United States, 1463 retail store employees participated in an intervention with "action teams" (Park 2004, in Egan et al.[71]). More specifically, employee representatives liaised with management and employees to improve team communication and cohesiveness, work scheduling, conflict resolution, and the recognition of good work (PAR/COM/JRD). Evaluated with Cohen's six-item scale, the intervention significantly improved stress ($P = 0.02$), when compared to 10 no-intervention control groups.

Table 6: Summary of Intervention Strategies with Positive Outcomes

Outcome measured	Intervention strategies	No. of primary studies	Comparator
Stress	TRA	1	No intervention
	PAR/COM/JRD	1	No intervention
Burnout	TRA/CSG	2	No intervention Placebo intervention
	TRA	1	No intervention
	PAR	2	No comparison group No intervention
Psychological wellbeing	TRA/CSG/PAR	1	No intervention
	TRA/CSG	2	1. Relaxation training 2. Stress management training No intervention
	JRD/PAR/PEC	1	No intervention
	PAR	1	No intervention
	JRD	1	No intervention
	PAR/JRD	1	No comparison group
	JRD	1	No intervention

	Quality of primary studies	Population	Outcome
	23/30 (high)	Psychiatric nurses (n = 115)	Reduced immediately postintervention
	8/10 criteria met	Retail employees (n = 1463)	Reduced
	23/30 (High) Not reported	Professional home care workers (n = 300) Mental health nurses (n = 53)	Reduced one subscale of burnout (Lack of Personal Accomplishment) Significantly reduced (level of significance not reported), although placebo group experienced a greater reduction than the intervention group did
	Marine = 18/30; Gilbody = Not reported	Forensic mental health unit staff (n = 20)	Reduced all 3 subscales
	2– * 10/10 criteria met	Human resources staff (n = 31) Nurses, orderlies, and auxiliary nurses (n = 613)	Reduced at 4 months postintervention but no effect detected at 13 months postintervention Reduced work-related burnout
	Not reported (probable unit of analysis error)	Nursing and non-nursing staff in mental facility (n = 2,210)	Improved (Gilbody) Inconclusive (Marine) **See text for explanation**
	2– * 16/30	High-tech corporation employees (n = 76) Nursing home staff (n = 98)	Reduced symptoms at 3-month follow-up, but no difference between groups when compared to other individual-level interventions Reduced symptoms
	9/10 criteria met	Factory manual workers (n = 187)	Improved
	7/10 criteria met	Central government office employees (n = 53)	Improved
	7/10 criteria met	Police officers (n = 62)	Improved
	7/10 criteria met	Factory manual workers (n = 29)	Improved
	Not reported	Psychiatric nurses (2 wards; n = ?)	Reduced

Table 6: Summary of Intervention Strategies with Positive Outcomes (continued)

Outcome measured	Intervention strategies	No. of primary studies	Comparator
Sickness absence and absenteeism	COM	1	No intervention
	TRA/PAR/CSG	1	No intervention
	JRD/PAR/PEC	1	No intervention
	JRD/RIS/COM/ PEC	1	No comparison group
	PAR	1	No intervention
	PAR/PEC/TRA	1	No comparison group
	COM	1	No intervention
Turnover	JRD/COM/CSG	1	No intervention
	TRA/PAR/CSG	1	No intervention
	PAR	1	No comparison group

*SIGN gradings (Scottish Intercollegiate Guidelines Network 2000): 1— meta-analyses, systematic reviews of randomized controlled trials or randomized controlled trials with a high risk of bias; 2++ high-quality systematic reviews of case control or cohort studies, or high-quality case control or cohort studies with a very low risk of confounding, bias, or chance and a high probability that the relationship is causal; 2+ well-conducted case control or cohort studies with a low risk of confounding, bias, or chance and a moderate probability that the relationship is causal; 2— case control or cohort studies with a high risk of confounding, bias, or change, and a significant risk that the relationships is not causal.

	Quality of primary studies	Population	Outcome
	Not reported	Psychiatric unit staff (n = 72)	Reduced
	2++ *	Not reported	Reduced
	9/10 criteria met	Factory manual workers (n = 187)	Reduced
	8/10 criteria met	Postal sorting office employees (n = 100)	Reduced
	7/10 criteria met	Central government office employees (n = 53)	Reduced
	5/10 criteria met	Hospital orderlies (n = 87)	Reduced
	Not reported	Psychiatric unit staff (n = 72)	Reduced
	Not reported	Psychiatric nurses (n = 161)	Less turnover in intervention group than in control group
	2++ *	Not reported	Reduced
	2– *	Human resources staff (n = 31)	Reduced

Burnout

Five of the SRs[64-66,69,71] reported that five interventions were associated with significant reductions in employee burnout, three did not have a significant effect (JRD/COM/CSG, JRD/TRA × 2), and one was associated with a significant worsening of burnout symptoms (PAR/JRD). The two studies that received generally high methodological quality ratings are described below.

An emotion-oriented care training program including clinical lessons and supervision meetings (TRA/CSG) (Schrijnemaekers 2003, in Marine et al.[65]) improved one symptom (Lack of Personal Accomplishment) of burnout on the Maslach Burnout Inventory when compared to a no-intervention control. This cluster-randomized trial was implemented in the Netherlands with 300 professional caregivers.

A participatory intervention (PAR) based on German "health circles" (Bourbonnais 2006, in Egan et al.[71]) was implemented in Canada with 613 nurses, orderlies, and auxiliary nurses. The intervention involved small groups of employee representatives who met to identify psychosocial stressors and recommend solutions. There was a significant improvement ($P = 0.034$) in one area of burnout (work-related) (MD –1.83, 95% CI –3.58 to –0.09) when compared to a no-intervention control (MD 0.06, 95% CI –1.66 to 1.78) using the Copenhagen Burnout Inventory. There was no significant change in the other two types of burnout (client-related and personal burnout). This was a prospective repeat cross-sectional study with a comparison group who received no intervention.

Discrepancy in reporting of results:

Although the results of one intervention (JRD/CSG/COM) were reported as nonsignificant or inconclusive in three SRs (Melchior 1996, in Gilbody et al.,[64] Mimura and Griffiths,[66] and Bambra et al.[70]) as well as the primary study, one SR (Marine et al.[65]) reported a significant improvement on the Depersonalization subscale of the Maslach Burnout Inventory. The reason for this discrepancy is unclear. This intervention is not listed in Table 6.

Psychological wellbeing

Five of the SRs[64,65,69-71] reported that seven interventions were associated with significant improvements in psychological wellbeing, 15 interventions did not have a significant effect (CSG/TRA, PAR/COM/RIS, JRD × 6, TRA/CSG/PAR, JRD/RIS, PAR × 2, PAR/TRA, PAR/JRD × 2), and four interventions demonstrated a significant decline in mental wellbeing (JRD/RIS, JRD, PAR/JRD, PAR/PEC/JRD). Four studies with higher methodological quality ratings are described below.

An intervention comprising a participatory stress reduction committee, more and smaller teams with sub-supervisors, more on-the-job training, and ergonomic improvements (JRD/PAR/PEC) (Kawakami 1997, in Egan et

al.[71] and Bambra et al.[70]) was studied using a prospective cohort design with comparison group. One hundred eighty-seven manual workers from a factory in Japan participated. There was a significant improvement ($P = 0.025$) in mean depression scores in the short term (pre 41.1; post 38.6) when compared to a no-intervention control (pre 41.5; post 42.3), using the Zung Self-rating Depression Scale.

Using the General Health Questionnaire and no comparison group, mental health improved significantly ($P < 0.05$) when control over production was immediately transferred to employee work groups (PAR/JRD) (Wall 1981, in Egan et al.[71]). A steering group of representatives was responsible for overseeing change. This study was conducted in the UK with 29 factory manual workers.

A participative action research intervention (PAR) (Bond 2001, in Egan et al.[71]) was implemented in the UK with 53 government office employees. The steering committee was made up of volunteer employee representatives. The Occupational Stress Indicator results indicated that mental ill health improved significantly ($P = 0.014$; pre: 57.56, 95% CI 54.10 to 60.93; post: 52.27, 95% CI 45.96 to 58.58) when compared to a no-intervention control (pre: 53.19, 95% CI 49.45 to 56.93; post: 58.96, 95% CI 53.99 to 63.93).

An intervention in which employees were given flexible working hours (JRD) (Smith 1998, in Egan et al.[71]) significantly improved mental health ($P < 0.05$; as measured by the General Health Questionnaire) when compared to a group with rigid 12-hour shift schedules. This study was conducted in the UK with 62 police officers.

Discrepancy in reporting of results:
One intervention (TRA/CSG; Proctor 1998, cited in Marine et al.[65] and Mimura and Griffiths[66]) was reported in one SR[65] as producing a significant decrease in psychological symptoms (MD −2.90, 95% CI −5.16 to −0.64) and in another[66] as having no significant effect. Closer examination of the primary study revealed that there was a statistically significant difference at follow-up on one (Somatic Symptoms) of the four subscales of the General Health Questionnaire ($P = 0.003$). In addition, there tended to be a smaller increase in the levels of psychological distress in the intervention group than there was in the control group. From this, the authors of the primary study suggest that it is possible that the intervention strategies may be useful for buffering increasing stress levels. The reason for the discrepancy in reporting is therefore unclear.

Another intervention (TRA/CSG/PAR; Heaney 1995, in Gilbody et al.[64] and Marine et al.[65]) was reported in one SR[64] as significantly improving psychological wellbeing ($P = 0.04$) and in another[65] as producing inconclusive results. Closer examination of the primary study revealed that regarding psychological wellbeing, the intervention had a positive effect only on those employees who were most at risk of quitting their jobs. This may explain why

one SR reported a positive outcome (referring only to those at risk of quitting) whereas another reported inconclusive results (referring to the nonsignificant finding when analyzing all participants).

Sickness absence and absenteeism

Four of the SRs[64,69-71] reported that seven interventions were associated with reductions in sickness and absenteeism (three of which statistical significance was not reported) and four interventions did not produce a significant change (JRD × 2, JRD/TRA, PAR/JRD). The three interventions that reported a statistically significant reduction in absenteeism and received generally high methodological quality ratings are described below.

The participatory stress reduction intervention (JRD/PAR/PEC) (Kawakami 1997, in Bambra et al.[70] and Egan et al.[71]) described earlier significantly reduced absenteeism ($P < 0.05$) among factory workers when compared to a no-intervention control.

An intervention consisting of more teamwork, more personnel, role clarification, production goals, fewer supervisors, a partial change in shift system, increased feedback, and a new vending machine and microwave (JRD/RIS/COM/PEC) (Wahlstedt 1994/1997, in Bambra et al.[70]) significantly reduced sick leave ($P < 0.05$). The prospective cohort study, which did not employ a comparison group, was implemented in Sweden with 100 postal sorting office employees. This study met 8 out of 10 methodological quality criteria.

The participative action research intervention (PAR) (Bond 2001, in Egan et al.[71]), described earlier, significantly reduced absenteeism ($P < 0.05$) among government office employees when compared to a no-intervention control.

Turnover

Two SRs[64,69] reported that four interventions were associated with a reduction in employee turnover. The level of statistical significance was reported for only one study, which is described below.

A change to a primary care nursing model with support from managers, advice on core skills, and promotion of effective interprofessional communication (JRD/COM/CSG) (Melchior 1996, in Gilbody et al.[64]) resulted in a lower turnover rate (17%) than that of the no-intervention control group (27%) ($P = 0.06$). This study was conducted in the Netherlands with 161 psychiatric nurses. Although no quality rating was presented, authors of the SR commented that baseline differences were accounted for in the analysis, there was a possible unit of analysis error, and there may have been cross-contamination due to nurses' switching wards.

DISCUSSION

Overall findings

Healthcare workers

No conclusions were reached on the effectiveness of one intervention relative to another. According to Marine et al.,[65] whose study was rated highly with both quality appraisal tools, there is limited evidence that work-directed or organizational-level interventions effectively reduce symptoms of stress and burnout in healthcare workers when compared to no intervention. According to Gilbody et al.,[64] whose SR had average ratings with the quality appraisal tools, strategies that are aimed at enhancing social support and improving managerial support and supervision may potentially improve the wellbeing of staff working in psychiatric units.

