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Barriers to more effective prevention of work-related musculoskeletal and mental health disorders

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ABSTRACT

Work-related psychosocial hazards have substantial effects on risks of both musculoskeletal and mental health disorders (MSDs, MHDs). Recent Australian research on workplace risk management practices in 19 work organisations found that risks from work-related psychosocial hazards were poorly managed. This study identified factors impeding better management of MSD and MHD risks within those organisations.

Method: Interviews were conducted with staff from residential aged care and logistics/transport organisations in Australia. Transcripts were analysed using a worker-centred systems framework.

Results and conclusions: Many barriers to more effective risk management were identified. Most fundamentally, few people knew of the need to manage MSD risk arising from work-related psychosocial hazards, and OHS-related skills of key managers were often reported as inadequate, particularly concerning management of risk from psychosocial hazards. Also, funding and staffing levels were often reported as problematic, and OHS issues were seen as lower priority than accreditation and commercial requirements.

1. Introduction

Musculoskeletal injuries and disorders (MSDs) are the most common type of serious occupational injury and disease worldwide, and in many countries stress-related mental health disorders (MHDs) are the second most common type (International labour Organisation, 2015; Safe Work Australia, 2015a). Both these risks are influenced by exposure to 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). The impact of psychosocial hazards on MHD risk is well established (e.g. Nieuwenhuijsen et al., 2010; Way, 2012). For MSD risk also, it is now clear that psychosocial hazards can have a major impact, together with effects of physical 'manual handling' hazards (e.g. Eatough et al., 2012; Gerr et al., 2014; Lang et al., 2012; Marras et al., 2009; NRC & Institute of Medicine, 2001).

In accord with this evidence, workplace occupational health and safety (OHS) risk management practices need to address work-related psychosocial hazards to achieve more effective management of both MHD and MSD risk. As depicted in Fig. 1, workplace risk management entails hazard identification, risk assessment and resultant implementation of risk control actions (Safe Work Australia, 2018). Actual workplace risk management practices are very poorly documented, but available evidence indicates that they largely fail to identify, assess and control risk from work-related psychosocial hazards (Leka et al., 2015; Macdonald and Evans, 2006; Macdonald and Oakman, 2013, 2015; Oakman et al., 2018; Whysall et al., 2004). Oakman et al. (2018) found that, regardless of whether the issue was seen as MHDs or MSDs, policies and practices addressing psychosocial factors mainly addressed *personal* factors such as bullying, harassment and individual stress management, rather than the work and organisational factors for which managers have clear responsibility.

Reasons for this situation are unclear, since guidance on how to manage risks from work-related psychosocial hazards is readily available (British Standards Institute, 2011; Canadian Standards Association, 2013; Comcare, 2008; Health and Safety Executive, 2012; International Labour Organisation, 2012; Leka and Cox, 2008). One possibility is that workplace managers responsible for OHS risk management are largely *unaware* of the need to address risk from work-related psychosocial hazards. Consistent with this, a 2015 review of European policies related to psychosocial factors affecting occupational health found that workplace hazards are predominately seen as physical in nature, even in the context of MHDs (Leka et al., 2015); findings from the Australian residential aged care sector accorded with this (Oakman and Bartram, 2017). In the case of MSD risk management, Whysall et al. (2004) found that a key barrier to more effective workplace practices of ergonomics consultants was

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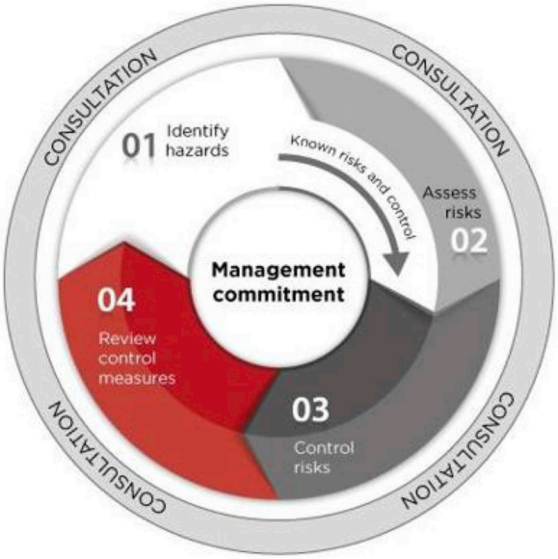

Fig. 1. The conventional OHS risk management process (Safe Work Australia, 2018).

their perceived need to meet "clients' needs and expectations", which the ergonomists saw as focused on physical hazards. Macdonald and Oakman (2015) suggested that psychosocial hazards might be largely ignored by those responsible for workplace MSD risk management simply because they are unaware that a *physical* health problem such as MSDs can be influenced by exposures to *psychosocial* hazards.

