

Workplace risk management practices to prevent musculoskeletal and mental health disorders: What are the gaps?



Jodi Oakman^{a,*}, Wendy Macdonald^a, Timothy Bartram^b, Tessa Keegel^{a,c}, Natasha Kinsman^a

^a Centre for Ergonomics and Human Factors, School of Psychology and Public Health, College of Science, Health & Engineering, La Trobe University, Bundoora, Victoria 3086, Australia

^b La Trobe Business School, Department of Management and Marketing, College of Arts, Social Sciences and Commerce (ASSC), La Trobe University, Bundoora, Victoria 3086, Australia

^c Monash Centre for Occupational and Environmental Health, School of Public Health and Preventive Medicine, Monash University, Prahran, Victoria 3181, Australia

ARTICLE INFO

Keywords:

Workplace risk management
Musculoskeletal
Psychosocial
Occupational health and safety

ABSTRACT

Introduction: A large body of evidence demonstrates substantial effects of work-related psychosocial hazards on risks of both musculoskeletal and mental health disorders (MSDs and MHDs), which are two of the most costly occupational health problems in many countries. This study investigated current workplace risk management practices in two industry sectors with high risk of both MSDs and MHDs and evaluated the extent to which risk from psychosocial hazards is being effectively managed.

Method: Nineteen, mostly large, Australian organisations were each asked to provide documentation of their relevant policies and procedures, and semi-structured interviews were conducted with 67 staff who had OHS or management roles within these organisations. Information about current workplace practices was derived from analyses of both the documentation and interview transcripts.

Results: Risk management practices addressing musculoskeletal and mental health risks in these workplaces focused predominately on changing individual behaviours through workplace training, provision of information, individual counselling, and sometimes healthy lifestyle programs. There were formal procedures to control sources of risk for workplace biomechanical hazards affecting musculoskeletal risk, but no corresponding procedures to control risk from work-related psychosocial hazards. Very few risk control actions addressed risk from psychosocial hazards at their workplace sources.

Practical applications: To reduce the risk of both musculoskeletal and mental health disorders, existing practices need considerable expansion to address risk from all potential psychosocial hazards. Risk controls for both biomechanical and psychosocial hazards need to focus more on eliminating or reducing risk at source, in accord with the general risk management hierarchy.

1. Introduction

Over recent decades ‘psychosocial risk’ has become a familiar term within the occupational health management domain (European Agency for Safety and Health at Work, 2007; Jain et al., 2011). This term refers to health risks arising from work-related ‘psychosocial hazards’, which have been defined as “aspects of the design and management of work and its social and organisational contexts that have the potential for causing psychological or physical harm” (Leka and Cox, 2008) p. 1. It is well established that in the causal mechanism linking psychosocial hazards to workers’ health, ‘stress’ plays a key role (Chandola et al., 2008; Cox, 1978; Karasek and Theorell, 1990; Kim and Kang, 2010; Kompier, 2003; Kompier and Van der Beek, 2008; Macdonald, 2012;

Macdonald and Evans, 2006; Marmot et al., 1999).

Two of the most prevalent and costly of the occupational health problems influenced by psychosocial hazards are musculoskeletal and mental health disorders (MSDs and MHDs). In Australia, for example, musculoskeletal injuries and disorders are by far the most prevalent type of work-related injury or illness, with mental disorders being the second most prevalent (Safe Work Australia, 2015). Quantitative international comparisons are hindered by wide variation in definitions and data recording systems, but prevalence levels are similarly high in most industrially developed countries (e.g. Montano, 2014)

Various guidance documents have been developed to help workplaces manage health risks from psychosocial hazards and associated stress, but this guidance has a strong focus on risk of *mental* health

* Corresponding author.

E-mail addresses: j.oakman@latrobe.edu.au (J. Oakman), w.macdonald@latrobe.edu.au (W. Macdonald), t.bartram@latrobe.edu.au (T. Bartram), t.keegel@latrobe.edu.au (T. Keegel), n.kinsman@latrobe.edu.au (N. Kinsman).

<http://dx.doi.org/10.1016/j.ssci.2017.09.004>

Received 20 December 2016; Received in revised form 18 July 2017; Accepted 7 September 2017
0925-7535/ © 2017 Elsevier Ltd. All rights reserved.

disorders (British Standards Institute, 2011; Canadian Standards Association, 2013; Health and Safety Executive, 2012; International Labour Office, 2012; Safe Work Australia, 2014). This is probably helpful in workplaces where mental health is the main concern, since psychosocial hazards are the main ones affecting such risk.

However, there is a large body of evidence that psychosocial hazards can also have substantial effects on workers' physical health, including risk of musculoskeletal disorders (MSDs) (Eatough et al., 2012; Gerr et al., 2014; Kompier and Van der Beek, 2008; Lang et al., 2012; Macdonald and Evans, 2006; National Research Council (US) & Institute of Medicine (US) Panel on Musculoskeletal disorders and the workplace, 2001). In workplaces where MSDs are the main OHS problem, the focus of stress-related guidance material on mental health is likely to present a barrier to more effective MSD risk management (Macdonald and Oakman, 2015), and this problem is exacerbated by current MSD risk management guidance. The best of this guidance includes mention of psychosocial hazards, but relatively little information is included about how to assess and control associated risks; for example see reviews by Macdonald et al. (2003), Macdonald and Evans (2006) and online guidance of the UK Health and Safety Executive (2012), SafeWork Australia (2016a), and the Occupational Health & Safety Council of Ontario (2013).

The ergonomics systems model shown in Fig. 1 represents the large and diverse range of factors known to influence MSD and MHD risk. It shows two groups of factors that are largely beyond the control of workplace managers. First, *Workers' Personal Characteristics*, which are the unique physical and psychological strengths and weaknesses that people bring with them to work, including vulnerabilities arising from fatigue or stress due to inadequate sleep, non-work personal responsibilities and problems, pre-existing injuries or health problems and so on. Second, *External Factors* include: OHS regulatory enforcement practices; injury compensation legislation and practices; state of the job market, pay levels and other economic factors; general societal norms concerning absenteeism and a 'fair day's work'; and of course OHS legislation and associated codes, regulatory standards and related guidance information. In the Australian jurisdiction where the current research was conducted, legislation requires 'duty holders' to protect against risk to workers' health and safety. It defines 'health' to include both psychological and physical, and specifies that employers' responsibilities include provision and maintenance of working environments, plant and 'systems of work' that are "safe and without risks to health"

(Occupational Health and Safety Act 2004, Victoria).

As shown in Fig. 1, workers interact with and are affected by the following sets of workplace factors for which their managers have primary responsibility.

- **Task & Equipment Factors:** characteristics of specific work tasks and the tools or equipment used in performing these tasks. These include the physical hazards associated with 'manual handling' tasks, which are widely recognised as affecting MSD risk. They also include some psychosocial hazards, such as bus drivers' stressful encounters with difficult passengers, or nurses' struggles to manage verbally abusive or distressed patients. In such cases it is often possible to mitigate risk by changes to task equipment, the immediate work space, and/or design of the particular task.
- **Work Organisation and Job Design Factors:** how work is organised and jobs designed. These factors include very long working hours, pressure to complete excessively large amounts of work in the time available, inadequate rest breaks, night shifts, jobs with low control over work rate (e.g. due to a moving assembly line, frequent deadlines), little variety or interest, few opportunities to use existing skills or develop new ones, little opportunity to interact with others, inadequate support from supervisors or colleagues, low rewards (not only financial) in relation to personal effort invested, etc.
- **Workplace Environment Factors:** both physical and psychosocial. Physical environment factors include air quality, extreme heat or cold, loud noise. The psychosocial environment includes factors arising from the general workplace culture or climate, such as widespread perceptions that getting work done quickly is more important than workers' health and safety, low job security, autocratic style of management with minimal participation by employees at lower levels, and so on.