According to Mimura and Griffiths,[66] "there is more evidence for the effectiveness of personal support than environmental management for reducing workplace stress in the nursing profession". However, the personnel support interventions described in that SR included examples of both individual-level (e.g. humour and relaxation, exercise and music, assertiveness training) and organizational-level (e.g. educational and support programs) interventions. Gilbody et al.'s[64] review also categorized its included interventions differently than the DeFrank and Cooper classification system: Interventions were categorized as educational, psychosocial, or environmental/organizational. For this reason, neither Gilbody et al.[64] nor Mimura and Griffiths[66] provided clear concluding statements on the effectiveness of organizational-level interventions.

Other workers

Three SRs[69-71] did not limit their target population to a single occupation or industry. Concerning employees without mental health problems or who are not considered to be at high risk, in their SR BOHRF claimed, "The evidence suggests that a range of stress management interventions can have a beneficial and practical impact." However, in focusing on organizational-level interventions, they stated, "There was limited evidence that organizational development approaches to common mental health problems at work are effective".

In their SRs, Bambra et al.[70] and Egan et al.[71] focused on work reorganization by looking at task-restructuring interventions and interventions aimed at increasing employee control. The task restructuring interventions were categorized according to Karasek's[68] three types of task structure interventions: task variety, team working, and autonomous groups. Through improving levels of support, control, or both, task restructuring and participatory interventions are hypothesized to produce positive health effects, particularly related to

psychological health.[70,71] Interventions in which task variety was increased "either had no effect (primary nursing) or [had] a limited positive effect (production line) on health".[70] Team interventions produced less noticeable health effects, whereas the autonomous work groups resulted in adverse health effects.

Regarding interventions in which employee participation in workplace decision-making is increased, "health improvements (e.g. mental health and sickness absenteeism) may sometimes result".[71] Where adverse health effects were reported, organizational downsizing may have been a confounder. In general, some health benefits occurred "when employee control improved or (less consistently) demands decreased or support increased".[71] However, such interventions may not protect employees from "generally poor working conditions".

Variability and transferability of interventions

Stress prevention interventions may vary widely in their objectives, strategy, and level of focus,[56] as demonstrated by the interventions evaluated in the included SRs. For example, a few of the included studies (Long et al. 1990, in Gilbody et al.;[64] Berg et al. 1994, in Gilbody et al.[64] and Mimura and Griffiths;[66] Melchior et al. 1996, in Gilbody et al.,[64] Marine et al.,[65] Mimura and Griffiths,[66] and Bambra et al.[70]) evaluated the effect of a nursing method change on various outcomes but several issues arise when these interventions are examined further. Although the interventions all involved a change in nursing delivery, the interventions were dissimilar (e.g. one intervention coupled the nursing method change with support training, whereas another coupled the nursing method change with increased supervision). Thus, it is difficult to determine what exactly caused the effect (if an effect was observed at all).

In addition, a nursing method change intervention applies only to nurses and therefore cannot be implemented for other working populations, such as retail or office workers. A nurse's sources of stress may also differ greatly, depending on the nature of the country's healthcare system (e.g. private versus publicly funded health care). For this reason alone, it is possible that a nursing method change that was effective in one country may not be effective in another. These last two points highlight the problem of transferring or generalizing organizational stress prevention interventions. Differences in intervention strategies, worker populations, and environmental, cultural, or political contexts may influence the effectiveness of interventions.

Individual-level versus organizational-level interventions

According to Briner and Reynolds,[72] there are three reasons for the de-emphasis on individual-level interventions within the more recent occupational stress literature:

1. It is better to tackle the causes of stress than to try to deal with its effects.
2. Individual-level stress interventions have yielded limited and short-term effects.
3. Targeting the individual is viewed as blaming the victim.

The results from this review cannot be used to support the first argument as no comparison was made between individual-level and organizational-level interventions. However, Reynolds[73] examined the evidence for the effectiveness of psychotherapy and counselling services, stress management training, and organizational-level interventions. Results from the review indicated that counselling services and stress management training had "modest but short-term effects on individual well-being," whereas organizational-level interventions had "insignificant effects on individual well-being and on organizational outcomes".

The second reason listed above loses its strength, however, when the results of this review are considered. If there is limited evidence for both the effectiveness of individual-level and organizational-level interventions, then there is no support for the claim that one is better than the other. Unsurprisingly, many authors recommend the implementation of comprehensive programs in which individual-level and organizational-level strategies are used in one intervention.[56,60,62,69,74-76] Intuitively it makes sense that reducing or modifying the causes of stress as well as teaching employees to better cope with stress should yield positive results.

The role of individual differences

One criticism of organizational-level interventions is their disregard for the individual characteristics that may hamper the effectiveness of the interventions. Many individual differences may act as moderating variables, including both demographic (i.e. age, sex, socio-economic status) and psychological variables (i.e. locus of control, self-efficacy, type A personality).[77]

In addition, how an occupational stressor is appraised may vary from one employee to the next. The way in which the individual chooses to cope will also vary. The coping behaviour may be effective or ineffective and therefore will influence the degree of strain experienced by the employee.[78] The level and type of strain that employees experience can, in turn, potentially dilute the effectiveness of the interventions.[77,79] Participating employees with lower levels of strain might show little or no change in the outcomes of interest. Where an intervention was quite effective for participants with high levels of strain, the results across all participants may only show moderate or limited effect, or no effect at all. Targeting employees with high levels of strain or "high-risk" occupations (high-strain jobs) may help to uncover the true potential of stress interventions.

Implications for Alberta

Alberta Health Services – Alberta Mental Health Board

Alberta Health Services – Alberta Mental Health Board can promote healthier workplace environments by supporting more research on the effectiveness of workplace interventions that are aimed at preventing stress and promoting mental wellness. This includes both primary and secondary research. Through the Alberta Mental Health Research Partnership Program, the AHS-AMHB can also facilitate communication between interested organizations and mental health researchers in order to promote applied research and generate relevant knowledge in the area of workplace mental health.

It is also important to develop standards that every Alberta workplace will strive to meet in an effort to maintain good mental health and prevent poor mental health. Starting from scratch is unnecessary and ill advised. The United Kingdom Health and Safety Executive (HSE), in an effort to reduce stress in the country's working population, developed Management Standards based on six extensively researched occupational stressors: demands, control, support, relationships, roles, and change (http://www.hse.gov.uk/stress/standards/).[39] Although not considered law, the standards help employers fulfill their "duty of care…to protect the health, safety, and welfare of all employees while at work" (International Stress Management Association (ISMA)[80]). These standards may be modified to better reflect Alberta's workplace and workforce issues, or they may be adopted in their entirety.

Employers

It is imperative that employers recognize stress as a workplace hazard in that it, too, can cause "injury" (psychological and physical symptoms) to their employees. In this sense, employers have a responsibility to protect their employees from such harmful working conditions by creating policies aimed at achieving balances with respect to effort-reward, demand-control-support, and work-life. Many are beginning to recognize stress as a workplace hazard, including government health and safety organizations (e.g. National Institute for Occupational Safety and Health (NIOSH), http://www.cdc.gov/niosh/topics/hazards.html), unions (e.g. Trades Union Congress, http://www.tuc.org.uk/h_and_s/tuc-8902-f0.cfm), and the media (e.g. British Broadcasting Corporation, http://news.bbc.co.uk/2/hi/health/196453.stm). Regarding employee turnover, Alberta employers can look to Alberta's Top 25 Employers for ideas on the kinds of strategies that are being implemented to retain employees (see http://www.canadastop100.com/alberta/).

If workplace interventions are considered, Alberta employers need to be open and committed to making organization-wide changes and ensuring that management supports such changes. In addition, employees should be encouraged and allowed to participate in the planning and implementation of workplace interventions. Formal programs or courses may not be necessary.

The adoption of policies that promote work-life balance (e.g. flexible work schedules) and increase employee control may achieve results similar to the implementation of formal interventions. However, it is important that adequate resources be committed to properly evaluating any workplace interventions, including major changes in policies and procedures, both at the individual and the organization level.

Employees

Employees are also expected to do their part. They may need to learn how to cope with the stress they face at work. Policies in which healthy coping behaviour is rewarded may be one method to encourage employees to take on some of the responsibility. Where employees need help learning the skills required to cope with stress (e.g. techniques to relieve stress, financial management, cognitive behavioural training), employers may need to offer the appropriate training courses or sessions. A complementary document to the HSE Management Standards describes how employees can support their employer in tackling workplace stress.[80]

Factors that may influence outcomes

The worker shortages in Alberta have created an environment where employers are reluctant to dismiss employees. Consequently, some employees are able to be absent frequently without the fear of losing their job. For this reason and others mentioned earlier (e.g. illness as a mediating variable), absenteeism cannot be definitively and always directly linked to stress.

However, this does not imply that Alberta employers should completely abandon the idea of preventing stress in the workplace. Some types of workers may need special immediate attention. For example, the care of patients by healthcare workers who are experiencing high levels of stress may suffer, resulting in serious concerns for patient safety. Stress and burnout among healthcare professionals has been associated with lower patient satisfaction, longer recovery time, and decreased quality and quantity of patient care.[38,81] Overall, more research could shed light on the reasons for and the ways in which to tackle workplace stress.

Considerations for further research

All six SRs recognized the need for more research in this area. The use of more robust or rigorous designs,[64,66,69-71] the analysis of costs,[64,69] and the use of proper outcome measures[69] were recommended. According to Marine et al.,[65] "more studies are needed that contrast various stress or burnout reducing techniques with one another. For work-directed interventions cluster-randomised studies are feasible, but care should be taken to avoid attrition". Egan et al.[71] suggested that more investigation of the relative impacts of different interventions, implementation, and the distribution of effects across the socio-economic spectrum is required.

Although the quality of research methodology on workplace stress prevention has improved over the past few years,[1] it is clear that there is still a lack of published rigorous evaluations of organizational-level interventions in the workplace. Although some of the SRs were able to identify randomized controlled trials (RCTs), the number is still low, making it difficult for authors of systematic reviews to draw solid conclusions. However, this might reflect the difficulty of conducting RCTs in workplaces. For example, several social threats to internal validity exist when two groups (intervention and control) of individuals frequently interact with one another, which would be expected in a workplace. Among other types of social threats to internal validity, diffusion or imitation of treatment occurs when the individuals in the comparison group learn about the intervention from the individuals in the intervention group. This may even out the outcomes between the two groups, reducing the chance of detecting a program effect.[82]

As well, many employees may not be interested in participating in a study knowing that they have a 50% chance of being assigned to the no-intervention control group. As Marine et al.[65] stated, cluster randomized controlled trials may be the best option for organizational-level interventions.

The Hawthorne effect may also create difficulties in determining the effectiveness of workplace interventions.[66] Demonstrated decades ago, the Hawthorne effect occurs when participants know they are being observed and are receiving extra attention, which results in enhanced performance on outcome measures.[83]

Some primary studies were able to recruit large numbers of participants (e.g. $n > 500$); however, many sample sizes were quite small ($n < 50$), which may impede the detection of effects because of low statistical power.[77] Although statistically significant changes were detected in some of the SRs' primary studies, there was never any mention of clinical significance. Defining clinical significance for the outcomes related to this area of study may be an important next step for researchers. Clinical significance might vary for each study, depending on the population or the industry of interest. For example, because of the potential consequences of stress in healthcare workers (i.e. mistakes resulting in dangers to the patient), any reduction in stress may be clinically significant. Without information on clinical significance, it will be difficult to determine whether the improvements in stress measures or other psychological outcomes are even relevant to the employees and therefore whether the interventions are worth the resources required to implement and evaluate them.

Several authors have highlighted the importance of managerial support in any workplace interventions.[62,64,75,76,84,85] Others have cited the need for employee involvement in the planning, implementation, and evaluation of workplace interventions.[39,56,60,62,75,85] However, with the implementation of various strategies and the tailoring of interventions to each workplace, it is difficult to determine

which strategies, or components of strategies, are responsible for producing a change.[77]

The results from this review cannot be used to determine whether organizational-level interventions are more effective than individual-level ones in preventing or reducing stress in the workplace as no comparison was made between individual- and organizational-level interventions. Unsurprisingly, many authors recommend the implementation of comprehensive programs in which individual- and organizational-level strategies are used in one intervention.[56,60,62,69,74-76] Intuitively this makes sense, as reducing or modifying the causes of stress as well as teaching employees to better cope with stress should yield positive results. However, as mentioned above, it is difficult to accurately determine the effectiveness of interventions with multiple strategies.

The issue of determining the active ingredient of interventions also applies to process variables (such as context and implementation). Recently Giardini Murta et al.[84] conducted an SR of workplace stress management interventions that included process evaluations. This SR was excluded from this review because the authors did not study the outcomes of interest. They found that "the incomplete reporting of information relevant to process evaluation makes it difficult to identify reliable determinants of effective intervention implementation or outcomes."