Within the Stages of Change framework (Prochaska and DiClemente, 1982; Whysall et al., 2007) awareness of the need for a particular behavioural or workplace change is an important pre-requisite for successful implementation of interventions to achieve such change. That is, lack of awareness of the need to control work-related psychosocial hazards would constitute a fundamental barrier to more effective risk management (Oakman et al., 2016). However, little is known about the views of workplace stakeholders who have direct responsibility for OHS risk management. Langenhan et al. (2013) reported the views of 14 Europeans (4 representing employer organisations, 3 policy makers, 2 trade unionists and 5 experts), including what they saw as key barriers to incorporation of 'psychosocial risks' into organisations' strategic decision making. However, the beliefs and opinions of ordinary workplace personnel on work-related MSD and MHD risk management requirements, and associated barriers to more effective management, have not previously been documented.

In addition to the possible lack of *awareness* among workplace managers of the importance of managing risk from work-related psychosocial hazards, the absence of established ergonomics *procedures* for assessing and controlling such hazards within the context of MSD risk management has been identified as a barrier to more effective workplace practices (Macdonald and Oakman, 2015; Whysall et al., 2004). To address the need for such a procedure, an MSDs risk management 'toolkit' that includes procedures to manage risk from psychosocial as well as physical hazards has been developed (Macdonald, 2012a; Macdonald et al., 2007; Macdonald and Oakman, 2013) and field tested (Oakman, 2014).

However, management of risk from psychosocial hazards requires substantial input from workers, via surveys or other activities entailing worker participation. This means that implementation of procedures to address risk from psychosocial hazards, including the above toolkit, will require the active involvement of line managers along with OHS specialists. The role of line managers is particularly important because "the workplace decisions and behaviours of supervisors and managers are the source of many hazards, particularly psychosocial ones, and technical experts typically lack the necessary authority to deal effectively with such issues" (Macdonald and Oakman, 2015). The support of senior managers is also crucial because they prioritise allocation of funds and other resources, and inadequate resources has been identified as a major barrier to more effective management of risk from psychosocial hazards (Langenhan et al., 2013).

More active involvement of line managers in OHS risk control procedures will require substantial changes in most workplaces, because currently there are known to be undesirable barriers "between safety and operations" (International Network of Safety and Health Practitioner Organisations (INSHPO, 2017)). In light of this, it is clear that the implementation of procedures to manage OHS risks from psychosocial hazards requires careful preparation. The research reported here was part of preparations to implement the MSDs risk management toolkit mentioned above.

The Quality Implementation Framework developed by Meyers et al. (2012) is based on a review of implementation science literature and synthesis of key elements in previously developed frameworks. This framework identifies four main phases of effective implementation, the first of which is "Initial Considerations Regarding the Host Setting" (Meyers et al., 2012, Tables 2 and 3).

The primary purpose of the research described in the present article was to document the current situation in typical host settings, in terms of beliefs and opinions of workplace stakeholders about various issues identified as important for this initial phase of preparing for implementation. Results reported here focus on barriers to more effective prevention of MSDs and MHDs. Stakeholder responses threw light both on their level of awareness of the need to manage risk from work-related psychosocial hazards and on other potential barriers to achieving change.

2. Method

In-depth semi-structured interviews with senior managers and other workplace stakeholders were conducted in a sample of organisations from two high-risk industry sectors – residential aged care and transport/logistics – where rates of workers' compensation claims for both MSDs and MHDs are relatively high (Safe Work Australia, 2015b, 2016a). Oakman et al. (2018) have previously reported on the nature of current OHS practices in these organisations, based on analyses of their current risk management documentation supplemented by analyses of related interview responses. Additional findings from the interviews are reported here, concerning interviewee perceptions of various aspects of existing risk management procedures and potential barriers to improving these.

Ethics approval S15/176 was obtained from the La Trobe University Human Ethics Committee.