It can be seen that the 'psychosocial' hazards for which managers have primary responsibility occur among all three of the above types of workplace factors. They include all work organisation, job design and psychosocial environment factors as well as some that are inherent in task performance. The great diversity of these hazards presents a major challenge to OHS risk managers because direct responsibility for them is widespread among various personnel, many of whom have general supervisory or management responsibilities but no specific OHS expertise. And although guidance for workplaces on managing health risks from occupational stress and associated psychosocial hazards is available, there is little information on the nature of actual workplace practices (Natali et al., 2008; European Agency for Safety and Health at Work, 2010; Langenhan et al., 2013). Similarly, there is extensive guidance on MSD risk management, albeit with inadequate coverage of risk from psychosocial hazards, but the nature and quality of actual workplace MSD risk management practices is very poorly documented (Macdonald et al., 2008; Oakman, 2014; Whysall et al., 2004).

Two basic requirements are needed for effective workplace management of occupational health problems that have multiple potential causes, such as MSDs and MHDs. The first is that risk from all potentially important hazards must be taken into account. Macdonald and Oakman (2015) argued that currently this is unlikely to be the case for MSD risk because risk from psychosocial hazards is unlikely to be addressed adequately.

The second requirement is that the risk control actions must be as high within the general hierarchy of risk control as is reasonably practicable (ILO-OSH, 2001). According to this hierarchy, highest priority must be given to actions that eliminate or at least reduce the severity of a hazard, since this kind of action is most reliably effective. This general principle is reflected also in EU Directive 89/391/EEC, Article 6 'General obligations on employers' (EU, 1989), where 6–2 specifies some 'general principles of prevention' of which the first three are "(a) avoiding risks; (b) evaluating the risks which cannot be avoided; (c) combating the risks at source;". For example, training

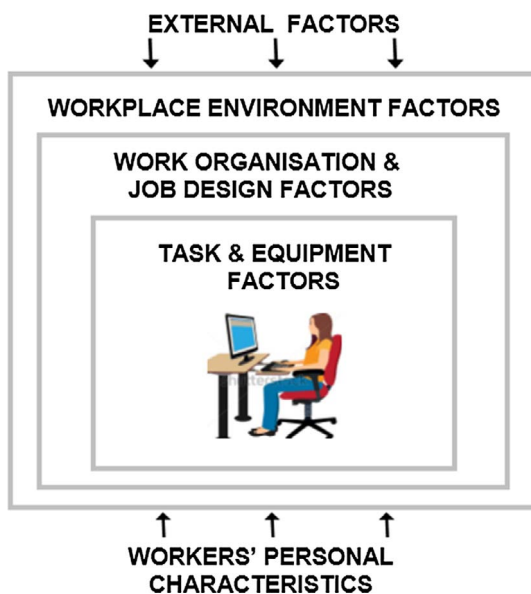


Fig. 1. The system of workplace factors affecting workers' health, safety and performance. (Adapted from Macdonald et al., 2003, Fig. 1.)

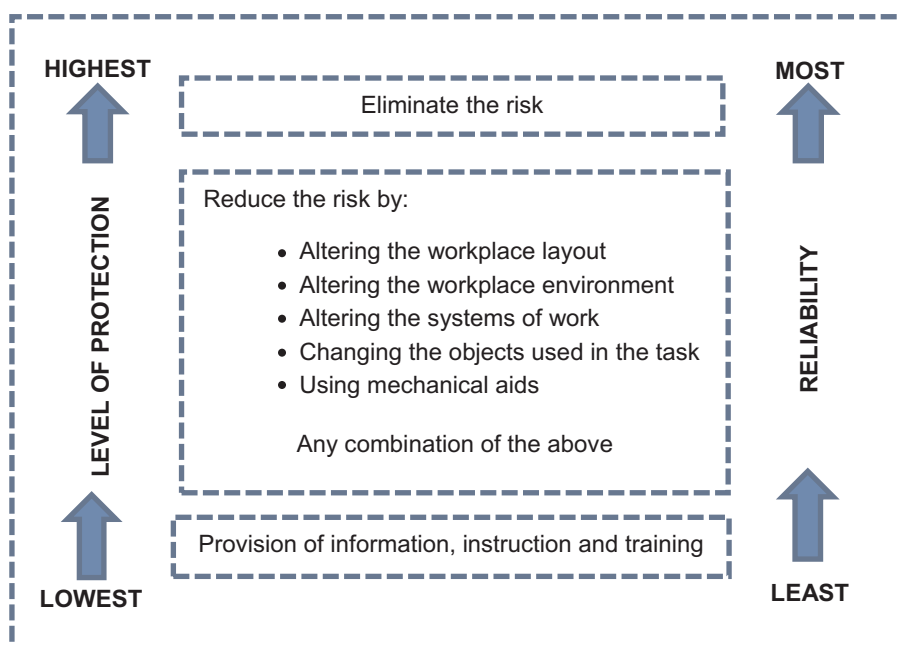


Fig. 2. Effectiveness and reliability of risk control measures to reduce risk of musculoskeletal disorders. Reproduced from WorkSafe Victoria, 2016..

workers to be more ‘resilient’ in order to reduce their MHD risk is low in the hierarchy, whereas job design and management strategies designed to eliminate or reduce the severity of psychosocial hazards are high in the hierarchy (Safe Work Australia, 2014).

Similarly with MSD risk, the lowest priority actions include provision of information or training intended to modify the behaviour of workers so as to reduce their risk (Macdonald, 2005; Worksafe Victoria, 2016). For example, training workers in ‘safe’ lifting techniques falls at the bottom of the hierarchy; further, there is substantial empirical evidence that such training is ineffective (Hignett, 2003; Haslam et al., 2007). Job re-design to eliminate or reduce the need for heavy lifting falls at the top of the hierarchy. Fig. 2 shows the general hierarchy as adapted for workplace use in MSD risk management by WorkSafe Victoria – the OHS regulator in the jurisdiction where this research was conducted.

The current research aimed to:

- (1) document workplace risk management practices targeting risk of musculoskeletal disorders (MSDs) and stress-related mental health disorders (MHDs) in samples drawn from two Australian industry sectors with high claim rates for both MSDs and stress-related MHDs;
- (2) evaluate the adequacy of current practices in relation to: (a) the extent to which they address all relevant hazards; and (b) the extent to which they comply with the hierarchy of risk control;
- (3) identify gaps in current workplace risk management practices and the kinds of changes that are needed.

2. Method

2.1. Recruitment of participating organisations and interviewees

Organisations were recruited from sub-sectors within two Australian industries – residential aged care (part of the Health Care and Community Services industry sector) and logistics/transport (part of the Transport and Storage industry sector). These two industry sectors have high rates of workers’ compensation claims for both MSDs and MHDs (Safe Work Australia, 2013, 2016a, 2016b).

The Victorian State Government OHS regulator (the funding agency for the research) sent a letter containing research team contact and study details to the ‘OHS Manager’ of approximately 230 organisations.

In response to this letter, 29 organisations contacted researchers; of these, 14 consented to participate. A further five organisations were recruited through snowball sampling giving a final total of 19 participant organisations. Inclusion criteria were to employ greater than 150 staff and have employees based in Victoria, Australia. Information on non-responders was not available.

Following recruitment of the organisation, individual interviewees were recruited. The first interview was usually with the organisation’s primary contact person, who then acted as a liaison to recruit further staff for interview. Interviewees were required to occupy roles with some responsibility for OHS risk management at various levels within the management hierarchy, to be aged over 18 years, and able to read and speak English reasonably well. In some organisations it was not possible to interview staff at the desired range of management levels due to their limited availability in relation to research project requirements.