Thus, many questions regarding the effectiveness of organizational interventions for the prevention of stress in the workplace have yet to be addressed satisfactorily. These include the following:

- The link between stress and absenteeism needs further exploration. Although it seems plausible that stress causes absenteeism, many other factors may play a role; therefore, the possibility of mediating and moderating variables must be taken into account. Similarly, the link between workplace stress and both physical and psychological illness needs to be explored further.
- New sources of stress are emerging, and their effect on psychological and physical health is unclear. An example is the stress caused by the advent of new technologies, such as the Internet, cell phones, and wireless connections, which have transformed the work environment. Taken together, the increase in demands (from being available to the employer at all times), the decrease in control (from the automation of routine tasks), and the decrease in social support (from less face-to-face communication) are likely to result in psychological or physical problems.
- More data are needed to determine which strategies work for which employees and under what circumstances. Clear, detailed information must be collected on the type of intervention being implemented, the population and/or setting, and the process (including contextual information). One particular research question may be whether the level of managerial support affects the effectiveness of the intervention.

- More rigorous evaluations of stress prevention interventions with longer follow-up periods are required, within the limits of practicality and feasibility. Ideally, these should incorporate a measure of presenteeism.
- New research needs to take into consideration current worker demographics and changing work environments.

Limitations

Time and resource constraints limited this review to the analysis and synthesis of secondary research only. Because of the breadth of SRs, detailed information (regarding various aspects of their included primary studies) is not provided and therefore cannot be commented on in this review.

The literature review was confined only to papers written in English and published from 1997 onwards. However, the focus on secondary research ensured the inclusion of data prior to 1997; the primary studies included in the selected SRs were published as far back as 1981. On the other hand, the studies that were published decades ago may no longer be relevant due to the major changes in work environments and employee demographics that have occurred in recent years.

Data on stress, absence rates, and psychological disability claims in Alberta could not be accessed. Therefore, the state of workplace mental health in Alberta could not be clearly described. However, interest in and enthusiasm for tackling workplace stress have been expressed by various stakeholders across Alberta, including regional health authorities, government ministries, and industry leaders. This confirms that workplace stress is an issue that deserves more attention in Alberta.

Interrater agreement was low on the quality subsections of the Quality Assessment Checklist. This tool was originally developed for a specific program in which literature on chronic pain treatments was appraised and summarized. It is possible that the tool did not transfer well to this project, and for this reason a second tool, where higher interrater agreement was obtained, was utilized.

CONCLUSION

There is limited evidence that organizational-level interventions reduce stress, psychological symptoms, or absenteeism in the workplace when compared to no-intervention controls or other stress interventions. The PAR, JRD, and TRA strategies seemed to be the most effective in producing positive outcomes; however, this may simply reflect the overrepresentation of these three strategies (as shown in Table 5). Studies have not yet incorporated measures of presenteeism in their evaluation of stress prevention interventions. Although turnover seems to decrease when organizational-level stress interventions are implemented, the included studies did not report on whether the changes were

statistically significant. None of the SRs discussed how a clinically significant change would be defined.

Research methodology in the area of stress prevention has improved over the years, although the need for more rigour is apparent. In this area of research, however, rigorous methods must be balanced with practicality and feasibility. RCTs are not always feasible in work settings, although every effort should be made to include appropriate control groups. Cluster randomized controlled trials may be more feasible for organizational-level interventions.

Because of the variability of the interventions implemented and outcomes measured, no firm conclusion could be drawn on which types of interventions or strategies are most effective. More research is needed to determine which strategies are the most effective for which populations and what components of interventions ensure or increase the likelihood of success. Most importantly, more research is needed to determine whether comprehensive programs (using individual- and organizational-level interventions) are more effective than organizational or individual-level interventions alone.

APPENDIX A: METHOD

Preliminary literature search and assessment

A preliminary assessment was performed in order to better understand the topic and to decide on the main area of focus for the project. A quick and limited search yielded 752 abstracts, a number of which were relevant to the area of occupational stress. As we read through all of the abstracts, several areas of focus emerged. The relevant abstracts could therefore be categorized according to their focus. The most frequent areas of focus appeared to be

- prevalence data of stress and/or burnout in specific occupations;
- descriptions of occupational stress theories, sources of stress, and occupation-specific stressors;
- descriptions of the consequences (physical, psychological, and behavioural) of work-related stress;
- descriptions of models or frameworks for stress prevention interventions;
- descriptions of strategies or programs to manage or reduce stress in the workplace (in general or occupation-specific); and
- the effectiveness of stress prevention interventions for the workplace.

The focus of the preliminary assessment was on the abstracts in the last category. Nineteen abstracts for reviews of workplace stress prevention interventions were identified. Upon completion of the preliminary assessment, a meeting was held with various experts in the area of workplace mental health to discuss the results of the assessment in order to explore the topic further and make decisions regarding the next steps. It was decided that the project continue to focus solely on the effectiveness of stress prevention interventions for the workplace. Because of an interest in organizational-level interventions (i.e. management practices, changing the work environment, increasing job control), the meeting participants decided that the project should focus solely on such interventions.

The 19 articles were retrieved, and a second literature search was performed.

Updated literature search strategy

A comprehensive search of the medical and business literature (published in English from January 1997 to July 2007) was conducted by the IHE Research Librarian on May 24 to 27, 2007, and updated on August 15 to 21, 2007, and June 12, 2008. Major electronic databases used include The Cochrane Library, CRD Databases (HTA, DARE), PubMed, and PsycInfo. In addition, relevant library collections, websites of government agencies and some HTA-related agency websites were searched. The Internet search engine Google was also used to locate grey literature.

Medical Subject Headings (MeSH) terms relevant to this topic are stress; stress, psychological; burnout, professional; and occupational health services.

Table A1: Literature search

Database	Edition or date searched	Search terms††
The Cochrane Library http://www.thecochranelibrary.com	June 12, 2008 Issue 2, 2008	(stress* OR burnout) AND (sick leave OR job OR absenteeism OR work-related OR workload OR workplace OR "work environment" OR employee OR employment OR occupation* OR profession* OR organization* OR organisation*) in Title, Abstract, or Keywords
PubMed http://www.pubmed.gov	June 12, 2008	1. (stress AND (pubmednotmedline[sb] OR publisher[sb] OR in process[sb])) OR stress[MeSH Terms] OR "stress, psychological"[MeSH Terms] OR burnout OR psychological distress OR "Occupational Diseases/psychology"[MeSH Terms] 2. sick leave OR job OR absenteeism OR work-related OR workload OR workplace OR "work environment" OR employee OR "employment"[MeSH terms] OR occupation OR occupational 3. (#1 AND #2) OR "organizational stressors" OR "burnout, professional"[MeSH Terms] 4. "occupational health services"[MeSH] OR "organizational innovation"[MeSH] OR primary prevention[mesh:noexp] OR intervention OR interventions OR "stress management" OR "stress reduction" OR wellness program OR empowerment OR enablement OR "stress survey" OR "stress surveys" OR "stress test" OR "stress tests" 5. stress/prevention AND control[MeSH Terms] OR "stress, psychological/prevention AND control"[MeSH Terms] 6. (#3 AND #4) OR (#5 AND #2) OR "burnout, professional/prevention AND control"[MeSH Terms] 7. meta-analysis[pt] OR meta-analysis[tiab] OR Pubmed OR Medline OR (systematic*[tiab] AND review*[tiab]) OR review[pt] OR search*[tiab] 8. #6 AND #7
CRD Databases (HTA, DARE) *Did not search NHS EED http://www.york.ac.uk/inst/crd/crddatabases.htm	June 12, 2008	1. (stress* OR burnout) AND (sick leave OR absenteeism OR workload OR workplace OR work-related OR "work environment" OR employee OR job OR occupation*) 2. MeSH burnout, professional) 3. #1 OR #2

Table A1: Literature search (continued)

Database	Edition or date searched	Search terms††
PsycINFO (Ovid Interface)	June 12, 2008	1. stress/ OR chronic stress/ OR psychological stress/ OR stress reactions/ OR burnout.mp. 2. work related illnesses/ OR employee absenteeism/ OR sick leave.mp. OR work load/ OR workplace.mp. OR work-related.mp. OR work environment.mp. OR employee.mp. OR exp "business and industrial personnel"/ OR government personnel/ OR exp nonprofessional personnel/ OR exp paraprofessional personnel/ OR (exp professional personnel/ not exp therapists/) OR exp religious personnel/ 3. treatment/ OR cognitive techniques/ OR prevention/ OR preventive medicine/ OR primary mental health prevention/ OR relaxation therapy/ OR stress management/ OR empowerment/ OR stress reduction.mp OR stress test$.mp. OR stress survey$.mp. OR intervention$.mp. OR enablement.mp. OR wellness program$.mp. 4. occupational stress/ OR organizational stressors.mp. 5. occupational therapy/ 6. (#1 AND #2 AND #3) OR (#1 AND #5) OR ((#3 OR #5) AND #4) 7. #6 AND (meta-analysis OR MEDLINE OR pubmed OR (systematic$ AND review$) OR search$).mp. 8. limit #6 to ("0800 literature review" OR "0830 systematic review" OR 1200 meta analysis) 9. #7 OR #8
Embase (Ovid Interface)	June 12, 2008	1. stress/ OR burnout/ OR chronic stress/ OR role stress/ 2. (sick leave OR absenteeism OR workload OR workplace OR work environment OR work-related OR employee OR employment OR job OR occupation$).mp. 3. (#1 AND #2) OR organizational stressors.mp. OR job stress/ 4. "prevention and control"/ OR prevention/ OR primary prevention/ OR health promotion/ OR stress management.mp. OR stress reduction.mp. OR intervention$.mp. OR empowerment.mp. OR enablement.mp. OR stress test$.mp. OR stress survey$.mp. 5. meta-analys$.mp. OR systematic review/ OR Pubmed.mp. OR Medline.mp. OR search$.mp. OR review/ 6. #3 AND #4 AND #5

Table A1: Literature search (continued)

Database	Edition or date searched	Search terms[††]
Cinahl (Ebsco Interface)	June 12, 2008	1. (MH "Burnout, Professional" OR MH "Stress, Occupational") AND (combat* OR intervention* OR "stress management" OR prevent* OR "stress reduction" OR empowerment OR enablement) 2. meta analy* OR (systematic* AND review*) OR pubmed OR medline OR cinahl OR PT systematic review OR PT review 3. S1 AND S2
ABI Inform (Proquest Interface)	June 12, 2008	(stress* OR burnout) AND (job OR sick leave OR absenteeism OR workload OR workplace OR employee OR occupation* OR work-related) AND (search* OR Medline OR pubmed OR meta-analy* OR (systematic* AND review*)) Limit to scholarly journals
Econ lit (Ebsco Interface)	June 12, 2008	(stress* OR burnout) AND (job OR sick leave OR absenteeism OR workload OR workplace OR employee OR employment OR occupation* OR work-related OR "work environment") AND (combat* OR intervention* OR "stress management" OR prevent* OR "stress reduction" OR empowerment OR enablement OR "stress survey*" OR "stress test*") AND (meta-analy* OR review* OR search*)
Web of Science (ISI interface)	June 12, 2008	1. TS=(stress* OR burnout) AND TS=(sick leave OR absenteeism OR workload OR workplace OR employee OR employment OR occupation* OR work-related OR "work environment" OR job) AND TS=(intervention* OR "stress management" OR prevent* OR "stress reduction" OR empowerment OR enablement OR "stress survey*" OR "stress test*" OR wellness program) 2. Limit #1 to DocType=Review; 3. #1 AND TS=(meta-analy* OR Medline OR pubmed OR psycinfo OR (systematic* AND review*) OR search*) 4. #2 OR #3
Business Source Complete (Ebsco Interface)	June 12, 2008	(DE "JOB stress" OR DE "BURN out (Psychology)") AND (combat* OR intervention* OR "stress management" OR prevent* OR "stress reduction" OR empowerment OR enablement OR "stress survey*" OR "stress test*" OR "wellness program") AND (meta-analy* OR review* OR search*) Limit to academic journals

Table A1: Literature search (continued)

Database	Edition or date searched	Search terms††
Library catalogues		
NEOS (Central Alberta Library Consortium) http://www.library.ualberta.ca/catalogue	June 12, 2008	(Job stress AND stress management) in subject Manually removed obviously "self-help" books
Government		
Alberta Health and Wellness http://www.health.gov.ab.ca	June 12, 2008	Browsed list of publications (0 results)
Health Canada (site searched with Google)	June 12, 2008	Stress management occupation OR job OR work Also browsed Occupational Health and Safety section http://www.hc-sc.gc.ca/ewh-semt/occup-travail/index_e.html
Public Health Agency of Canada http://www.phac-aspc.gc.ca/new_e.html	June 12, 2008	Browsed list of publications (0 results)
CIHR's Institute of Neurosciences, Mental Health and Addiction http://www.cihr-irsc.gc.ca/e/8602.html	June 12, 2008	Browsed list of publications
CIHR's Institute of Population and Public Health http://www.cihr.ca/e/13777.html	June 12, 2008	Browsed list of publications
HTA agencies/coverage agencies		
AETMIS http://www.aetmis.gouv.qc.ca	June 12, 2008	Browsed list of publications 1997-2007 (0 results)
CADTH http://www.cadth.ca/index.php/en/hta/reports-publications/search	June 12, 2008	Stress; burnout; anxiety; wellness (0 relevant results)
ECRI http://www.ta.ecri.org/Topics/prod/home/current.aspx	June 12, 2008	Stress AND (occupation* OR work OR employee OR job) Browsed results

Table A1: Literature search (continued)

Database	Edition or date searched	Search terms††
Search engine		
Google http://www.google.ca	June 12, 2008	Stress management occupation OR workplace OR employee Search within results: systematic-review OR meta-analysis

Note:

† Limits: English; publication type: systematic reviews. These limits are applied in databases where such functions are available. Publication date 1997-2008.