2.1. Recruitment

A total of 29 organisations from targeted industry sectors contacted the researchers in response to a letter sent to them by the Victorian State Government OHS regulator, which was the funding agency for the research. Of those 29, 14 consented to participate and another 5 were recruited through snowball sampling, giving a final total of 19 participant organisations. Inclusion criteria were: employs greater than 150 staff, and has employees based in Victoria, Australia. Information on non-responders was unavailable. (For further details of the recruitment process see Oakman et al., 2018.)

Following an organisation's recruitment, the primary contact person was usually the first person interviewed. That person then acted as a liaison to recruit further participants from within their organisation. Inclusion criteria were: has some legal responsibility for OHS risk management (either in an OHS-specific role, or more generally as a line manager or executive board member); aged over 18 years; and able to read and speak English.

2.2. Data collection

Most interviews were by telephone, with the remainder in person. Interview duration ranged from 45 to 90 min and all were audio

recorded. The first five interviews were conducted jointly by two researchers who conferred and revised the interview schedule. Of the remaining interviews, one of the researchers conducted 16 interviews, and the other conducted 46 interviews. At the start of each interview, the interviewee was informed that:

> We will ask a range of questions relating to your involvement in management of workplace risk factors for musculoskeletal disorders, and also for mental health or stress-related disorders. We'd also appreciate your feedback about some proposed new risk management procedures. In order to obtain your feedback, I am going to email you a YouTube link to a presentation. Can you please ensure that you have access to the Internet, and a device that will enable you to open this?

Participants were advised of the latter requirement prior to the interview.

Interviewees were asked what they saw as the main causes of MSDs and stress-related MHDs in their workplace, and about their existing risk management practices for which results have previously been reported (Oakman et al., 2018). Other questions explored participants' beliefs and perceptions about factors limiting their own ability to take effective actions to reduce risk, and the effectiveness of existing risk management strategies. For example, "*What are the main factors limiting your ability to reduce current levels of MSDs [or MHDs]?*", and "*Thinking about your existing risk management procedures targeting musculoskeletal [or mental health] problems, how effective do you think they are?*". Responses were probed (mostly unscripted) to elucidate barriers to more effective risk management, separately for MSD and MHD risk, although responses sometimes extended to address OHS risk management more widely. Participants were encouraged to describe things in their own words and interviewers avoided use of formal terminology such as 'psychosocial', since the meaning of such terms is often unclear and the aim here was to document people's own perceptions, unprompted by formal definitions. There were also more general questions relating to the adequacy of communication of MSD/MHD risk management policies and procedures throughout the workplace.

Following those questions, information about the nature and role of psychosocial hazards and associated risk management issues was presented to interviewees as part of the YouTube presentation on the rationale, structure and main components of the 'toolkit' mentioned in the Introduction above. After watching that and having any questions answered, they were asked: "*Had you previously known about the link between MSDs and psychosocial hazards?*". Finally, there was a series of questions about specific aspects of the toolkit, but responses to those questions are not reported here because that would require detailed explanation of the toolkit, which is beyond the scope of the present article.

2.3. Data analysis

Audio-recordings of interviews were transcribed, and the worker-centred systems framework shown in Fig. 2 was used to guide initial coding of each transcript. This framework represents the broad system of work and external factors affecting people's health, safety and work performance. As such, it encompasses but is not confined to the work-related hazards affecting MSD and MHD risk (Eatough et al., 2012; Gerr et al., 2014; Lang et al., 2012; Marras et al., 2009; Nieuwenhuijsen et al., 2010; NRC & Institute of Medicine, 2001; Way, 2012), as well as potential barriers to more effective risk management. Within both OHS and ergonomics professional contexts, the importance of 'systems thinking' has been recognised as important for the development of more effective OHS risk management practices (Borys et al., 2012; International Network of Safety and Health Practitioners, 2017; Singleton, 1974; Wilson, 2014). Use of a systems framework is particularly important when the risk in question is influenced by a large and diverse range of potentially interacting hazards, as is the case for both MSDs and MHDs (Macdonald, 2012b).

Work-related psychosocial factors fall mainly within the framework's Work Organisation & Job Design component. Some other psychosocial factors, such as hazards arising from the high emotional demands of dealing with distressed or aggressive clients, fall within Task & Equipment Factors. Physical issues associated with 'manual handling' work tasks also fall within the Task & Equipment category, while physical environment factors are part of Workplace Environment. Individual Factors that each worker brings with them, including health-related variables associated with age and gender, are shown as external to the workplace since these are not primarily a workplace responsibility. Other external factors include OHS legislation and enforcement practices of the jurisdiction within which a workplace operates. For further explanation of these system components, see Oakman et al. (2018).