2.2. Data collection procedures

Each participating organisation was requested to provide the research team (via email) with the organisation’s policy and procedure documents related to OHS risk management for musculoskeletal and stress-related disorders; several follow-up requests were made in some cases.

An interview schedule was developed, based on the systems framework shown in Fig. 1 and the more specific research evidence concerning MSD and MHD causation as outlined in the Introduction. Questions were designed to elicit information about the organisation’s current OHS risk management practices, seen by the interviewee as relevant to prevention of MSDs and stress-related health problems more generally, and about participants’ understanding of requirements for effective risk management. Key questions included: ‘What do you think are the main factors causing musculoskeletal/stress-related problems?’ and ‘Do you have any strategies to deal with those factors?’, separately for MSDs and MHDs. Results presented here relate to the second of these questions.

Individual interviews ranged from 45 to 90 minutes duration and were conducted via telephone except for six at the interviewees’ workplaces; all were audio-recorded. One researcher interviewed 52 people and a second researcher interviewed 15. The first four interviews were conducted jointly by both researchers who later conferred

and adjusted the interview schedule as necessary. Interviews did not necessarily follow the order of the schedule, but all topics were covered during the interview.

2.3. Analyses

Documentation of risk management policies and procedures: Documents were first categorised according to which Fig. 1 work system component they targeted, or as having more general OHS coverage. This categorisation was based on documents' titles and listed contents, and in some cases also on perusal of their contents. (The resultant set of categories are shown in Table 2). Both MSD and MHD risks are affected by hazards in all work system components so this categorization provides some indication of the extent to which documents addressed the full range of relevant hazards (aim 2a).

Additional, more detailed analysis of document content focused on the extent and quality of their coverage of psychosocial factors. This entailed electronic searching for key words related to risks arising from stress and commonly recognised psychosocial hazards, and associated evidence of the kinds of risk control measures being promoted (related to aims 2a and 2b).

Interview transcripts. Audio-recordings of interviews were transcribed and then coded using NVivo 11 software and the approach to thematic analysis described by Braun and Clarke (2006), following their phases 1 through 5. Initially, two transcripts were coded line by line, and resultant coding categories and were discussed and refined by the full research team, based on team consensus; such discussions were used throughout the coding process to resolve uncertainties. The data-driven themes that emerged initially from this process represented different types of reported risk management practices for MSDs and MHDs separately. During phase 5 of this process, the broad conceptual framework of work system components depicted in Fig. 1 was used as a template to facilitate *evaluation* of reported risk management practices. That is, over-arching themes were identified and located within one or other work system component; this entailed refinements to details and names of each theme in accord with Braun and Clarke's account of the phase 5 process, as well as some adjustment to the work system elements shown in Fig. 1.

The resultant themes, each representing a different type of reported risk management practice (MSDs and MHDs separately) are shown in Tables 3 and 4. On this basis, risk management practices were evaluated in terms of how comprehensively risk from the full range of relevant hazards was addressed (Aim 2a), and the status of risk control measures within the OHS risk control hierarchy (Aim 2b).

3. Results

3.1. Participating organisations and interviewees

The 10 logistics/transport organisations included a diverse range from international shipping to public transport, with the majority operating at a national level (three State based). Seven of the aged care organisations were based in just one Australian state (Victoria) with the remainder (two) operating across several states. Organisations ranged in size from 150 to 15,000 employees and most (16 of the 19) had 400 or more. The largest occupational groups in these organisations include public transport drivers, personal care and nursing assistants and enrolled nurses – occupations that are among the highest risk for both stress-related claims and MSDs (Safe Work Australia, 2013, 2016a, 2016b).

There were 67 interviewees in total (35 male, 32 female): 41 from the logistics/transport sector and 26 from the residential aged care sector. All interviewees had some role in the management of OHS within their respective organisations, as shown in Table 1. For 27 participants, OHS was their main responsibility. A further 28 were managers whose more general responsibilities included OHS. Senior

Table 1
Participants' details.

	Logistics/Transport (n)	Aged Care (n)
Organisations	10	9
Interviewees	41	26
Female	14	18
Male	27	8
Staff with specific OHS responsibilities		
OHS manager	7	4
OHS consultant/advisor	10	5
Executive level manager	0	1
Managers with more general responsibility		
Senior Manager	3	4
Executive (mostly Board members)	7	2
Site manager/coordinator	5	7
Health & Safety Representatives	9	3

managers with an executive role are referred to in Table 1 as 'Executive'; most were board members.

3.2. Results from analysis of documented policies and procedures

3.2.1. Overview of documents provided

Documents were provided by 14 of the 19 organisations, of which 8 (of 10) were from the logistics/transport sector and 6 (of 9) were from the aged care sector. Four organisations did not respond to numerous requests, and one organisation was unwilling to provide any of their OHS policy documents as they were only in draft form.

Organisations varied widely in how information was structured both within and between documents. Some had a variety of quite brief documents, each on a different topic, while others had fewer documents of which one or two had broad coverage and/or references to other documents concerning particular procedures. The types and numbers of documents provided, separately for each sector, are shown in Table 2.

All organisations provided information about OHS policy, mostly in a separate policy document but sometimes as part of a more general OHS policy and risk management document. All except one organisation included at least one such general document, but policy wording was so broad that it provided no indication of either the extent or quality of actual risk management practices.

Documents dealing with more specific aspects of general OHS risk management were provided by 8 organisations; topics included critical incident management, maintenance of a risk register, reporting of near-misses or OHS concerns, reporting of risk control measures, and OHS issue resolution.

All organisations provided information about "manual handling" (MH) risk management. Eight organisations provided MH-specific documents (Task/Equipment category) and in a few cases MH information was included within 'safe operating procedures' for some specific tasks. The other 6 organisations included MH information within general risk management documents. From the content of MH information it was evident that this was seen as synonymous with MSD risk management information; coverage of psychosocial hazards in these MH-related documents is described in the following section. There were no documents specifically addressing MSD risk management as such (i.e. going beyond a MH focus).

Seven documents were categorised as Work Environment and 6 as Personal Factors; the content of both was 'psychosocial' in nature so it is described in the following section. Finally, an assortment of 9 documents addressed various External Factors.

Coverage in *all* types of document of risk from psychosocial hazards is summarised below.

3.2.2. Documents' coverage of risk from psychosocial hazards

For 11 of the 14 organisations there was mention of some kind of psychosocial hazard or risk in at least one document. There was no

Table 2
Numbers of OHS documents (docs) provided in response to a request to organisations (orgs) for all documents relevant to MSD and/or stress-related or MHD risk management.

Targeted work system component	Logistics/Transport 8 organisations Docs (orgs)	Aged Care 6 organisations Docs (orgs)	Total 14 organisations Docs (orgs)
<i>General</i>			
OHS policy	7 (5)	6 (5)	13 (10)
OHS policy & risk management	9 (7)	8 (6)	17 (13)
Specific aspects of general OHS risk management	8 (6)	5 (2)	13 (8)
<i>Tasks & equipment</i>			
'Manual handling' risk assessment and control (some task-specific, some not)	16 (5)	4 (3)	20 (8)
<i>Work environment</i>			
All on psychosocial topics (see text)	4 (2)	3 (2)	7 (4)
Personal factors	2 (2)	4 (3)	6 (5)
External factors	5 (3)	4 (3)	9 (6)

marked difference between sectors in the extent of their coverage. The quality was generally poor in terms of the frequency and breadth of psychosocial hazard coverage (aim 2a), and the extent to which support for risk control measures was outlined in accord with the hierarchy of risk control (aim 2b).