†† "*," "$," and "?" are truncation characters that retrieve all possible suffix variations of the root word; e.g. surg* retrieves surgery, surgical, surgeon, etc.

Semicolons separate searches that were entered separately.

This second search strategy included more databases (e.g. to capture the business literature) and modified search terms. This search yielded 748 abstracts (714 once duplicates were removed). The updated search resulted in fewer abstracts than the preliminary assessment search because the IHE Research Librarian applied review filters in an attempt to eliminate any primary studies from the search. A second updated search, performed 10 months after the first update, brought the total of abstracts up to 810.

Additional reviews

In addition to the reviews retrieved from the search strategy, we identified six reviews, mainly through personal contacts. An employee at the Institute for Work and Health provided us with the contact information of a researcher working on job stress interventions. Via email, the researcher provided us with his review that was in press and would soon be released in a peer-reviewed journal (International Journal of Occupational and Environmental Health). In his email he had granted us permission to use it. This review made reference to the Health and Safety Executive's systematic review Beacons of Excellence (2003), which, therefore, was also retrieved. Two more grey-area literature reviews were identified by the project team, one by the BOHRF and the other by the Institut de recherche Robert-Sauvé en santé et en sécurité du travail (IRSST). One of the project's consultants (JianLi Wang) suggested an additional review that was in press and would soon be released in the peer-reviewed Journal of Epidemiology and Community Health. After contacting one of the authors of this review, we were told of a second review by the same authors that was also in press and would soon be released in the same journal. Both articles have since been published. These six reviews went through the identical selection process as the other reviews.

Study selection

Once the updated search was complete, two reviewers (LB and PC) independently read through the 810 abstracts and selected papers for retrieval if, based on the abstracts, they seemed to meet the inclusion criteria below. Before the researchers retrieved the articles, a consensus meeting was held where any disagreements were resolved and consensus was achieved. Once the reviews had been retrieved, the same two reviewers independently assessed the papers according to the inclusion criteria. Studies that did not meet the inclusion criteria are listed in Table A2. Relevant information contained in the excluded studies was used to inform and expand the discussion. The reviewers were not blinded to any aspects of the published papers being evaluated.

Inclusion criteria

Types of studies

Only systematic reviews (SRs) on the effectiveness or evaluation of interventions were included for analysis. A review was deemed to be systematic if it met all of the following criteria as defined by Cook et al.:[86]

1. focused clinical question;
2. explicit search strategy;
3. use of explicit, reproducible, and uniformly applied criteria for article selection;
4. critical appraisal of the included studies encompassing the use of a quality tool or checklist; and
5. qualitative or quantitative data synthesis.

If two (or more) SRs were similar and had overlapping primary studies, the older review was excluded as long as the more recent review had similar or higher methodological quality ratings. If the more recent review was of lower quality than that of the older review, both were included.

Only full-text articles were included as abstracts do not provide adequate detail on target populations, study design, outcomes, and measurement methods to allow an accurate, unbiased assessment and comparison of the study results.

Participants

The target population comprised working individuals without diagnosed psychological disorders. Although a review might not state that it targeted adults, it was included if an adult population was assumed because of the nature of the work (e.g. healthcare workers).

Interventions

Only reviews that included organizational-level interventions were selected. Interventions were deemed to be "organizational" if their aim was to make changes in the work environment as opposed to changes in the employee. Therefore, individual-organizational interventions and organizational interventions, as defined by DeFrank and Cooper in 1987 (cited in Jordan et al.[56]), were considered organizational-level interventions. Tertiary prevention interventions were excluded because they are reactive rather than preventive or proactive strategies.

Comparative intervention

Any intervention designed to prevent stress in the workplace or no intervention was considered as a comparator.

Outcomes

The following outcomes were included: stress, burnout, or both; psychological wellbeing; absenteeism; presenteeism; and turnover or retention.

Exclusion criteria

Types of studies: letters/editorials/news or conference abstracts, nonsystematic reviews, primary studies, economic studies.

Participants: employees with diagnosed psychological illness/disorders (including addiction), physical complications (e.g. chronic low back pain), or both.

Interventions: employee assistance programs, return-to-work programs, individual-level interventions, interventions administered or implemented outside of work (e.g. in a psychologist's office).

Data extraction

Two reviewers (LB and PC) independently extracted data from the included SRs, using a form that was developed a priori. Data extraction items included the authors' names, year of publication, objective(s), databases searched, publication dates searched, language limits, inclusion criteria (study design, population, interventions, comparators), exclusion criteria, quality assessment tools or checklists, method of analysis or synthesis, number of organizational-level interventions included in review, total number of studies included in review, description of organizational-level interventions (including author, year, country of origin, population, and organizational-level strategies), quality assessment rating, length of follow-up, outcomes and results, and conclusion for organizational-level interventions. Pertinent information from the included reviews is presented in Table B1 (Appendix B).

The reported results of a primary study differed between two SRs; this occurred twice (Proctor 1998, in Marine et al.[65] and BOHRF;[69] Carson 1999, in Gilbody et al.[64] and Mimura and Griffiths[66]). This prompted one reviewer (LB) to retrieve the articles of the two primary studies to verify the results. In the evidence table (Table B1, Appendix B) the findings reported by the SRs are presented. In reporting the SRs findings in the text of this review, the results of the primary studies were reported when necessary.

Classification of intervention strategies

Two reviewers (LB and PC) independently classified the interventions, with an understanding that several strategies could have been used for each intervention. In order to achieve consistency among the classification of intervention strategies, original articles of the primary studies were retrieved if the SRs did not provide enough detail to classify the interventions. Using the descriptions of intervention strategies from Giga et al.[62] and Jordan et al.,[56] the primary studies were examined and their interventions classified.

Methodological quality assessment

Two reviewers (LB and PC) independently assessed the methodological quality of the included systematic reviews, using two tools, the AMSTAR tool[87] and the Quality Assessment Checklist developed by the Alberta Heritage Foundation for Medical Research and the Institute of Health Economics (2006) for their Ambassador Program (see http://www.ihe.ca/documents/Generating%20the%20evidence%20-%20Methodology%20-%20December%202007%20-%202.pdf). Two tools were used because the AHFMR/IHE tool was designed for a specific program in which literature on chronic pain treatments was appraised and therefore may not be transferable to this project.

Prior to critically appraising the studies, the two reviewers discussed the tools with respect to the interpretation of the tools' questions. The guidelines developed by the reviewers as well as the templates for the tools are included in Appendix B. Any disagreements in the critical appraisal results for each of the included reviews were resolved by discussion until consensus was reached. The degree of the difference or equivalence between the two reviewers was calculated for both the white rows and the grey rows of the Quality Assessment Checklist as well as the AMSTAR tool.

Critical appraisal results for all included studies are presented in Tables B2 and B3, Appendix B. The evidence was graded by reporting the scores of the two quality assessment tools. The Quality Assessment Checklist highlights six criteria that are believed to be necessary for a high-quality review. Using this tool, we rated SRs as poor (1/6 to 4/6), average (5/6), or good (6/6). The AMSTAR provides an overall quality rating on a scale of 0 to 11. Using the

same rating categories for the AMSTAR tool as those used by the Canadian Agency for Drugs and Technologies in Health (see http://www.cadth.ca/index.php/en/compus/optimal-ther-resources/interventions/methods), we rated the SRs' quality as low (score 0 to 3), medium (score 4 to 7), or high (score 8 to 11).

Expert review

External reviewers with research expertise in workplace stress prevention and systematic review methodology evaluated the draft report and provided feedback. In selecting external reviewers, the practice of IHE is to choose content and methodology experts who are well recognized and widely published in the peer-reviewed literature and who can offer a provincial, national, and/or international perspective with respect to the interventions to prevent stress in the workplace.

APPENDIX B

Table B1: Evidence from included systematic reviews

Study	Study's characteristics
Gilbody, Cahill, Barkham, Richards, Bee, and Glanville[64] 2006 UK **Objective:** To examine the impact and cost-effectiveness of strategies to improve staff morale and reduce burnout among staff working in psychiatric units	**Methodology:** Relevant databases were searched for English publications from 1980 to 2004. Qualitative assessment included key design features, endpoints, and results of selected studies. Quality assessment scores/ratings were not reported. **Included studies:** Randomized controlled trials, controlled clinical trials, controlled before-and-after studies, interrupted time series **Excluded studies:** Not reported **Participants:** Staff working in hospital or community-based inpatient/residential psychiatric units caring for people with mental health problems **Interventions:** All interventions designed to improve the working environment, working experience, and staff morale of inpatient staff (including educational, psychosocial, and environment/organizational interventions) **Comparator(s):** Not clearly reported/ determined a priori **Outcome(s) and outcome measures:** Psychological wellbeing and psychiatric morbidity among staff, job satisfaction, burnout and stress, sickness and staff turnover, and direct and indirect costs (outcomes measured using validated/standardized instruments)

* Only main findings regarding the intervention of interest (organizational-level stress prevention interventions) are summarized.

** We have summarized the conclusions stated by the author(s) or quoted them exactly as in the published report.

Study's main findings* and conclusions**
Main findings*
Seven out of eight included studies implemented organizational-level interventions (2 RCTs, 2 cluster randomized, 2 CCTs, 1 CBA).
1. Change from separate wards for admission and discharge to a continuous admission/discharge model of care (JRD) – Long 1990, UK – two wards of psychiatric nurses
2. Course on clinical care, followed by promotion of innovation and creativity in nursing and direct case supervision for each patient (JRD/TRA) – Berg1994, Sweden – 36 psycho-geriatric nurses
3. Caregiver support program: teaching to increase social support systems and participation in problem solving (TRA/CSG/PAR) – Heaney 1995, US – 2,210 direct-care nursing and non-nursing staff in mental facility
4. Empathic communications skills course (COM) – Smoot 1995, US – 72 psychiatric unit staff (all professions)
5. Change to primary care nursing model with support from managers, advice on core skills and promotion of effective interprofessional communication (JRD/COM/CSG) – Melchior 1996, Netherlands – 161 psychiatric nurses
6. Social support intervention (CSG/TRA) – Carson,1999, UK – 52 psychiatric nurses
7. Psychosocial Intervention (TRA) – Ewers 2002, UK – 20 forensic mental health unit
Stress: Statistically significant (SS) pre-post difference in intervention group but no between-group differences for one intervention (**1.** $P = 0.05$), not statistically significant (NSS) for one intervention (**6.**)
Burnout: NSS for two interventions (**2.** and **5.**), SS improvement for one intervention (**7.** $P < 0.05$ on all three subscales of MBI)
Psychological wellbeing: SS improvement for one intervention (**3.** $P = 0.04$), NSS for one intervention (**6.**)
Sickness/absenteeism: Reduced rates of sickness absence for two interventions (**1.** from 5.3 average monthly hours lost per staff member to 3.3; **4.** by 28%)
Turnover: Reduced turnover for two interventions (**4.** 63% decrease; **5.** Turnover rate in intervention vs. control: 17% vs. 27%, $P = 0.06$)
Conclusions**
Authors did not have a conclusion statement for organizational interventions alone. "Findings from this review suggest that strategies to enhance social support networks and to improve managerial support and supervision also have a potential impact on staff wellbeing….Further research is needed to examine the wider impact of models that incorporate some of the potentially effective approaches that are identified in this review – such as enhanced staff skill, staff support, supervision and psychological care. Research needs to use robust designs and measure long-term cost and outcome in a standardized way."