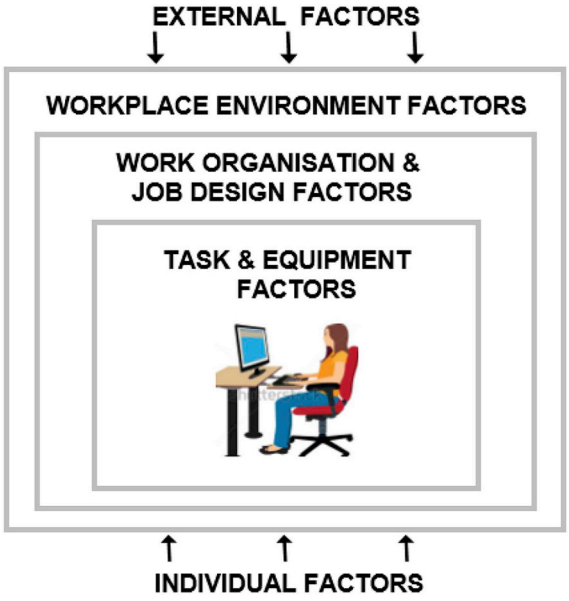

Fig. 2. The worker-centred system of workplace factors affecting workers' health, safety and performance (*Simplified version of model in* Macdonald et al., 2003, Fig. 1.).

Transcripts were coded using NVivo software v.11.0. After the initial 'top down' coding outlined above, responses within each of those high-level themes were coded thematically in a data-driven or 'bottom up' way. Two researchers independently analysed the first few interviews, with any coding issues being resolved via discussions with other team members. Having identified a final set of themes (i.e. once no new themes were emerging), remaining transcripts were coded by one of the first two researchers and then a third researcher reviewed the content and names of all themes; final amendments were made jointly. This process followed the 'phases of thematic analysis' identified by Braun and Clarke (2006, Table 1), except that the initial set of high-level themes were derived from the system components shown in Fig. 2.

3. Results

3.1. Interviewees

Interviews were conducted with 26 people from 9 aged care organisations and 41 people from 10 logistics/transport organisations. As shown in Table 1, they represented a range of management levels, including Executives (top management team), Site Managers and other Senior Managers; some of them had specialist OHS roles. Workers' Health and Safety Representatives (HSRs) were also included, where practicable. Most organisations provided three participants from different job roles, except for one aged care organisation where only one, a senior manager, was interviewed, and two logistics/transport companies where it was only possible to interview managers due to the limited availability of others.

Table 2 shows that in aged care, only 3 of the 10 people in specialist OHS manager or coordinator roles had professional-level qualifications

Table 1
Participant details.

	Participant Numbers	
	Aged Care	Transport/Logistics
Gender		
Female	18	14
Male	8	27
Age (yrs)		
18–24	0	1
25–34	2	5
35–44	5	9
45–5	14	17
55–65	5	9
Highest Education Level		
≤ Year 12	3	11
Certificate/Diploma	5	14
Bachelor	2	5
Graduate Certificate/Diploma	11	7
Masters Degree	5	4
Specialist OHS Responsibility		
Executive	1	0
Senior Manager	4	7
OHS Consultant/Adviser	5	10
Health & Safety Rep (HSR)	3	9
General OHS Responsibility		
Executive	2	7
Senior Manager	4	2
Site manager/Coordinator	7	5
HR Officer	0	1

(i.e. Graduate Diploma or higher), and 2 had minimal or none. Of the 13 general managers (Executive, Senior and Site Manager levels) 6 of the 13 had minimal or no formal OHS training/education, and none of these had completed more than a 5-day OHS course. Participants from the transport/logistics sector tended to have higher levels of OHS training, although still only 8 of the 17 people in specialist OHS manager or coordinator roles had professional qualifications. Of the 14 general managers in this sector, 4 had minimal or no OHS training. Over both sectors, only 11 of the 27 in specialist OHS roles (excluding HSRs) had professional-level OHS qualifications.

3.2. Interview responses

Responses are summarised in Tables 3–6, categorised according to whether factors identified as hindering effective risk management were related to: workers; task/equipment; work organisation, job design and management; or factors external to the organisation. In each of these tables, responses are grouped according to the context in which they were made: MSD risk management, MHD risk management, or both MSDs and MHDs (i.e. more general OHS management issues), and within each of these are the two industry sector subgroups. Numbers of interviewees who made at least one such comment are shown for each of these sub-groups, along with the most common sub-themes with illustrative quotes for each.