All of the documents categorised as Work Environment (7) and Personal Factors (6) were about psychosocial hazards. Two of the seven documents categorised as Work Environment were concerned only with the need for consultation (a legislative requirement) and/or communication issues. The other five were about workplace policies and procedures concerning people's *behaviour at work* ... harassment, bullying, equal opportunity issues and a general code of conduct.

Much of the content of the six documents categorised as Personal Factors was also about people's behaviour, but in these the primary focus was behaviour *beyond* the workplace – although words used in the titles of some (e.g. 'Occupational Stress', 'Healthy Workplace') suggested otherwise. These documents dealt with issues such as: drug and alcohol use; availability of employee assistance programs; the health benefits of physical activity; fitness for work (focusing on strategies to avoid negative effects on work performance of fatigue and psychological distress); and 'occupational stress' (entirely about non-work causes, except for advice on *personal* strategies to control effects of fatigue due to shift work).

Psychosocial hazards were mentioned in five of the 17 General OHS policy and risk management documents. In one, 'psychosocial risk' was referred to but only in relation to interpersonal problems. Another mentioned 'psychological hazards', referring to risk from stress due to: use of equipment without proper training or instructions; overwork; being coerced into using faulty equipment that carries a risk of injury. Neither of these included any information on risk assessment or control for such problems. A third included a statement that stress can be caused at work, so managers, team leaders and supervisors must "assess the hazards of stress related ill health arising from work activities", and "take measures to manage the risk", but provided no links to any procedures. This document also mentioned effects of work-related driving on the development of fatigue, with reference to fatigue-related risk management procedures, and it had some sections on consultation and communications. These first three were from the logistics/transport sector. Two documents from two aged care organisations included brief information on the importance of consultation and of good communication more generally, and advice to staff dealing with aggressive clients.

Finally, psychosocial hazards were mentioned in 2 of the 20 documents specifically about 'manual handling'. One of these mentioned work organisation and job design in its section on risk control measures, although with little detail. The other had a sub-section on 'work organisation' within its training section, where it listed as factors to consider: "inappropriate staffing levels, unbalanced work schedule, inappropriate shift work, lack of variety/breaks" – but with no associated advice on how to identify, assess or control risk from these factors.

In summary, there were no documents that dealt specifically with workplace requirements for managing risk of stress-related health disorders, or with all types of psychosocial hazards in the context of MH risk management, or with risks from psychosocial hazards more generally. In the context of workers' mental health, coverage focused strongly on workers' personal characteristics and health-related behaviours.

3.3. Results from interviews

The MSD and MHD risk management practices reported by interviewees are shown in Tables 3 and 4 respectively, with practices categorised according to the work system component targeted, as described in Section 2.3 above. Numbers in the tables indicate the number of *organisations* for which at least one of the interviewees from that organisation reported such a practice. Further details are presented below, illustrated by quotes from interviewees.

Table 3
Numbers of organisations with at least one report of particular types of MSD risk management practices.

Types of Practice, categorised according to the Work System Component targeted	Logistics/ transport (n = 10)	Aged Care (n = 9)	Total
<i>Workers</i>			
Training & Information			
Manual handling	10	9	19
Risk management	5	2	7
General safety info	3	1	3
Exercises	2	1	3
Performance management	7	5	12
Health professional consults	5	5	10
Recruitment screening	4	2	6
Healthy lifestyle program	5	0	5
Worker exercises	4	0	4
<i>Equipment/task</i>			
Equipment/ Infrastructure	10	8	18
Task redesign	5	3	8
Personal protective equipment	5	1	6
<i>Job design, work organisation & management</i>			
Audits	6	5	11
Job safety analysis	5	2	7
Manager engagement	4	2	6
Task ("job") rotation	3	0	3
Job redesign	2	1	3
Accommodate non-work health problems.	2	1	3
Increase managers' skills	1	1	2
Increase staffing levels	1	1	2
<i>External</i>			
Liaise with external organisations	3	0	3

Table 4
Numbers of organisations with at least one report of particular types of MHD risk management practices.

Types of Practice, categorised according to the Work System Component targeted	Logistics/transport (n = 10)	Aged care (n = 9)	Total (n = 19)
<i>Workers</i>			
Counselling (EAP)	8	8	16
Training & Information:			
– managing difficult clients	4	3	7
– personal coping strategies	2	3	5
– general safety info	1	3	4
– risk management	2	2	4
Healthy lifestyle program	4	5	9
Performance management	5	4	9
Health professional consults	2	1	3
Encourage to take leave	0	3	3
Co-worker support	2	0	2
<i>Equipment/task</i>			
Equipment/Infrastructure	1	0	1
Task redesign	1	0	1
<i>Job design, work organisation & management</i>			
Job redesign	4	2	6
Increase managers' skills	3	1	4
Increase staffing levels	1	1	2
Manager engagement	1	0	1
Accommodate non-work health problems.	0	1	1
<i>External</i>			
Liaise with external organisations	3	0	3

3.3.1. Risk management practices reported as addressing MSD risk

3.3.1.1. Work system component: workers – their behaviour and personal vulnerabilities. Table 3 shows that training and provision of Information together are the most widely used kind of practice, with ‘manual handling’ training being most widely mentioned (all organisations). In the logistics/transport sector this training was about task performance techniques intended to minimise body stressing ... “educating the guys about the correct technique” (Logistics/transport, Manager) or “...on average maybe once a year they’ll show some sort of a video of, you know, things to avoid” (Logistics/transport, HSR). In aged care organisations such training was about mandatory “no lift” procedures, including use of lifting machines equipment for moving patients when possible, rather than manual lifting/moving techniques. A few organisations also reported some training in basic risk management processes.

We recognise that they need to be trained in how to do that [risk management] and so they are responsible for assessing the risk in their area (Logistics/transport, OHS Coordinator).

Provision of safety information through ‘toolbox talks’ was also mentioned by a few, along with company newsletters.

We hold Toolbox Meetings and we hand out flyers on different subjects. So one week it might be forklift time (safety and everything) and the next week it might be the use of wearing seatbelts. The next week it might be manual handling and it’s just a constant of rehashing the same things over and over again in a 12 month timeframe (Logistics/transport, Manager).

After Training and Information, the next most frequently mentioned practice among those targeting workers was Performance Management. This involved supervisors or managers intervening to ensure that staff followed correct procedure, sometimes with consequences for staff who were non-compliant.

If a person is found to have been not following our processes, there are performance management consequences. (Aged Care, Site Manager).

...we review each driver, make sure that ... they’re doing the right method of restraining to avoid any injuries. So we monitor that quite closely. (Logistics/transport, OHS coordinator).

Consultations with health professionals was often mentioned as being part of the overall program to reduce MSD risk. This entailed provision of onsite services by a range of therapists (mainly physiotherapists):

We’ve got our physios here, so if there was an issue....the staff need to (see a physio) just to help manage backs and things (Aged Care, HSR) ... when people report pain – where we can, and where they consent – we get them into our in-house physio program to get early treatment (Logistics/transport, OHS Coordinator).

The next most widely reported strategy was Recruitment Screening, targeting a certain type of employee.

So [we look at] ... pre-existing conditions or degenerative conditions and that includes the pre-employment medicals that we want to do as well as (Aged Care, Manager).

...we make sure the employees ... are fit enough, big enough to hold these ... and to make sure that they’re not going to hurt themselves. We make sure that we’re not going to hire someone if they’re not going to be able to perform safely in the warehouse. (Logistics/transport, OHS Coordinator).

The last two practices in this part of Table 3 were mentioned only by people from the logistics/transport sector. A common view was that many workers in the logistics/transport sector are overweight and this contributes to their MSD risk, so some organisations provided Healthy Lifestyle programs.

We have what you call a health and wellness department which is new across many industries, which is looking at the healthy lifestyles of people. A lot of people actually get a bad back because they have a beer gut, they’re not fit. (Logistics/transport, OHS Coordinator).