Table B1: Evidence from included systematic reviews (continued)

Study	Study's characteristics
Marine, Ruotsalainen, Serra, and Verbeek[65] 2006 Finland, Spain **Objective:** To evaluate the effectiveness of work- and person-directed interventions in preventing stress at work in healthcare workers and to compare the effectiveness of different kinds of interventions in preventing stress in healthcare workers	**Methodology:** Relevant databases were searched for publications up until May 2005. Reference lists were carefully reviewed, and *Work & Stress* was handsearched. Meta-analysis and qualitative synthesis were performed where appropriate. Quality assessment (QA) scores were reported using the Downs checklist.*** **Included studies:** Randomized controlled trials (for person-directed interventions), controlled before-and-after studies, and interrupted time series (for work-directed interventions) **Excluded studies:** Studies in which the participants were caregivers not employed by a healthcare organization **Participants:** Healthcare employees or students in training (in healthcare setting) to become a healthcare professional **Interventions:** Work-directed interventions containing measures to change the working environment, work tasks or working methods, and person-directed interventions aimed at teaching personal skills, techniques, or remedies to decrease the effects of stressors at the individual level **Comparator(s):** Other active or passive interventions or no intervention control **Outcome(s) and outcome measures:** *Primary outcomes*: validated self-report questionnaires measuring stress/ burnout *Secondary outcomes*: effects of stress or burnout including psychological and physical symptoms

* Only main findings regarding the intervention of interest (organizational-level stress prevention interventions) are summarized.

** We have summarized the conclusions stated by the author(s) or quoted them exactly as in the published report.

*** Downs checklist (1998) contains subscales for reporting, external validity, internal validity, and power. Total maximum score is 30.

Study's main findings* and conclusions**
Main findings*
Seven out of 19 included studies implemented organizational-level interventions (5 RCTs, 2 cluster randomized).
1. Caregiver support program: training program to mobilize support from colleagues and learn participatory problem solving and decision-making (TRA/CSG/PAR) – Heaney 1995, US – 1,375 direct-care staff and home managers – QA = 16/30
2. Support and advice given by nurse management or quality care coordinators (JRD/CSG/COM) – Melchior 1996, Netherlands – 161 psychiatric nurses – QA = 19/30
3. Developing knowledge and skills and individual program planning (TRA/CSG) – Proctor 1998, UK – 98 nursing home staff – QA = 16/30
4. Emotion-oriented care training, clinical lessons, and supervision meetings (TRA/CSG) – Schrijnemaekers 2003, Netherlands – 300 professional home care workers – QA = 23/30
5. Psychological Training Program (TRA) – Delvaux 2004, Belgium – 115 oncology nurses – QA = 23/30
6. Psychological Training Program (TRA) – Razavi 1993, Belgium/France – 72 oncology nurses – QA = 18/30
7. Psychosocial Intervention (TRA) – Ewers 2002, UK – 20 forensic mental health nurses – QA = 18/30
Stress: NSS for one intervention (**3.**), SS reduction immediately post-intervention, but NSS at six-month follow-up for one intervention (**5.** MD —0.34, 95 % CI —0.62 to —0.06; MD —0.19, 95% CI —0.49 to 0.11)
Burnout: Reduced one symptom of burnout (depersonalization) for one intervention (**2.** MD —1.14, 95% CI —2.18 to —0.10), reduced one symptom of burnout (lack of personal accomplishment) for one intervention (**4.**), and reduced all three symptoms of burnout for one intervention (**7.** emotional exhaustion: WMD —8.40, 95% CI -11.15 to -5.65; depersonalisation: WMD —3.92, 95% CI —6.78 to —1.06; lack of personal accomplishment: WMD —7.43, 95% CI —9.58 to —5.28)
Psychological wellbeing: Inconclusive for one intervention (**1.**) and decreased symptoms for one intervention (**3.** MD —2.90, 95% CI —5.16 to —0.64)
Conclusions**
There is limited evidence that work-directed (organizational) interventions in healthcare workers effectively reduce the levels of stress and burnout symptoms.
"More studies are needed that contrast various stress or burnout reducing techniques with one another. For work-directed interventions cluster-randomised studies are feasible, but care should be taken to avoid attrition."

Table B1: Evidence from included systematic reviews (continued)

Study	Study's characteristics
Mimura and Griffith[66] 2003 UK **Objective:** To determine which approach, environmental or personnel, is more effective for reducing workplace stress in the nursing profession	**Methodology:** Relevant databases were searched for English and Japanese publications from 1990 onwards. Reference lists and a bibliography were scanned, and experts were asked to provide additional references. All selected studies were appraised in accordance with the CASP checklist and the guidelines by Oxman and Guyatt. Quality assessment scores/ratings were not reported. **Included studies:** Controlled trials and cohort studies **Excluded studies:** Not reported **Participants:** Nurses **Interventions:** Personnel or environmental interventions that are clearly described **Comparator(s):** Other personnel or environmental interventions, no intervention controls, or placebo **Outcome(s) and outcome measures:** Stress levels or symptoms or sequelae of stress (measured by an instrument with evidence of validity)

* Only main findings regarding the intervention of interest (organizational-level stress prevention interventions) are summarized.

** We have summarized the conclusions stated by the author(s) or quoted them exactly as in the published report.

Study's main findings* and conclusions**
Main Findings*
Five out of 10 included studies implemented organizational-level interventions (2 RCTs, 3 PCSs).
1. Education and training program with structured training and regular support (TRA/CSG) – Proctor 1998, UK – 84 care assistants
2. Nursing method change and supervision: introduced individualized nursing care (JRD/TRA) – Berg 1994; Hallber 1993, Sweden – 31 nurses
3. Nursing method change and support training (JRD/CSG/COM) – Melchior 1996, Netherlands – 161 nurses
4. Educational program (TRA) – Razavi 1993, Belgium – 72 nurses
5. Social support education (CSG/TRA) – Carson 1999, UK – 53 mental health nurses
Stress: Increased for one intervention, although a larger but NSS increase occurred in the control group (**1.**), a NSS decrease for one intervention (**2.**), NSS for one intervention (**4.**), decrease in one intervention, although the placebo group experienced a greater reduction than the intervention group (**5.** intervention group: MD —3.0; placebo group: MD —11.5)
Burnout: Stable for one intervention (**3.**), SS reduction for one intervention although the placebo group experienced a greater reduction than the intervention group (**5.** level of significance not reported)
Psychological wellbeing: Increase in psychological symptoms for one intervention and its control group, no significant difference between groups (**1.**), SS decrease in symptoms for one intervention although the placebo group experienced a greater decrease than the intervention group (**5.** level of significance not reported)
Conclusions**
Interventions with environmental change (nursing method change) can be classified as potentially effective in reducing workplace stress and burnout symptoms in nurses.
"There is more evidence for the effectiveness of personal support than environmental management for reducing workplace stress in the nursing profession. However, it is not possible at this stage to determine what kind of approach is more effective, because the number of studies is too small to compare different approaches."
"Further research is definitely needed, specifically RCTs or PCSs with rigour. This review strongly suggests the need for experimental research on stress management programs that overcome the limitations pointed out in the critical appraisals and methodological weaknesses."

Table B1: Evidence from included systematic reviews (continued)

Study	Study's characteristics
British Occupational Health Research Foundation[69] 2005 UK **Objective:** To provide evidence-based answers to key questions related to mental ill health in the workplace. Two research questions (of interest to this project): (1) What is the evidence for preventative programs at work, and what are the conditions under which they are most effective? (2) For those employees identified as at risk, what interventions most effectively enable them to remain at work?	**Methodology:** Relevant databases were searched for English publications from 1980 to April 2004. References were scanned and experts consulted. Qualitative assessment of selected studies and pertinent information presented in tabular format. Quality assessment scores were reported using SIGN***. **Included studies:** Quantitative and qualitative research studies (randomized controlled trials, systematic reviews, meta-analyses, cohort studies, quasi-experimental studies, intervention evaluation studies) **Excluded studies:** Studies focusing only on pharmacology; interventions dealing with severe mental health problems, learning disabilities or substance abuse; studies with sample sizes less than 50; dissertations; book reviews; policy documents; case studies; studies with unclear research questions, objectives, or outcomes; studies with data collection at only one point in time; studies based in psychiatric settings **Participants:** Employees with or without common mental health problems **Interventions:** Preventative, retention, and rehabilitation programs for the workplace **Comparator(s):** Other preventative, retention, or rehabilitation interventions, no intervention controls, or placebo **Outcome(s) and outcome measures:** Clear and focused outcomes with sufficient data to assess validity (no specific outcomes determined a priori)

* Only main findings regarding the intervention of interest (organizational-level stress prevention interventions) are summarized.

** We have summarized the conclusions stated by the author(s) or quoted them exactly as in the published report.

Study's main findings* and conclusions**
Main findings*
Eight out of 31 included studies implemented organizational-level stress prevention interventions (2 SRs, 1 RCT, 2 quasi-experimental controlled studies, 1 randomized study, 1 action research, 1 feasibility study)
1. Coworker support (CSG) – Cecil 1990, US – 54 teachers – QA = 2+
2a. Skills training to enhance social support and problem-solving (TRA/PAR/CSG) – Michie and Williams 2003 – QA = 2++
2b. Communications training (COM) – Michie and Williams 2003 – QA = 2++
3. Environmental approach (no details) (TRA/CSG) – Proctor 1998 (in Mimura and Griffiths, 2003) – QA = 1–
4. Increasing employees' participation and control, clarify responsibilities/duties (PAR/COM/RIS) – Reynolds 1997, UK – 156 city council department staff – QA = 2–
5. Educational/social support group (CSG/TRA) – Sallis 1987, US – 76 high-tech corporation employees – QA = 2–
6. Participatory action research (PAR) – Golembiewski 1987, US – 31 human resources staff – QA = 2–
7. Online support group (CSG) – Meier 2002, US – 26 social workers – QA = 2–
8. Stressor reduction process (PEC/PAR) – Munz 2001, US – 55 customer services/sales representatives – QA = 2+
Stress: No effect for two interventions (**1.** and **7.**), reduced for two interventions **(2a.** not clear if SS or NSS; **3.** NSS positive effect)
Burnout: Decreased at 4 months postintervention for one intervention (**6.** no effect detected at 9 months postintervention)
Psychological wellbeing: No effect for one intervention (**4.**) and reduced anxiety, depression, and hostility at three--month follow-up for one intervention but no difference between groups when compared to other individual-level interventions (**5.**)
S*ickness/absenteeism*: Reduced sick leave for one intervention (**2a.** not clear if SS or NSS)
Turnover: Improved for two interventions (**2a.** not clear if SS or NSS; **6.** not clear if SS or NSS)
Conclusions**
"There was limited evidence that organizational development approaches to common mental health problems at work are effective" (one-star evidence rating, Royal College of General Practitioners' three-star system, 1995).
"Amongst employees who have not manifested with common mental health problems or who are not at high risk, the evidence suggests that a range of stress management interventions can have a beneficial and practical impact. These interventions also provide employees with a range of useful skills that can be exploited to their own and their organization's wider benefit. The extent to which any of these interventions prevent common mental health problems remain unclear. Amongst employees deemed to be at risk, either through their job role or who have been assessed as at risk, the evidence from the included studies demonstrates that individual rather than organizational approaches to managing common mental health problems are most likely to be effective in enabling this group to remain at work."
There is a need for an evidence base built on studies done in the UK, including the use of relevant control groups, proper outcome measures, economic evaluations, and follow-ups of at least 12 weeks. There is a need for research that is informed directly by the evidence needs of employers and employees. There is a need for more research on interventions based on employment practices and management style.
"Organisational level interventions should be designed to include training in an individually tailored focus such as learning coping skills"

*** SIGN gradings (Scottish Intercollegiate Guidelines Network, 2000): 1– meta-analyses, systematic reviews of randomized controlled trials or randomized controlled trials with a high risk of bias; 2++ high-quality systematic reviews of case control or cohort studies, or, high-quality case control or cohort studies with a very low risk of confounding, bias, or chance and a high probability that the relationship is causal; 2+ well-conducted case control or cohort studies with a low risk of confounding, bias, or chance and a moderate probability that the relationship is causal; 2– case control or cohort studies with a high risk of confounding, bias, or change, and a significant risk that the relationships is not causal.