3.2.1. Work organisation, job design and management

This largest category of comments (n = 83) is shown in Table 3. Across both industry sectors, two of the most commonly reported barriers to more effective management of MSD risk were seen as inadequate funding and inadequate staff numbers, and consequently inadequate time for staff with OHS responsibilities to do everything required. The low priority accorded to workers' OHS, relative to the wellbeing of residents (aged care) or to the organisation's profitability (logistics/transport), was also frequently mentioned.

In the context of MHD risk management, managers' lack of competence to deal with stress-related problems was often identified as problematic; this was sometimes mentioned directly by interviewees and sometimes illustrated indirectly by responses demonstrating poor knowledge or understanding of this topic. Examples of the latter type of comment are asterisked in Table 3 within the MHDs aged care subgroup.

3.2.2. Workers

Comments in this second largest category (n = 65; see Table 4) were about problems seen by interviewees as caused by workers themselves. Poor worker attitudes were frequently mentioned in both industry sectors as a barrier to more effective MSD risk management, usually because they were seen as causing workers to take risky 'short cuts' rather than follow specified procedures. In the logistics/transport sector, such attitudes were often seen as due to a 'macho' culture among the workforce, and in relation to MHD risk this culture was seen as stigmatising people with mental health problems.

Ageing workforces were reported by people in both industry sectors as a particular factor making MSD risk management more difficult. And people in the aged care sector often reported that cultural differences among Personal Care Assistants (the largest category of workers there), arising from their highly diverse countries of origin, present problems for risk management, as do low literacy levels more generally.

3.2.3. Tasks and equipment

Fewer people commented on barriers related to these factors (n = 46; see Table 5), and in both industry sectors the most common topic was sources of risk, both physical and psychosocial, that are unavoidable because they are inherent in the nature of the work itself.

Table 2
Participants' level of OHS training (numbers of participants).

Job	Type of OHS training								
	Masters	Bachelor	Graduate diploma	Graduate certificate	Diploma	Certificate IV	5-day course	Short course	No training
AGED CARE SECTOR									
Executive, OHS Specialist (1)	–	–	1	–	–	–	–	–	–
Executive, General (2)			–	–		–	2	–	–
Senior Manager, OHS Specialist (4)	–	–	1	–	–	1	2	–	–
Senior Manager, General (4)	–	–	–	–	–	–	–	1	3
Site coordinator/manager (7)	–	–	–	–	–	–	4	1	2
OHS consultant/advisor/coordinator (5)	–	–	1	1	–	–	1	1	1
HSR (3)	–	–	–	–	–	–	2	–	1
TRANSPORT/LOGISTICS SECTOR									
Executive, General (7)	–	–	–	–	–	2	2	1	2
Senior Manager, OHS Specialist (7)	1	1	3	–	2	–	–	–	–
Senior Manager, General (2)	–	–	–	1	–	1	–	–	–
Site coordinator/manager (5)	–	–	–	–	–	–	4	–	1
OHS consultant/advisor/coordinator (10)	1	1	1	–	3	2	1	–	1
HSR (9)	–	–	–	–	1	1	6	–	1

Qualifications were not presented for one participant (HR Officer) due to risk of infringing anonymity.

Table 3
Barriers related to Job Design, Work Organisation & Management.