Finally, workers’ vulnerability to injury was also the focus of Worker Exercise programs in which drivers were encouraged to undertake ‘warm up’ exercises prior to driving/ loading/ unloading their vehicles.

It’s up to that individual to do those exercises. A lot of them probably don’t. I know I do because I have those problems as well. So you do your exercises, you keep it loose to the best of your ability. So I just put that down to people who do get crook backs is, basically, neglect, unfortunately, on the person involved. (Logistics/transport, HSR).

3.3.1.2. Work system component: design of equipment and work tasks. There were many fewer reports of practices targeting the design of equipment and work tasks, compared to the number targeting workers. In the aged care sector these practices included the mandatory use of lifting machines, and sometimes also overhead tracking to assist with transferring residents. In the logistics/transport sector reported practices included provision of more adjustable vehicle seats, or equipment to minimise the biomechanical loads associated with heavy manual handling.

... trialling some portable conveyors for the handling of passenger car tyres at the moment, and I think that will actually give us a productivity lift. Certainly it’ll give us a reduction in musculoskeletal disorders. (Logistics/transport, Manager).

And in the aged care sector:

I’ve moved store rooms, I’ve adjusted storage shelving to accommodate staff’s heights... all staff are aware that they cannot store things above a certain height level (Aged Care, Site Manager & Manager).

More general Task Redesign was also mentioned, such as:

... we try and (modify) ... loading techniques, we think about how we load it. (Logistics/transport, OHS Coordinator).

Finally, in this category the use of Personal Protective Equipment was sometimes mentioned, including provision of equipment, footwear and other clothing.

3.3.1.3. Work system component: job design, work organisation and management. Most work-related psychosocial hazards are located within this component of the work system, but many organisations had no reported practices targeting such hazards. The most commonly mentioned of the practices listed here were audits and job safety analysis, which actually target *multiple* system components including workers, tasks and equipment. Audits were viewed by some participants as a useful means of identifying hazards and initiating risk control processes informally.

... I audit all the drivers so I travel with them continually and we continually talk about safety, we continually talk about procedures. I always ask them is there any issues with anything, all of that sort of stuff. (Logistics/transport, Site Manager).

Job safety analyses were often considered an important means of reviewing operating procedures and ensuring that the safest way to perform a particular task is clearly defined and put into practice.

... we have our JSAs in place. So you're constantly reviewing that and seeing... how it transfers across from paperwork into real life, and trying to mitigate the risk. (Logistics/transport, Site Manager).

The next most frequently reported type of practice in this category was Manager Engagement. These are not OHS risk management practices *per se*; rather, they are practices intended to increase the engagement of managers in OHS risk management. Some interviewees reported that in meetings with more senior managers they tried to increase resources available for OHS purposes by highlighting the benefits of improved MSD risk management in relation to costs that would be incurred.

I love prosecutions, enforceable undertakings, anything I can leverage our executive with to get some more money to do what I want to do ... (Logistics/transport Manager).

Another kind of Manager Engagement practice was reported by a senior executive manager.

If middle management think that safety is a crock, then the troops will think safety's a crock. If middle management think that a manual handling aid is rubbish, then the troops will think manual handling aids are rubbish. So we've got to convince those people that what we're doing is right. (Aged Care, Executive).

The other risk management practices in this category were each reported by only two or three organisations. These included Task ("Job") rotation, which refers to staff changing between different tasks quite frequently.

... we talk about job rotation and all of those sorts of things to try and reduce the duration of time that we're leaving the guys handling material. So that's a big part of it, in managing that process to reduce the risk. (Logistics/transport, Site Manager).

Another practice was Job redesign, referring to changes in the content of someone's job – for example, having someone dedicated entirely to housekeeping:

That's all they did and then that supported all the others and that allowed them to meet their deadlines and their flows (Logistics/transport, OHS Advisor/consultant).

Finally, increasing staffing levels was reported as an effective strategy, making it easier to ensure a balance between experienced and less experienced staff in a team.

We've increased our staffing hours and the team nursing works well. So having two staff attending to residents as much as possible....We have a more experienced staff member with a lesser experienced

staff member to just educate them on what we do need to be careful and to be mindful of the processes (Aged Care, Site Manager).

3.3.1.4. External factors influencing MSD risk. There were reports from three logistics/transport organisations that they had negotiated with local government authorities over traffic management issues. In one of these, the main concern was shoulder injuries:

... we find that we constantly have battles with councils when they want to introduce roundabouts, chicanes, speed cushions, all the rest of it because we're saying, "Yeah we understand that you got a need to look after that, but I've got a responsibility to look after my drivers" and that's why we fight a lot around traffic management devices. (Logistics/transport, Executive).

3.3.2. Practices reported as relevant to stress-related health problems

3.3.2.1. Work system Component: Workers – Their behaviour and personal vulnerabilities. Table 4 shows that a large majority of reports on mental health risk management practices targeted workers themselves. The most widely used of these were counselling of individuals experiencing problems, often as part of an employee assistance program (EAP). Usually the EAP could be accessed by staff at their own discretion.

We've got an EAP service so staff are aware of the service and there's posters and cards in the staffroom area that they can access EAP confidentially whenever they like (Aged Care, Site Manager).

However, two organisations reported that staff required approval to access the service, which was considered a barrier to its use.

...If we made that available [EAP] without having to come to us, I think that'd be a lot better, and employees would use it a lot more ... (Logistics/transport, Manager).

Over half of all participating organisations provided training of some kind. In logistics/transport organisations this often aimed to increase drivers' resilience or to improve their customer relations skills (e.g. dealing with aggressive public transport passengers).

...we provide conflict resolution training to drivers. So that's done as part of their Certificate III and that's usually a 3–4 h course just on the conflict resolution. (Logistics/transport, OHS Coordinator).

...internal workshops on managing stress presented by the HR personnel that are trained in doing that. (Logistics/transport, Manager).

In aged care, training was typically about managing the challenging behaviours of some residents, and about bullying and harassment issues.

...training on how to deal with residents with dementia which helps keep them calm and hopefully reduces the aggression and the reaction from the resident (Aged Care, OHS Coordinator).

...eLearning module that just covers bullying and harassment. And then I think it would be just maybe onsite, again it's yeah. We don't have a systematic approach. (Aged Care, OHS Coordinator).

Information was also provided to raise more general awareness of mental health issues.

Just awareness posters of depression or workplace stress or different things like that so people can know that they're not alone in feeling stress at work and what they can do to manage it. (Aged Care, Site Manager)

... I send out things about bullying and harassment, stress, what the signs may be, who's your contact officer if you need help, all those sorts of things. I try to do that every quarter. (Logistics/transport, Manager).

There were reports from half the organisations of 'healthy lifestyle' programs, which were considered a means of helping individual workers with personal problems by means such as helping them to improve their coping strategies or providing physical massages or social

activities.

We've had a lot of focus on mental health this year and staff employee wellness services so we've had lots of people come into do talks on how to handle emotional stress and we've had other talks as well and things that we've rolled out through the year. (Aged Care, Site manager).

...that mainly falls under our HR bracket and like just for example we always do monthly kind of barbecues to get everyone together. We also do next week they're having a ten-minute massage, someone comes in, like a therapist comes in and they will do back massages for everyone that wants to participate (Logistics/transport, OHS coordinator).

Performance management practices were also reported by half of the organisations. These included monitoring staff to identify those experiencing difficulties.

It's just something that ... if I notice something and I can see someone's under stress, then if I can I ... alleviate it by getting another bloke to help him out– (Logistics/transport, HSR).

... if somebody says hey, I've noticed that [a particular person] is not quite herself, I've got to make sure I go out of my way or [get] one of the care managers just to touch base with her and say oh how have you been? (Aged Care, Site Manager).