Table B1: Evidence from included systematic reviews (continued)

Study	Study's characteristics
Bambra, Egan, Thomas, Petticrew, and Whitehead[70] 2007 UK **Objective:** To systematically review the health and psychosocial effects (with reference to the demand-control-support model) of changes to the work environment brought about by task structure work reorganization, and whether those effects differ for different socio-economic groups	**Methodology:** Relevant databases were searched for publications (of any language) from start of databases to December 2006. Search also included follow-up on citations found in other studies, handsearching, and expert consultation. Narrative synthesis involved emphasis given to the studies that were more methodologically robust. Overall quality scores were not assigned.*** **Included studies:** Randomized controlled trials, prospective studies with or without controls, and retrospective studies with or without controls **Excluded studies:** Studies that do not include employees in their study population and non-workplace interventions and interventions that fall into the following categories (unless they are part of a package of workplace measures that also include interventions that fall within the inclusion criteria): explicit health interventions; individual-level interventions; interventions aimed at preventing unsafe practices in the workplace; interventions intended to reduce bullying or physical assault; changes to salary; macro-level work reorganization interventions (staff meetings, participatory workers councils, etc.); studies that: focus exclusively on economic outcomes, measure general work satisfaction, but use no specific measures of physical or mental health or stress, and do not report on the psychosocial work environment beyond general job satisfaction; general discussion papers not presenting data on impacts; and predictive studies **Participants:** Employees (including subcontracted workers) working at the site or department in which the intervention has taken place or who are otherwise affected by the intervention **Interventions:** Task restructuring interventions (task variety, team working, or autonomous groups): implemented as single interventions or as part of a package of interventions that may include a range of other measures (e.g. other organizational-level interventions, individual-level, or therapeutic interventions) **Comparator(s):** Not clearly reported/determined a priori **Outcome(s) and outcome measures:** Health outcomes: measures of physical health, mental health, reports of stress, sickness absence *Psychosocial outcomes*: measures of demand, control, support, or related psychosocial factors

* Only main findings regarding the intervention of interest (organizational-level stress prevention interventions) are summarized.

** We have summarized the conclusions stated by the author(s) or quoted them exactly as in the published report.

Study's main findings* and conclusions**
Main Findings*
All 19 included studies implemented organizational-level stress prevention interventions (8 PCSs with comparison group, 6 PCSs without comparison group, 3 prospective repeat cross-section without comparison group, 1 retrospective cross-section, 1 retrospective cross-section with comparison group).
1. Primary nursing (JRD/TRA) – Boumans 1999, Netherlands – 59 nurses
2. Primary nursing (JRD/TRA) – Boumans 2000, Netherlands – 248 professional caregivers
3. Primary nursing (JRD/TRA) – Melchior 1996, Netherlands – 161 nurses
4. Primary nursing (JRD) – Berkhout 2004, Netherlands – 147 professional caregivers
5. Increased task variety, more teamwork, more personnel, more time to plan work, bonus scheme (JRD) – Wahlstedt 2000/2001, Sweden – 82 postal sorting office employees
6. Production line introduced, decreased task variety, team working (JRD) – Fredriksson 2001, Sweden – 102 factory floor manual workers
7. Increased operator control on production line (JRD) – Wall 1990, UK – 19 factory floor manual workers
8. Computerization of production line (JRD) – Majchrzak 1988 US – 31 factory floor manual workers
9. More and smaller teams with sub-supervisors, participatory committee, more on-the-job training, ergonomic improvements (JRD/PAR/PEC) – Kawakami 1997, Japan – 187 factory floor manual workers
10. More teamwork, more personnel, role clarification, production goals, fewer supervisors, partial change in shift system, increased feedback, new vending machine and microwave (JRD/RIS/COM/PEC) – Wahlstedt 1994/1997, Sweden – 100 postal sorting office employees
11. More teamwork and incentive system (JRD) – Korunka 2003, Austria – 185 local government office employees
12. More teamwork, new roles (JRD/RIS) – Sutherland 1989/1992, UK – 917 general practitioners
13. More teamwork, new roles (JRD/RIS) – Appleton 1998, UK – 285 general practitioners
14. Lean production (JRD) – Parker 2003, UK – 368 factory floor manual workers
15. Lean production (JRD) – Jackson 2000, UK – 556 factory floor manual female workers
16. Just in Time (JRD) – Jackson 1996, UK – 44 factory floor manual workers
17. Just in Time (JRD) – Mullarky 1995, UK – 44 factory floor manual workers
18. Autonomous work groups (JRD) – Wall 1986, UK – 50 factory floor manual workers and shop floor supervisors
19. Autonomous work groups (JRD) – Christmansson 1999, Sweden – 12 factory floor manual workers and shop floor supervisors
Stress: NSS for one intervention (**11.**)
Burnout: NSS for two interventions (**2.** and **3.**)
Psychological wellbeing: NSS for eight interventions (**7.**, **8.**, **13.**, **15.**, **16.**, **17.**, **18.**, and **19.**), SS worsening for two interventions (**12.** $P < 0.05$; **14.** $P < 0.05$), SS improvement for one intervention (**9.** $P < 0.05$)
Sickness/absenteeism: NSS for three interventions (**1.**, **4.**, and **6.**), SS improvement for two interventions (**9.** $P < 0.05$; **10.** $P < 0.05$)
Conclusions**
"In summary, those interventions that improved the psychosocial work environment by increasing task variety either had no effect (primary nursing) or a limited positive effect (production line) on health. The team working interventions tended to improve the psychosocial work environment in most studies, although not for all workers, but the health effects were less apparent. The autonomous work groups, contrary to the stated aims of such interventions, caused deterioration in the psychosocial work environment, and, as would be predicted from the demand-control-support model, the resulting health effects were correspondingly adverse, though in some cases they were negligible."
"Prospective, well controlled studies of task structure interventions which examine the impacts on the psychosocial work environment, health and health inequalities, and which also assess the fidelity of implementation, are therefore needed in the future. Studies which particularly examine the effects of interventions which increased control would be the most useful."

*** Studies were rated "yes" or "no" on 10 methodological criteria, but authors did not assign overall ratings to each study.

Table B1: Evidence from included systematic reviews (continued)

Study	Study's characteristics
Egan, Bambra, Thomas, Petticrew, Whitehead, and Thomson[71] 2007 UK **Objective:** To systematically review the health and psychosocial effects of increasing employee participation and control through workplace reorganization, with reference to the demand-control-support (DCS) model of workplace health	**Methodology:** Relevant databases were searched for publications (of any language) from start of databases to December 2006. Search also included follow-up on citations found in other studies, handsearching, and expert consultation. Narrative synthesis was used, with emphasis given to the studies that were more methodologically robust. Overall quality scores were not assigned.*** **Included studies:** Randomized controlled trials, prospective studies with or without controls, retrospective studies with or without controls **Excluded studies:** Studies that do not include employees in their study population, non-workplace interventions, and interventions that fall into the following categories (unless they are part of a package of workplace measures that also include interventions that fall within the inclusion criteria): explicit health interventions, individual-level interventions, interventions aimed at preventing unsafe practices in the workplace, and intervention intended to reduce bullying or physical assault, changes to salary; studies that focus exclusively on economic outcomes, measure general work-satisfaction, but use no specific measures of physical or mental health or stress and do not report on the psychosocial work environment beyond general job satisfaction; general discussion papers not presenting data on impacts; and predictive studies **Participants:** Employees (including subcontracted workers) working at the site or department in which the intervention has taken place or who are otherwise affected by the intervention Interventions: Organizational-level workplace interventions designed to increase employees' opportunities to make decisions or participate in the decision-making process, implemented as single interventions or as part of a package of interventions that may include a range of other measures (e.g. other organizational-level interventions, individual-level or therapeutic interventions) **Comparator(s):** Not clearly reported/ determined a priori **Outcome(s) and outcome measures:** *Health outcomes*: measures of physical health, mental health, reports of stress, sickness absence *Psychosocial outcomes*: measures of demand, control, support, or related psychosocial factors

Study's main findings* and conclusions**

Main findings*

Fourteen out of 18 included studies implemented organizational-level stress prevention interventions (5 PCSs with comparison group, 3 PCSs without comparison group, 1 prospective controlled repeat cross-section, 1 prospective repeat cross-sectional study with nested cohort study with comparison groups, 1 prospective repeat cross-section with comparison group, 1 retrospective repeat cross-sectional study, 1 retrospective cohort study, 1 qualitative retrospective panel study).

1. Problem-solving committees (PAR) – Landsbergis 1995, US – 77 local government agency employees

2. Participative action research (PAR) – Bond 2001, UK – 53 central government office employees

3. Participative management intervention (PAR/JRD) – Counte 1987, US – 99 nurses

4. Participatory intervention based on German "health circles": small groups of employee representatives meet to identify stressors and recommend solutions (PAR) – Bourbonnais 2006, Canada – 613 nurses, orderlies, and auxiliary nurses

5. Action teams: employee representatives liaise with management and employees (PAR/COM/JRD) – Park 2004, US – 1463 retail store employees

6. Flexible working hours (JRD) – Smith 1998, UK – 62 police officers

7. Control transferred to employee work groups (PAR/JRD) – Wall 1981, UK – 29 factory manual workers

8. Stress reduction working committee (PAR/JRD/PEC) – Kawakami 1997, Japan – 187 factory manual workers

9. Participatory ergonomics team (PAR/PEC/TRA) – Evanoff 1999, US – 87 hospital orderlies

10. Conference on working conditions followed by supervisor and employee work group meetings (PAR/TRA) – Mikkelsen 1999, Norway – 125 post office employees

11. Management-employee design teams set up to implement "re-engineering" of hospital services (PAR/JRD) – Woodward 1999, Canada – 346 hospital staff (managers, doctors, nurses, clerical and technical staff)

12. Empowerment initiative (PAR/JRD) – Parker 1997, UK – 139 factory employees

13. Participatory action research committee (PAR/JRD) – Heaney 1993, US – 277 factory manual employees and supervisors

14. Collaboration meetings, labour-saving ergonomic changes, downsizing linked with restructuring (PAR/PEC/JRD) – Herting 2003, Sweden – 6 hospital clerical staff

Stress: NSS for one intervention (**10.**), SS improvement in one intervention **(5.** $P = 0.02$)

Burnout: NSS for two types of burnout (client related and personal) but SS improvement for one type of burnout (work related) in one intervention (**4.** Intervention: −1.83, 95% CI −3.58 to −0.09; Control: 0.06, 95% CI −1.66 to 1.78; $P = 0.034$), SS worsening in one intervention (**11.** $P < 0.05$).

Psychological wellbeing: NSS for five interventions (**1.**, **4.**, **10.**, **12.**, and **13.**), SS improvement in four interventions (**2.** Intervention: Pre 57.56, 95% CI 54.10 to 60.93; Post 52.27, 95% CI 45.96 to 58.58. Control: Pre 53.19, 95% CI 49.45 to 56.93; Post 58.96, 95% CI 53.99 to 63.93; $P = 0.014$. **6.** $P < 0.05$. **7.** $P < 0.05$. **8.** Intervention: Pre 41.1; Post 38.6. Control: Pre 41.5; Post 42.3; $P = 0.025$), worsened in two interventions (**11.** $P < 0.05$; **14.** qualitative feedback)

Sickness/absenteeism: NSS for one intervention (3.), SS improvement in three interventions (**2.** $P < 0.05$; **8.** Intervention: Pre 52%; Post 34%. Control: Pre 33%; Post 37%; $P = 0.034$. **9.** $P < 0.05$)

Conclusions**

"More robust evidence is required, but the findings from this review remain broadly compatible with the UK Department of Health's view that increasing employee control is a key task for policy-makers. Health improvements (e.g. mental health and sickness absenteeism) may sometimes result from such interventions. The only negative health effects were reported in two uncontrolled studies that may have been confounded by organizational downsizing.

This systematic review of "participatory" interventions has identified evidence of some health benefits occurring when employee control improved or (less consistently) demands decreased or support increased.

The evidence identified suggests that the strategy of reorganizing workplaces to facilitate employee participation and control offers a potential means of improving employee health and wellbeing, although the most effective means of implementing this strategy needs to be better understood.