Typical Barriers related to Job Design, Work Organisation & Management Context and numbers of organisations with at least one such comment (n = 83)	
MSDs	**Aged Care: 14** ***Gaps between policy and practice, inadequate funds, staffing***: "… manual handling training is a mandatory training for this company and it's a mandatory competency but I know we don't do it. We just don't do it … it's probably a staffing issue, it's probably a funding issue because it would take probably several days to assess staff as competent. You've got to take them off the floor to do that. You've got to replace them." (Senior Manager, General) "I don't think that we actually provide all the necessary manual handling aids or actually enforce our own procedures for safe lifting and movement of things." (OHS Consultant/Advisor) **Logistics: 16** ***Inadequate funding, OHS low management priority***: "Money, without question, is a big [barrier]." (Senior Manager, Specialist OH) "I don't know that manual handling, specifically, is high on the list for a lot of people in management positions, because they say or they see it's part of the job, it's an acceptable risk. Whether that's true or not, but I think sometimes that's how people perceive it." (Senior Manager, Specialist OHS) "Running profitable businesses. That sounds terrible, but that's a limitation in itself because there are some pretty fantastic solutions out there, but all come with a lot of cost as well." (Site Manager) ***Staffing:*** "I think we're too thin on the ground at the worker level to be able to effectively multi-skill our workforce and therefore effectively have some job rotation for people and manage that job rotation." (Senior Manager, OHS Specialist)
MHDs	**Aged Care: 11** ***Inadequate OHS stress-related competencies:*** "… that's why I wanted to participate in this for some direction on how to stop it because I don't know how I can make people less stressed in this environment without, perhaps, paying them more." (Senior Manager, Specialist OHS) [a] "I think it's just the interaction with other staff members … in my experience is what causes people stress, just people [not] understanding that not everyone's the same." (Site manager)[a] [a] "If someone's fairly stressed, I would always say to them, take some time off. That's what your annual leave is there for." (HSR)[a] [a] "It's difficult to gauge how many people are feeling stressed." (Site Manager)[a] **Logistics: 13** ***Inadequate competencies re stress-related issues:*** "… no one here has any formal training into all of those issues, so it's based on what we've learned and research ourselves. So some formal training would probably help quite a fair bit." (Senior Manager, General) "I don't think we [the business] really understand what our problems with stress and anxiety are at the moment." (OHS Consultant/Advisor) ***Managers' communications:*** "You know in leadership roles they really should sort of come to the party and talk to drivers a lot better than they do." (OHS Consultant/Advisor)
Both	**Aged Care: 13** ***Inadequate general OHS competencies:*** "Lack of knowledge, understanding. Maybe lack of education themselves in what to look for. Lack of understanding about risk factors and risk management." (Site Manager) "… our risk manager is an accountant, so he's used to managing financial risk, so he's on a steep learning curve at the moment … (OHS consultant/advisor) "We used to have a safety manager but we don't have one anymore …" (Site Manager) ***Managers' inadequate time, resources:*** "I'm the first health and safety manager to ever work in the organisation … I have only just employed an injury management specialist to work with me … so in terms of resource, there is [a] very, very low level of resource put into this area … I can't envisage myself actually physically visiting each of those facilities more than twice a year." (OHS Consultant/Advisor) "Look, there's 400 staff and I'm only one person and I do have multiple roles as well in the organisation." (Senior Manager, General) ***Inadequate staffing:*** "Staffing. You know, like not enough. Working … a staff member down or things like that." (HSR) "… if they're working short staffed … it tends to happen at the time of year before the end of financial year … probably because they've run out of money to pay people … if people take sick leave you've got to back fill and pay that person, so it's double wages." (OHS Consultant/Advisor) **Logistics: 16** ***Inadequate OHS competencies, communications:*** "… the information can get lost in the communication because … we can't pick up the big lingos or like this is why this happens. And sometimes we have these workshops for Team Managers that just don't make sense. Sometimes makes no sense because we can't understand what exactly the problem is." (Site Manager/Coordinator) ***OHS a low management priority:*** "We're going through our bi-annual risk matrix now and developing them. We do that every year, but at this time it's not the injuries that's the priority. Its other factors … like running the business for revenue and that type of thing." (Senior Manager, General) ***Inadequate staffing:*** "… being such a small team, and yeah there's only so much time to do those things unfortunately. But … never enough money in a budget to employ anyone else." (Senior Manager, General) ***OHS admin system issues:*** "It's quite hard to find the exact form you have to fill out or know who exactly to send it to." (HSR)

[a] Interpreted by researchers as illustrating lack of knowledge or competence, although not reported as such by informant.

Despite the mandatory use of lifting machines in aged care, physically demanding postures and intermittently forceful actions are still required during frequently performed tasks such as assisting residents to move around, shower and toilet. And because many residents have some form of dementia and may be uncooperative or aggressive, such tasks are often psychosocially difficult also. Similarly in some logistics/transport jobs, physical sources of risk continue to arise where drivers are seated for long periods, or are required to load and unload trucks; some jobs in this sector can also be psychosocially difficult due to interactions with aggressive passengers. Problems of these types were usually seen as largely unavoidable aspects of such jobs.