Some managers also described trying to limit exposures to potentially stressful interactions.

I as a manager try and intervene as soon as I can so staff aren't being confronted by complaints and by relatives. So I try and take that pressure away from them. I'm a little bit more equipped to deal with all of that. (Aged Care, Site Manager).

Consultations with health professionals were reported as part of return-to-work procedures to check that drivers who had been involved in a traumatic incident were well enough to resume normal work. Consultations also included massages as a general service for aged care staff who might want this. And for those experiencing high stress levels or other such personal difficulties, some reported encouraging them to take annual leave.

If someone's fairly stressed, I would always say to them, take some time off. That's what your annual leave is there for, and I think that's adequate, and if they did, they can just take their time off, there's never a real issue with that here (Aged Care, HSR).

Co-worker support referred to comments that peer support is often the most effective kind, with staff being encouraged to provide this to each other when needed.

3.3.2.2. Work system component: design of work tasks and equipment. Such practices were reported from only two organisations, both in the logistics/transport sector. These included installation of equipment ('cages') in public transport vehicles to protect drivers from abusive passengers, and task redesign to temporarily reduce workload.

The manager may then take a bit of work off them and say, "Okay. And I'll give it to someone else." (Logistics/transport, HSR).

3.3.2.3. Work system Component: Job design, work organisation and management. These were mainly roster changes – both permanent changes to accommodate staff personal needs, and shorter-term changes in response to problems such as interpersonal conflicts.

As a business, we've taken a positive approach to try and get our drivers home for their rest break, their long rest break, their 24-h breaks. We make a concerted effort to try get them home every weekend. (Logistics/transport, Site Manager).

... day staff were a little bit ticked off with the night staff not doing showers and it got to the point where they did have a bit of an altercation...It was actually a really valid reason why they weren't

doing the showers so we shuffled some duties around and then all is calm again. (Aged Care, Site Manager).

Training to improve managers' skills was also reported.

I do believe that the HR group do provide training to managers as well in identifying stress-related bullying, harassment, that type of thing. (Logistics/transport, OHS Coordinator).

...senior manager's forum, we had a two hour session that was presented by Beyond Blue (a national organisation providing direct support to people experiencing mental health problems) about identifying potential mental health issues in your staff and how to have those sensitive conversations with staff. (Aged Care, OHS Coordinator).

Increasing staffing levels was sometimes mentioned as a means of reducing pressures on staff experiencing excessively high workloads.

So we review the allocation of staffing quite frequently, just to work out the acute needs of the resident, based on how many staff are allocated in that area. (Aged Care, Site Manager).

We employed extra staff, so we increased the team back to its normal numbers. (Logistics/transport, Manager).

3.3.2.4. External factors influencing MHD risk. Reports from three logistics/transport organisations described risk management practices targeting external factors, aiming to reduce drivers' exposure to trauma (road fatalities) or to decrease abuse by passengers. Practices included infrastructure changes such as: provision of additional roadway curbs to reduce crash risk; modifications to railway level crossings to prevent people driving around boom gates; and improved liaison with law enforcement agencies aiming to reduce adverse social behaviour on public transport.

4. Discussion

Information about the workplace practices used to manage risks of musculoskeletal and mental health disorders (MSDs, MHDs) was documented and evaluated in a sample of 19 organisations from two high-risk Australian industry sectors. Each participating organisation provided several interviewees, including OHS staff and representatives as well as some with broader OHS responsibility as part of their senior management roles. Organisations were also asked to provide all documented OHS policies and procedures that they considered relevant to managing MSD and MHD risks, and 14 of the 19 organisations complied.

There were almost as many aged care organisations as logistics/transport ones (9 versus 10), but only 26 aged care interviews were conducted compared with 41 for logistics/transport. As seen in [Table 1](#), this discrepancy was largely due to smaller numbers of aged care interviewees who had specific OHS responsibilities either as part of their job (10 versus 17) or as staff-elected health and safety representatives (3 versus 9). There were fewer executive level participants from aged care compared to logistics/transport (2 versus 7). Based on researchers' experiences in recruiting interviewees, these numbers reflected the employment of more staff with OHS technical expertise in the logistics/transport sector. In light of the higher proportion of OHS staff at executive level (mostly Board members) from logistics/transport organisations, larger numbers of staff with OHS expertise might also reflect greater recognition of the importance of OHS in that sector.

Organisations varied widely in the documentation they provided, as shown in [Table 2](#). They varied in the number of separate documents and how information was structured, in the topics covered and in level of detail. The only substantial difference between sectors in this documentation was the higher number of logistics/transport documents specifically targeting hazards related to 'Tasks and Equipment'. To some

degree this might reflect inter-sectoral differences in the nature of work tasks, with perhaps a greater variety of manual handling work tasks performed in the logistics/transport sector, such as those involved in loading and unloading vehicles and in order picking. In the aged care sector, use of mechanical equipment for lifting residents is mandatory but little related documentation was provided, except mention of the mandatory requirement for staff training in its use and other manual handling issues related to resident care.

Analysis of documentation provided some useful basic information, but the interviews provided much richer detail and additional insights into how risk management practices are implemented in reality. Risk management practices reported by interviewees are summarised in Tables 3 (MSDs) and 4 (MHDs). The same general patterns of risk management practices are evident across the two sectors, with inter-sectoral differences simply reflecting differences in the nature of work undertaken. For example, training of workers, particularly ‘manual handling’ training, was the most widely reported risk management strategy in both sectors for both MSD and MHD risk management. The only inter-sectoral differences evident in these tables was the greater reported use of ‘healthy lifestyle’ programs and physical exercises, and of personal protective equipment (e.g. protective footwear) in logistics/transport MSD risk management.

Data from both the OHS documentation and the interviews in both sectors highlighted some major deficiencies in how MSD and MHD risks are being managed. Effective management requires risk from *all* potentially important hazards to be addressed, so practices were evaluated against this criterion in accord with project aim 2 a. Just as importantly, the measures used to reduce risk from these hazards need to be effective, and to achieve this they should comply with the hierarchy of risk control. Therefore, reported risk controls were evaluated in relation to the hierarchy of risk control in accord with aim 2 b.

In the case of MSD risk, it appeared from analyses of both the documents (Table 2) and interviews (Table 3) that ‘manual handling’ hazards are well recognised and that most organisations have formal risk assessment procedures that are used to address at least some of these hazards, particularly in the logistics/transport sector. This contrasts with the scanty evidence that work-related (as opposed to personal) psychosocial hazards are considered as part of MSD risk management. There was very little mention of assessing risk from psychosocial hazards arising from job design, work organisation, management, and the workplace psychosocial environment. A few such hazards were mentioned in a small number of documents and by a few interviewees, but there was no evidence of any participating organisation having procedures for assessing or controlling risk from these hazards. This heavy emphasis on MSD risk from physical rather than psychosocial hazards is consistent with previous research in which 14 ergonomics consultants were interviewed about workplace practices in the UK (Whysall et al., 2004), and with previous Australian research (Macdonald et al., 2008; Oakman, 2014).

In the case of MHD risk (Table 4), there was an even greater lack of evidence that risk from work-related (as opposed to personal) psychosocial hazards is systematically identified and assessed. Clearly, risk from psychosocial hazards and associated stress is being given inadequate attention, regardless of whether the context is MSD or MHD risk management.

Moving to project aim 2b, patterns of results in Table 3 (MSDs) and Table 4 (MHDs) illustrate that in both industry sectors the main work system component targeted by risk control measures is the workers who are at risk. This is at odds with the requirement that risk control actions should comply with the general hierarchy of risk control, so that actions target *work-related sources* of risk to the greatest extent that is practicable. Fig. 2 specifies the hierarchy of control for MSD risk, and Safe Work Australia (2014, p.4) specifies it for MHD risk as follows: “The risk of psychological harm can be minimised by implementing effective control measures addressing the work environment and systems of work. Control measures aimed at individuals are usually less effective.”