Interventions that successfully improve employees' sense of control are potentially health improving, although they may not protect workers from generally poor working conditions.

More investigation of the relative impacts of different interventions, implementation, and the distribution of effects across the socio-economic spectrum is required.

Table B1: Evidence from included systematic reviews (continued)

* Only main findings regarding the intervention of interest (organizational-level stress prevention interventions) are summarized.

** We have summarized the conclusions stated by the author(s) or quoted them exactly as in the published report.

*** Studies were rated "yes" or "no" on 10 methodological criteria, but authors did not assign overall ratings to each study.

Table B2: Methodological quality appraisal using the Quality Assessment Checklist

Review characteristics	
Study question formulated	
Inclusion/exclusion criteria	Participants
	Interventions
	Outcome measures
	Study type/design
Search strategy	Electronic databases
	At least Medline and Embase
	Other sources
Data extraction	Data extraction method
	Standardized method
	Independent data extraction by at least two reviewers
Quality assessment	Criteria used to assess the validity of included studies
	Independent quality assessment by at least two reviewers
	Interrater agreement for quality assessment
Data analysis/ synthesis	Qualitative review
	Study quality used in analysis or discussion of study results
	Semiquantitative review
	Confidence interval or range reported
	Meta-analysis
	Precision of the results reported
	Test of homogeneity conducted
	Test for publication bias

CASP – Critical Appraisal Skills Programme; CCT – Clinical controlled trial; CI – Confidence interval; CBA – Controlled before and after study; ITS – Interrupted time series; RCT – Randomized controlled trial; MA – Meta-analysis; MBI – Maslach Burnout Inventory; MD – Mean difference(s); NSS – Non-statistically significant; PCS – Prospective cohort study; SR – Systematic review; SS – Statistically significant; QA – Quality assessment; WMD – Weighted mean difference(s);

	Gilbody et al.[64]	Marine et al.[65]	Mimura and Griffiths[66]	BOHRF[69]	Bambra et al.[70]	Egan et al.[71]
	●	●	●	●	●	●
	●	●	●	●	●	●
	●	●	●	●	◐	◐
	●	●	●	○	●	●
	●	●	●	●	●	●
	●	●	●	●	●	●
	✓	✗	✗	✓	✓	✓
	○	●	●	●	●	●
	●	●	◐	○	●	●
	✗	✓	?	✗	✗	✗
	✓	✓	✗	✗	✗	✗
	●	●	●	●	●	●
	✓	✓	✗	?	✓	✓
	●	◐	○	○	●	●
	●	n/a	●	●	●	●
	✓		✓	✓	✓	✓
	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	●	n/a	n/a	n/a	n/a
		✓				
		✓				
	○	●	○	○	○	○

Table B2: Methodological quality appraisal using the Quality Assessment Checklist (continued)

Review characteristics	
Concluding section	Potential methodological limitations
	Clinical application of results
	Conclusions supported by results
Quality rating	Six criteria (search at least 2 databases; independent data extraction and quality rating by 2 reviewers; appropriate data synthesis; conclusions supported by results)
Conflict/funding	Conflict of interest (if any)
	Source of funding

Key for quality of reporting: Reported = ● ; Partially reported = ◐ ; Not reported = ○; Not applicable = N/A

Key for quality of review (grey sections of table): Yes = ✔; No = ✖; Unclear = ?

Table B3: Methodological quality appraisal using AMSTAR

AMSTAR's review characteristics	
1. Was an a priori design provided?	
2. Was there duplicate study selection and data extraction?	
3. Was a comprehensive literature search performed?	
4. Was the status of publication (i.e. grey literature) used as an inclusion criterion?	
5. Was a list of studies (included and excluded) provided?	
6. Were the characteristics of the included studies provided?	
7. Was the scientific quality of the included studies assessed and documented?	
8. Was the scientific quality of the included studies used appropriately in formulating conclusions?	
9. Were the methods used to combine the findings of studies appropriate?	
10. Was the likelihood of publication bias assessed?	
11. Was the conflict of interest stated?	
Totals	Yes
	No
	Can't answer
	Not applicable

C/A – Can't answer; N/A – Not applicable

	Gilbody et al.[64]	Marine et al.[65]	Mimura and Griffiths[66]	BOHRF[69]	Bambra et al.[70]	Egan et al.[71]
	○	◐	○	●	○	○
	◐	●	●	●	◐	◐
	✓	✓	✓	✓	✓	✓
	5/6 Average	5/6 Average	2/6 Poor	3/6 Poor	4/6 Poor	4/6 Poor
	●	●	○	○	●	●
	●	●	○	●	●	●

	Gilbody et al.[64]	Marine et al.[65]	Mimura and Griffiths[66]	BOHRF[69]	Bambra et al.[70]	Egan et al.[71]
	C/A	C/A	C/A	C/A	Yes	Yes
	Yes	Yes	C/A	C/A	No	No
	No	Yes	Yes	Yes	Yes	Yes
	No	No	No	Yes	Yes	Yes
	No	Yes	No	No	No	No
	Yes	Yes	No	Yes	C/A	C/A
	Yes	Yes	Yes	Yes	Yes	Yes
	Yes	Yes	Yes	Yes	Yes	Yes
	N/A	Yes	N/A	N/A	N/A	N/A
	No	Yes	No	No	No	No
	No	No	No	No	No	No
	4	8	3	5	5	5
	5	2	5	3	4	4
	1	1	3	2	1	1
	1	0	1	1	1	1

Quality Assessment Checklist Guidelines

This checklist contains six quality subsections (grey rows) that are believed to be the criteria necessary for a high-quality review. Determining the Quality Rating is optional and is explained following the description of the checklist's criteria.

Study Question

The objective(s) of the review were stated in the abstract, introduction, or methods.

Inclusion/Exclusion Criteria

Reported: Details of the participants, interventions, outcome measures, and types of studies considered for analysis should be stated in the abstract, introduction, or methods section of the review. If the first mention of any of these elements occurs in the results section, the review should be scored as "not reported."

Search Strategy

Electronic databases

Any electronic databases used in the literature search should be listed. A review that used both Medline (and PubMed) and Embase is scored "yes" in the quality subsection.

Other sources

Any resources or methods used in the literature search other than searching of electronic databases (e.g. pearling or handsearching of journals).

Data Extraction

Standardized method

If the data categories extracted were listed or the use of a standardized data extraction form was mentioned, then the review scores "yes."

Independent data extraction

If data were extracted by at least two independent reviewers, the review should be scored "yes." In cases where data were extracted by one reviewer and checked by another, or if data were extracted by only one reviewer, the review scores "no." If there was no mention of the number of reviewers for data extraction, the review scores "unclear."

Quality Assessment

Independent quality assessment

If the quality of the included studies was assessed by at least two independent reviewers, the review should be scored "yes." In cases where the studies were assessed by one reviewer and checked by another, or if the studies were

assessed by only one reviewer, the review scores "no." If there was no mention of the number of reviewers for quality assessment, the review scores "unclear."

Interrater agreement

Interrater agreement was considered to be reported if there was a statement of the degree of difference or equivalence between the reviewers, a statistical measure of interrater agreement was provided, or a consensus procedure was described.

Data Analysis/Synthesis

In this section only one of the three methods for data analysis or synthesis can be assessed and is said to be "reported." If a review contains a meta-analysis at all (even if the results of only a few studies were pooled, and the remaining studies were analyzed or synthesized qualitatively), then data analysis/synthesis is reported as "meta-analysis." Only the quality subsection(s) under the chosen method were assessed.

Qualitative review

A qualitative review is defined as a narrative summary of the study results with no statistical analysis or pooling of results. A review in which the authors analyzed or discussed the results of the included studies in terms of their quality scores "yes."

Semiquantitative review

A semiquantitative review incorporates a statistical analysis of individual studies without pooling the results (e.g. relative risks calculated for individual study outcomes), pooling of results using only descriptive statistics (e.g. median, mean, mode, frequency), or both. A range or confidence interval must be reported for the review to score "yes" in the quality subsection.

Meta-analysis

This is defined as any analysis where a pooled effect estimate is calculated for at least two studies. Confidence intervals must be reported for the review to score "yes" in the first quality subsection; results of a statistical analysis of heterogeneity must be reported for the review to score "yes" in the second quality subsection.

Test for publication bias

A review was scored as "reported" if the authors had performed a test or they explained why a test was not performed.

Concluding Section

Potential methodological limitations

A review was scored as "reported" if it contained a section or paragraph specifically on its potential methodological limitations.

Clinical application of results

The clinical application of results was considered to be reported if all of the following four elements were present in the concluding section (includes discussion) or statement of the review: treatment, treatment effect, patient group, and comparator. If only three of the four elements were present, the study was scored as "partially reported." A review was scored as "not reported" if fewer than three of these elements were present.

Conclusions supported by results

The review was scored as "yes" if the conclusions drawn by the authors of the review were supported by the evidence presented in the results section.

Conflict/Funding

A statement of conflict of interest (if any) and any funding sources should be present.

Optional Quality Rating

Systematic reviews may be rated on how well their methods excluded bias and confounding by examining the inclusion/exclusion criteria and search strategy used; how the data extraction, quality assessment of the included studies, and data analysis or synthesis were conducted; whether the conclusions of the review matched the results; and if conflicts of interest and funding sources were reported. The reviews are rated for quality with respect to the six essential quality criteria, as follows:

Good – six criteria met or five criteria met and one criterion "unclear"

Average – one criterion not met, one criterion not met and one criterion "unclear," or two criteria "unclear"

Poor – at least two criteria not met

N.B. – For a criterion to have been met, it must have received a ✔. The two review characteristics under meta-analysis count as one quality criterion. Therefore, to meet the fifth quality criterion, each of the characteristics must have received a ✔.

Key for quality of reporting:

Reported = ● ; Partially reported = ◐ ; Not reported = ○ ; Not applicable = N/A

Key for quality of review (grey sections of table):

Yes = ✔; No = ✖ ; Unclear = ?

AMSTAR Quality Assessment Tool[87]

(http://www.biomedcentral.com/content/supplementary/1471-2288-7-10-S1.doc)

1. Was an a priori design provided? The research question and inclusion criteria should be established before the conduct of the review.	O Yes O No O Can't answer O Not applicable
2. Was there duplicate study selection and data extraction? There should be at least two independent data extractors, and a consensus procedure for disagreements should be in place.	O Yes O No O Can't answer O Not applicable
3. Was a comprehensive literature search performed? At least two electronic sources should be searched. The report must include years and databases used (e.g. Central, Embase, and Medline). Key words and/or MESH terms must be stated and where feasible the search strategy should be provided. All searches should be supplemented by consulting current contents, reviews, textbooks, specialized registers, or experts in the particular field of study, and by reviewing the references in the studies found.	O Yes O No O Can't answer O Not applicable
4. Was the status of publication (i.e. grey literature) used as an inclusion criterion? The authors should state that they searched for reports regardless of their publication type. The authors should state whether they excluded any reports (from the systematic review) based on their publication status, language etc.	O Yes O No O Can't answer O Not applicable
5. Was a list of studies (included and excluded) provided? A list of included and excluded studies should be provided.	O Yes O No O Can't answer O Not applicable
6. Were the characteristics of the included studies provided? In an aggregated form such as a table, data from the original studies should be provided on the participants, interventions, and outcomes. The ranges of characteristics in all the studies analyzed (e.g. age, race, sex, relevant socioeconomic data, disease status, duration, severity, or other diseases) should be reported.	O Yes O No O Can't answer O Not applicable
7. Was the scientific quality of the included studies assessed and documented? A priori methods of assessment should be provided (e.g. for effectiveness studies if the author(s) chose to include only randomized, double-blind, placebo-controlled studies, or allocation concealment as inclusion criteria); for other types of studies alternative items will be relevant.	O Yes O No O Can't answer O Not applicable
8. Was the scientific quality of the included studies used appropriately in formulating conclusions? The results of the methodological rigor and scientific quality should be considered in the analysis and the conclusions of the review, and explicitly stated in formulating recommendations.	O Yes O No O Can't answer O Not applicable

AMSTAR Quality Assessment Tool[87] (continued)
(http://www.biomedcentral.com/content/supplementary/1471-2288-7-10-S1.doc)