In compliance with the risk control hierarchy for MSDs, there was considerable evidence that workplaces targeted hazards arising from the design of tasks, equipment and associated infrastructure. However, the most frequently reported control actions were various kinds of training and provision of information, particularly training in manual handling techniques. Such training is at the bottom of the hierarchy and there is a substantial body of empirical evidence that it is *not* effective in reducing MSD risk (Haslam et al., 2007; Hignett, 2003). Other worker-focused practices included exercises such as stretching, and ‘healthy lifestyle’ programs. Evidence of the effectiveness of these practices is mixed. Some evidence suggest these may be beneficial when well designed and customised to particular work conditions (da Costa and Vieira, 2008; Van Eerd et al., 2015), but they do not remove the need for actions to eliminate or reduce risk at its source.

Control actions intended to change workers’ behaviours or reduce their vulnerability were also the most widely reported MHD risk control actions. The most common practices were the provision of various forms of training and information, followed by counselling of workers experiencing problems. As with MSD risk, various performance management strategies and more general ‘healthy lifestyle’ programs were also reported. Despite the large body of research evidence of the major impact on workers’ stress levels and mental health of hazards arising from job design, work organisation and management, there were relatively few reports of risk control actions targeting these hazards.

This situation appears similar to that found by a large computer-assisted survey of OHS managers in 31 European countries (European Agency for Safety and Health at Work, 2010). In enterprises with 250 + employees (those most comparable to the present sample), the most frequently reported control measure addressing ‘psychosocial risks’ was provision of training, followed by confidential counselling. Further, training as a risk control was easily the most common type in *all* industry sectors, which suggests that although the present study was confined to only two sectors, results might be more widely applicable. More recently but on a much smaller scale, Langenhan et al. (2013) conducted 14 semi-structured interviews with various stakeholders including both employer and trade union representatives from six European countries, and concluded that “the majority of organisations do not sufficiently, if at all, incorporate psychosocial risks into strategic decision making ...” (p. 87).

4.1. Limitations of this study

Both peer-reviewed and ‘grey’ literature was extensively searched but no previous systematic investigation of workplace risk management practices targeting MSDs and MHDs was found. The present study addressed the need for such information and provides important insights into requirements for more effective workplace practice. However, some limitations should be noted. First, the sample was limited to 19 aged care, logistics and transport organisations in Victoria, Australia, who were recruited from the 29 organisations that responded to a letter initially sent to 290 organisations. While clearly this limits the generalisability of findings, it is worth noting that ‘volunteer bias’ among participating organisations probably means that their risk management practices are better than average for these sectors – which is important given the major inadequacies identified in these practices.

Second, risk management documentation was provided by only 14 of the 19 participating organisations, and their selection of documents was no doubt influenced by their perceptions of what was relevant. In some organisations mental health issues might be seen as the responsibility of Human Resources rather than OHS staff, which could have resulted in omission of information about practices relevant to mental health. Third, telephone interviews were used for the majority of interviews, which can make it more difficult to establish personal rapport although the greater distance between interviewer and interviewee may result in more honest responses than with face-to-face interviews.

5. Conclusions: addressing the gaps

Some important gaps are evident in current workplace MSD and MHD risk management practices when evaluated against contemporary evidence of requirements for effective risk management. First, risk from work-related psychosocial hazards is not being adequately identified and assessed in the two high-risk Australian industry sectors investigated here. This is an important gap in current practices because in addition to their very well documented effects on MHD risk, psychosocial hazards have variable but often substantial effects on MSD risk, comparable in size to the effects on risk of the more widely recognised biomechanical hazards of physical work performance (Marras, 2008; Gerr et al., 2014).

Second, the most commonly reported risk control actions for both musculoskeletal and mental health disorders have a strong focus on changing workers' behaviours via training programs and on providing assistance to people experiencing mental health difficulties, rather than addressing risk from work-related hazards *at their source* in accord with the hierarchy of risk control. This means that a significant proportion of the financial and other resources available at enterprise level to improve workers' health and safety is not being expended with the maximum possible cost-effectiveness.

Third, there is great variation between organisations in workplace risk management documentation. This variation is just as great within as between industry sectors, and documentation within most organisations is very fragmented. This is particularly problematic for MSD and MHD risk management because both types of health problem are affected by very large and diverse sets of work-related hazards, some of which are additive or can interact so that assessing the severity of individual hazards in isolation from each other is not necessarily a good predictor of risk (Macdonald and Oakman, 2015).

This study highlights the need for more extensive translation of existing research evidence into workplace risk management practices addressing musculoskeletal and mental health problems. This is likely to require a high level of collaboration between researchers and workplace stakeholders, as well as active support from OHS regulators.

Acknowledgements

We are very grateful to the participating organisations and interviewees for their time. This project is funded by WorkSafe Victoria, through the Institute for Safety, Compensation and Recovery Research. WorkSafe Victoria assisted in the recruitment of participating organisations.