9. Were the methods used to combine the findings of studies appropriate? For the pooled results, a test should be done to ensure that the studies were combinable, to assess their homogeneity (i.e. Chi test for homogeneity, I^2). If heterogeneity exists, a random effects model should be used and/or the clinical appropriateness of combining should be taken into consideration (i.e. is it sensible to combine?).	O Yes O No O Can't answer O Not applicable
10. Was the likelihood of publication bias assessed? An assessment of publication bias should include a combination of graphical aids (e.g. funnel plot, other available tests) and/or statistical tests (e.g. Egger regression test).	O Yes O No O Can't answer O Not applicable
11. Was the conflict of interest stated? Potential sources of support should be clearly acknowledged in both the systematic review and the included studies.	O Yes O No O Can't answer O Not applicable

AMSTAR Guidelines adapted by LB and PC

1. Was an a priori design provided?
Yes: if it explicitly says that criteria were established before

No: no statement on question or inclusion criteria

Can't answer: can't tell if question and criteria were established a priori

2. Was there duplicate study selection and data extraction?
Yes: two reviewers for selection and extraction and a consensus procedure

No: at least one of the above is a "no" (e.g. one reviewer for selection, two for extraction, and a consensus procedure in place)

Can't answer: if at least one of the above is not mentioned

3. Was a comprehensive literature search performed?
Yes: all four elements are there (two electronic sources, years and databases, key words or MESH terms, additional sources)

No: if any are missing

4. Was the status of publication (i.e. grey literature) used as an inclusion criterion?
Yes: clear statement about publication type and language

No: no statement on publication type or language

Can't answer: statement is unclear

5. Was a list of studies (included and excluded) provided?
Yes: both included and excluded are presented (tables or lists)

No: if one or both are not listed

6. Were the characteristics of the included studies provided?
Yes: tables of included studies with all three elements (participants, interventions, and outcomes)

No: no tables

Can't answer: if only some elements

7. Was the scientific quality of the included studies assessed and documented?
Yes: if tool or checklist is mentioned and critical appraisal is documented in tables or text

No: no mention of a tool/checklist

Can't answer: tool/checklist not specified, or critical appraisal not documented in tables or text

8. Was the scientific quality of the included studies used appropriately in formulating conclusions?
Yes: conclusions make reference to quality of evidence

No: no reference to quality of evidence

9. Were the methods used to combine the findings of studies appropriate?
Yes: for quantitative analysis, tests for homogeneity/heterogeneity must be done

No: no test for homogeneity/heterogeneity done, or not mentioned

Can't answer: test was done but results not mentioned

Not applicable: qualitative analysis

10. Was the likelihood of publication bias assessed?
Yes: if anything is mentioned on publication bias (graphical aids not required, but a statement is required)

No: no statement on publication bias

11. Was the conflict of interest stated?
Yes: sources of support acknowledged for both the review and the included studies

No: if source of support of one or both are missing

APPENDIX C: EXCLUDED STUDIES

Table C1: Excluded studies

Study	Reason for exclusion
Briner and Reynolds. The costs, benefits, and limitations of organizational level stress interventions. Journal of Organizational Behavior 1999;20:647-64.	This study did not meet all criteria for a systematic review.
Bunce. Statistical considerations in the interpretation of research on occupational stress management interventions. Work & Stress 2001;14:197-212.	This study did not meet all criteria for a systematic review. However, the article was used as a background document.
Burke. Work stress and coping in organizations: progress and prospects. Nursing Management 2002;33:41-2.	This study did not meet all criteria for a systematic review.
Caulfield et al. A review of occupational stress interventions in Australia. International Journal of Stress Management 2004;11:149-66.	This study did not meet all criteria for a systematic review.
Chang et al. Role stress in nurses: review of related factors and strategies for moving forward. Nursing & Health Sciences 2005;7:57-65.	This study did not meet all criteria for a systematic review.
Cole et al. Integrative interventions for MSDs: nature, evidence, challenges, and directions. Journal of Occupational Rehabilitation 2006;16:359-74.	Irrelevant. This study was focused on interventions for musculoskeletal disorders.
Cotton and Hart. Occupational wellbeing and performance: a review of organisational health research. Australian Psychologist 2003;38:118-27.	This study did not meet all criteria for a systematic review.
Couser. Challenges and opportunities for preventing depression in the workplace: a review of the evidence supporting workplace factors and interventions. Journal of Occupational and Environmental Medicine 2008;50:411-427.	This study did not meet all criteria for a systematic review.
Damiani et al. Do occupational stress management programmes affect absenteeism rates? Occupational Medicine (Lond) 2004; 54:58-9.	This study did not meet all criteria for a systematic review.
Dickinson and Wright. Stress and burnout in forensic mental health nursing: a literature review. British Journal of Nursing 2008;17:82-87.	This study did not meet all criteria for a systematic review.
Dosani. Review: stress is a problem for mental health nurses but research on interventions is insufficient. Evidence-Based Mental Health 2003;6:126.	This study did not meet all criteria for a systematic review.
Ebell. Which interventions have been shown to reduce stress, and how can these methods be applied to the problem of stress among physicians? Evidence-Based Practice 1998;1:5-6.	Abstract/review of Sims, 1997, which was excluded.
Edwards et al. Research in brief: a systematic review of the effectiveness of stress-management interventions for mental health professionals. Journal of Psychiatric & Mental Health Nursing 2006;10:370-71.	This study did not meet all criteria for a systematic review.

Table C1: Excluded studies (continued)

Study	Reason for exclusion
Edwards and Burnard. A systematic review of stress and stress management interventions for mental health nurses. Journal of Advanced Nursing 2003;42:169-200.	This study did not meet all criteria for a systematic review.
Edwards. A systematic review of the effects of stress and coping strategies used by occupational therapists working in mental health settings. British Journal of Occupational Therapy 2003; 66:345-55.	This study did not meet all criteria for a systematic review.
Edwards et al. Stress management for mental health professionals: a review of effective techniques. Stress and Health: Journal of the International Society for the Investigation of Stress 2002;18:203-15.	This study did not meet all criteria for a systematic review.
Fothergill et al. Stress, burnout, coping and stress management in psychiatrists: findings from a systematic review. International Journal of Social Psychiatry 2004;50:54-65.	This study did not meet all criteria for a systematic review.
Giga et al. The UK perspective: a review of research on organisational stress management interventions. Australian Psychologist 2003;38:158-64.	This study did not meet all criteria for a systematic review.
Gilbert. Are interventions aimed at reducing occupational stress effective? Communicating Nursing Research 2002;35:206.	Conference abstract. Focus on individual-level interventions.
Hannigan et al. Stress and stress management in clinical psychology: findings from a systematic review. Journal of Mental Health 2004;13:235-45.	This study did not meet all criteria for a systematic review.
Harris. Occupational health issues affecting the pharmaceuticals sales force. Occupational Medicine 2003;53:378-83.	Not intervention research.
Institute de recherche Robert-Sauvé en santé et en sécurité du travail (IRSST). Organizational interventions and mental health in the workplace: a synthesis of international approaches. Available at: http://www.irsst.qc.ca/files/documents/ PubIRSST/R-480.pdf	This study did not meet all criteria for a systematic review.
Jenkins and Rogers. Managing stress at work: an alternative approach. Nursing Standards 1997;11:41-4.	This study did not meet all criteria for a systematic review.
Jonathon. Sources of social support and burnout: a meta-analytic test of the conservation of resources model. Journal of Applied Psychology 2006;91:1134.	Not intervention research.
Jones and Johnston. Reducing distress in first level and student nurses: a review of the applied stress management literature. Journal of Advanced Nursing 2000;32:66-74.	This study did not meet all criteria for a systematic review.
Jordan et al. Beacons of excellence in stress prevention. Research report 133. Norwich, UK: Health and Safety Executive; 2003.	This study did not meet all criteria for a systematic review. However, the article was used as a background document.
Kompier et al. Stress prevention in bus drivers: evaluation of 13 natural experiments. Journal of Occupational Health Psychology 2005;5:11-31.	This study did not meet all criteria for a systematic review.

Table C1: Excluded studies (continued)

Study	Reason for exclusion
LaMontagne et al. Systematic review of the job stress intervention evaluation literature: 1990-2005. International Journal of Occupational & Environmental Health 2007;13(3):268-80.	This study did not meet all criteria for a systematic review. However, the article was used as a background document.
LaMontagne et al. Protecting and promoting mental health in the workplace: developing a systems approach to job stress. Health Promotion Journal of Australia 2007;18(3):221-228.	This study did not meet all criteria for a systematic review. However, the article was used as a background document.
LeFevre et al. Eustress, distress and their interpretation in primary and secondary occupational stress management interventions. Journal of Managerial Psychology 2006;21:547-65.	This study did not meet all criteria for a systematic review.
Lusk. Health effects of stress management in the worksite. AAOHN Journal 1997;45:149-52.	This study did not meet all criteria for a systematic review. Overview of Murphy's (1996) review.
Mackay. "Management Standards" and work-related stress in the UK: policy background and science. Work & Stress 2004;18:91-112.	This study did not meet all criteria for a systematic review. However, the article was used as a background document.
McVicar. Workplace stress in nursing: a literature review. Journal of Advanced Nursing 2003;44:633-42.	This study did not meet all criteria for a systematic review.
Michie and Williams. Reducing work related psychological ill health and sickness absence: a systematic review. Occupational & Environmental Medicine 2003;60:3-9.	This study did not meet all criteria for a systematic review.
Milliken et al. The impact of stress management on nurse productivity and retention. Nursing Economics 2007;25:203-210.	This study did not meet all criteria for a systematic review.
Murta et al. Process evaluation in occupational stress management programs: a systematic review. American Journal of Health Promotion 2007;21:248-54.	This study did not meet all criteria for a systematic review. However, the article was used as a background document.
Nytrø et al. An appraisal of key factors in the implementation of occupational stress interventions. Work & Stress 2000;14:213-25.	This study did not meet all criteria for a systematic review. However, the article was used as a background document.
Parks and Steelman. Organizational wellness programs: a meta-analysis. Journal of Occupational Health Psychology 2008;13:58-68.	This study was not based on organizational-level interventions as defined by our inclusion criteria.
Reynolds. Interventions: what works, what doesn't? Occupational Medicine (Lond) 2000;50:315-19.	This study did not meet all criteria for a systematic review.
Richardson and Rothstein. Effects of occupational stress management intervention programs: a meta-analysis. Journal of Occupational Health Psychology 2008; 13:69-93.	This study did not meet all criteria for a systematic review.
Riedel et al. The effect of disease prevention and health promotion on workplace productivity: a literature review. American Journal of Health Promotion 2001;15:167.	This study did not meet all criteria for a systematic review.

Table C1: Excluded studies (continued)

Study	Reason for exclusion
Rout. Stress management for primary health care professionals. New York: Kluwer Academic/Plenum; 2002.	This study did not meet all criteria for a systematic review. However, the article was used as a background document.
Schaufeli and Peeters. Job stress and burnout among correctional officers: a literature review. International Journal of Stress Management 2000;7:19-48.	This study did not meet all criteria for a systematic review.
Shirey. Stress and coping in nurse managers: two decades of research. Nursing Economics 2006;24:193-203, 211.	Not intervention research.
Short. Psychological effects of stress from restructuring and reorganization: assessment, intervention, and prevention strategies. AAOHN Journal 1997;45:597-604.	This study did not meet all criteria for a systematic review.
Sims. The evaluation of stress management strategies in general practice: an evidence-led approach. British Journal of General Practice 1997;47:577-82.	This study did not meet all criteria for a systematic review.
Sonnentag and Frese. Stress in organizations. Comprehensive handbook of psychology, Volume 12: Industrial and organizational psychology. Hoboken, NJ: Wiley; 2003: p.453-491.	This study did not meet all criteria for a systematic review. However, the article was used as a background document.
Swanson. Working women and stress. Journal of American Medical Women's Association 2000;55:76-9.	This study did not meet all criteria for a systematic review.
Thomas. Resident burnout. JAMA 2004;292:2880-89.	This study did not meet all criteria for a systematic review.
Van der Klink et al. The benefits of interventions for work-related stress. American Journal of Public Health 2001;91:270-76.	This study did not meet all criteria for a systematic review.
Van der Hek and Plomp. Occupational stress management programmes: a practical overview of published effect studies. Occupational Medicine 1997;47(3):133-41.	This study did not meet all criteria for a systematic review.
Wardle et al. Stress and the caregiver. Nursing Connections 1999;12:35-9.	This study did not meet all criteria for a systematic review.
Wick and Zanni. Stress in the pharmacy: changing the experience. Journal of American Pharmacists Association 2002;42:16-20.	Individual-level interventions. This study did not meet all criteria for a systematic review.

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ISBN 978-1-897443-50-7 (print)
ISSN 978-1-897443-51-4 (online)