References

- Braun, V., Clarke, V., 2006. Using thematic analysis in psychology. *Qualitat. Res. Psychol.* 3 (2), 77–101.
- British Standards Institute, 2011. PAS 1010:2011 Guidance on the Management of Psychosocial Risks in the Workplace. BSI, United Kingdom.
- Canadian Standards Association, 2013. CAN/CSA-Z1003-13/BNQ 9700-803/2013 - Psychological Health and Safety in the Workplace - Prevention, Promotion, and Guidance to Staged Implementation. CSA, Ottawa, Ontario.
- Chandola, T., Britton, A., Brunner, E., Hemingway, H., Malik, M., Marmot, M., 2008. Work stress and coronary heart disease: what are the mechanisms? *Eur. Heart J.* 29 (5), 640–648.
- Cox, T., 1978. *Stress*. Macmillan, London.
- da Costa, B.R., Vieira, E.R., 2008. Stretching to reduce work-related musculoskeletal disorders: a systematic review. *J. Rehabil. Med.* 40 (5), 321–328.
- Eatough, E., Way, J., Chang, C., 2012. Understanding the link between psychosocial work stressors and work-related musculoskeletal complaints. *Appl. Ergonom.* 43 (3), 554–563.
- EU Council Directive 89/391/EEC on the introduction of measures to encourage improvements to the safety and health of workers at work (the OSH “Framework Directive”), 12 June 1989.
- European Agency for Safety and Health at Work, 2007. Expert forecast on emerging psychosocial risks related to occupational safety and health. Retrieved from: <https://osha.europa.eu/en/tools-and-publications/publications/reports/7807118>.
- European Agency for Safety and Health at Work, 2010. European Survey of Enterprises on New and Emerging Risks: Managing Safety and Health at Work. Retrieved from: https://osha.europa.eu/en/node/6745/file_view.
- Gerr, F., Fethke, N., Anton, D., Merlino, L., Rosecrance, J., Marcus, M., 2014. A prospective study of musculoskeletal outcomes among manufacturing workers: II. Effects of psychosocial stress and work organization factors. *Hum. Factors* 56. <http://dx.doi.org/10.1177/0018720813487201>.
- Haslam, C., Clemes, S., McDermott, H., Shaw, K., Williams, C., Haslam, R., 2007. Manual handling training: investigation of current practices and development of guidelines. Retrieved from < <http://www.hse.gov.uk/research/rpdr/rr583.pdf> > .
- Health and Safety Executive, 2012. What are the Management Standards for work related stress? Retrieved from: <http://www.hse.gov.uk/stress/standards/>.
- Hignett, S., 2003. Intervention strategies to reduce musculoskeletal injuries associated with handling patients: a systematic review. *Occup. Environ. Med.* 60. <http://dx.doi.org/10.1136/oem.60.9.e6>.
- ILO-OSH, 2001. Guidelines on occupational safety and health management systems. Retrieved from Geneva .
- International Labour Office, 2012. *Stress Prevention at Work Checkpoints: Practical Improvements for Stress Prevention in the Workplace*. International Labour Organisation, Geneva, Switzerland.
- Jain, A., Leka, S., Zwetsloot, G., 2011. Corporate social responsibility and psychosocial risk management in Europe. *J. Bus. Ethics* 101 (4), 619–633.
- Karasek, R., Theorell, T., 1990. *Healthy Work: Stress, Productivity and the Reconstruction of Working Life*. Basic Books, New York.
- Kim, D.-S., Kang, S.-K., 2010. Work-related cerebro-cardiovascular diseases in Korea. *J. Korean Med. Sci.* 25 (Suppl), S105–S111.
- Kompier, M., 2003. Job design and well-being. *The Handbook of Work and Health Psychology* 2, 429–454.
- Kompier, M., Van der Beek, A., 2008. Psychosocial factors at work and musculoskeletal disorders. *Scand. J. Work Environ. Health* 34. <http://dx.doi.org/10.5271/sjweh.1281>.
- Lang, J., Ochsmann, E., Kraus, T., Lang, J.W., 2012. Psychosocial work stressors as antecedents of musculoskeletal problems: a systematic review and meta-analysis of stability-adjusted longitudinal studies. *Soc. Sci. Med.* 75. <http://dx.doi.org/10.1016/j.socscimed.2012.04.015>.
- Langenhan, M.K., Leka, S., Jain, A., 2013. Psychosocial risks: is risk management strategic enough in business and policy making? *Safety and Health at Work* 4 (2), 87–94. <http://dx.doi.org/10.1016/j.shaw.2013.04.003>.
- Leka, S., Cox, T., 2008. PRIMA-EF: Guidance on the European framework for psychosocial risk management. Retrieved from: < http://www.who.int/occupational_health/publications/PRIMA-EF%20Guidance_9.pdf > .
- Macdonald, W., 2005. A hierarchy of risk control measures for prevention of work-related musculoskeletal disorders (WMSDs). Paper presented at the Humanising Work and Work Environment, Proceedings of International Ergonomics Conference, Guwahati, India.
- Macdonald, W., 2012. Models of causation: Health determinants. In: *Health and Safety Professionals Alliance (Ed.), The Core Body of Knowledge for Generalist OHS Professionals*. Tullamarine. Safety Institute of Australia, Victoria.
- Macdonald, W., Evans, O., 2006. Research on the prevention of work-related musculoskeletal disorders: stage 1 literature review. Retrieved from: < http://www.safeworkaustralia.gov.au/sites/SWA/about/Publications/Documents/512/Research_Prevention_Workrelated_Musculoskeletal_Disorders_Stage_1_Literature_review.pdf > .
- Macdonald, W., Evans, O., & Armstrong, R., 2008. Research on the prevention of musculoskeletal disorders – stage 2. A study of small sample of workplaces in high risk industries. *Project No. CIR 1001439, 072007*.
- Macdonald, W., Munk, K., Evans, O., 2003. Ergonomics approaches to the prevention of work-related musculoskeletal disorders. An analysis and critical review of existing national, and regional standards and guidelines: A report prepared on behalf of the International Ergonomics Association for the International Labour Organisation.
- Macdonald, W., Oakman, J., 2015. Requirements for more effective prevention of work-related musculoskeletal disorders. *BMC Musculoskelet Disord.* 16 (1), 1–9. <http://dx.doi.org/10.1186/s12891-015-0750-8>.
- Marmot, M., Siegrist, J., Theorell, T., Feeney, A., 1999. Health and the psychosocial environment at work. *Soc. Determin. Health* 105–131.
- Marras, W., 2008. *The Working Back: A Systems View*. John Wiley & Sons Inc., Hoboken, New Jersey, USA.
- Montano, D., 2014. Upper body and lower limbs musculoskeletal symptoms and health inequalities in Europe: an analysis of cross-sectional data. *BMC Musculoskelet. Disord.* 2014 (15), 285. <http://dx.doi.org/10.1186/1471-2474-15-285>.
- Natali, E., Deitinger, P., Rondonone, B., Iavicoli, S., 2008. Exploring stakeholders' perceptions on social policies, infrastructures and social dialogue in relation to psychosocial risks. *The European Framework for Psychosocial Risk Management*. PRIMA-EF, Leka, S., Cox, T. (Eds.), pp. 79–95.
- National Research Council (US) & Institute of Medicine (US) Panel on Musculoskeletal Disorders and the Workplace, 2001. *Musculoskeletal disorders and the workplace: low back and upper extremities*. Retrieved from: <https://www.ncbi.nlm.nih.gov/books/NBK222440/>.
- Oakman, J., 2014. *Investigation of MSD Toolkit Risk and Hazard Measures in Relation to Claim Rates and Other Indicators*. Institute for Safety, Compensation and Recovery Research. Melbourne, Australia.
- Occupational Health and Safety Act 2004, Victoria, Australia. Retrieved from: <http://file:///W:/Files/OHS%20general/OHS%20Act%20Vic%202004%204-107aa024%20authorised.pdf>.
- Safe Work Australia, 2013. The incidence of accepted workers' compensation claims for mental stress in Australia. Retrieved from: <http://www.safeworkaustralia.gov.au/sites/swa/about/publications/pages/workers-compensation-claims-for-mental-stress-in-australia>.

- Safe Work Australia, 2014. Preventing Psychological Injury Under Work Health and Safety Laws: Fact Sheet. Retrieved from: <http://www.safeworkaustralia.gov.au/sites/SWA/about/Publications/Documents/855/Preventing-Psychological-Injury-Under-WHS-Laws.pdf>.
- Safe Work Australia, 2015. Key Work Health and Safety Statistics, Australia 2015. Retrieved from: <http://www.safeworkaustralia.gov.au/sites/SWA/about/Publications/Documents/910/key-whs-stat-2015.pdf>.
- Safe Work Australia, 2016a. Hazardous Manual Tasks Code of Practice. Retrieved from: http://www.safeworkaustralia.gov.au/sites/SWA/about/Publications/Documents/640/Hazardous_Manual_TasksV2.pdf.
- Safe Work Australia, 2016b. Statistics on work-related musculoskeletal disorders. Retrieved from: <http://www.safeworkaustralia.gov.au/sites/SWA/about/Publications/Documents/974/Statistics%20on%20Work-Related%20Musculoskeletal%20Disorders.pdf>.
- Van Eerd, D., Munhall, C., Irvin, E., Rempel, D., Brewer, S., van der Beek, A.J., Amick, B., 2015. Effectiveness of workplace interventions in the prevention of upper extremity musculoskeletal disorders and symptoms: an update of the evidence. *Occup. Environ. Med.* <http://dx.doi.org/10.1136/oemed-2015-102992>.
- Whysall, Z.J., Haslam, R.A., Haslam, C., 2004. Processes, barriers, and outcomes described by ergonomics consultants in preventing work-related musculoskeletal disorders. *Appl. Ergon.* 35. <http://dx.doi.org/10.1016/j.apergo.2004.03.001>.
- WorkSafe Victoriam 2016. Manual Handling: Review and revision of risk control measures. Guidance for employers on how to review and revise risk control measures for manual handling. Retrieved from: < http://www.worksafe.vic.gov.au/_data/assets/pdf_file/0005/191219/ISBN-manual-handling-review-revision-risk-control-measures-2016-05.pdf > .