3.2.4. External factors

This was the smallest category (n = 44; see Table 6). Most of the comments related to external factors causing inadequate funding, and causing OHS to be seen as a relatively low priority – two of the most common barriers identified in Table 3. The Australian government's funding model for residential aged care was seen as inadequate, and government accreditation requirements for aged care facilities were identified as a major factor causing residents' safety and wellbeing to be routinely prioritised over the health and safety of workers caring for them. In logistics/transport, 'commercial imperatives' were similarly seen to cause OHS risk management to be a low priority relative to the organisation's profitability, or in some cases, relative to requirements for accreditation as a customer service organisation.

Comments on the physical workplace environment were made by only two interviewees. Both were in the logistics/transport sector and related to MSD risk. For example: "… the floor is frozen and it's slippery and you're trying to manually pallet jack stuff in or out of it, or even using an electric pallet jack on a frozen floor can be difficult." (OHS Consultant/Advisor).

Finally, when asked whether they had previously known about the link between MSD risk and psychosocial hazards (near the end of the interview, after the YouTube presentation), only 5 aged care interviewees and 6 logistics/transport interviewees responded with an unequivocal 'yes'.

4. Discussion

This research has identified barriers to more effective management of MSD and MHD risk in two high-risk industry sectors, based on the

Table 4
Barriers related to workers.

Typical Comments on Barriers related to Workers Context and numbers of interviewees making at least one such comment (n = 65)	
MSDs	**Aged Care: 13** ***Attitudes***: "I think the challenge that we have … identified is that we still may have elements of our workforce that want to take shortcuts." (Senior Manager, General) "I think people's attitude towards work, health and safety, and I guess attitude towards compliance and stuff like that, some have a bad attitude. And so, people that do have that sort of attitude, they're more at risk as well." (Executive, General) ***Cultural differences***: "[Personal Care Assistants] tend to come from quite a diverse range of country of origins and therefore have different concepts of what manual handling is and what safe behaviour is." (OHS consultant) ***Ageing workforce***: "Demographics certainly plays a large part in the injuries and most of the facts that we get when we're lodging a claim is that there is an underlying degenerative condition that has been aggravated at work." (Senior Manager, General) **Logistics: 24** ***Attitudes***: "Some of them are a bit lazy [about reporting vehicle faults]. I guess sometimes they forget. But most of the times they just can't be bothered. (HSR) … with the older guys who have that mentality of, you know, "I've done it that way for a hundred years, it's okay. Nothing's ever going to happen …" (Senior Manager, OHS Specialist) "It's … somewhat of a generational thing I think in that sense. It's really hard, a lot of people are set in their ways." (Executive, General) "It's 'That takes too long,' or 'I'm not using that [mechanical lifting device], I'm doing it the short-cut way because it's faster'." (OHS Consultant/Advisor) "There are great lifting jigs and lifting tools out there but blokes being blokes who are tough guys don't take the time to use the available lifting devices that are there. They'll lift things as a team or themselves." (OHS Consultant/Advisor) ***Ageing workforce***: "… you've been doing it for 30 or 40 years, your body just starts to wear out, and an injury that might have not fazed you when you were 25, at 55 can put you off work for a couple of days you see, and takes longer - and also it becomes a cumulative type of thing. So it gets worse, particularly things like backs and knees." (OHS Consultant/Advisor)
MHDs	**Aged Care: 7** ***Cultural differences:*** "We've got a very multicultural workforce as well, so there's going to be some different values and beliefs that people bring to their role as well." (OHS Consultant/Advisor) **Logistics: 9** ***'Macho' culture among workers:*** "I think right up till now there's a stigma attached to mental health. Especially in our organisation which is pretty much a blue collar macho sort of culture." (Senior Manager, General) ***Lack of personal skills:*** "… there are some people that's not their forte [dealing with difficult passengers] or they don't have the aptitude about dealing with difficult situations." (Executive, General)
Both	**Aged Care: 6** ***Level of education:*** "We do have a workforce where some … aren't necessarily literate …" (Senior Manager, General) **Logistics: 6** ***Workforce culture:*** "Our culture and that Aussie mentality of, roll up the sleeves and get the job done, especially what I've seen in the transport industry with our drivers and the subcontractors." (OHS Consultant/Advisor)

Table 5
Barriers related to Task/Equipment.

Typical Comments on Barriers related to Task/Equipment Context and numbers of interviewees making at least one such comment (n = 46)	
MSDs	**Aged Care: 13** ***Demands inherent in work tasks***: "Well you can't get away with not leaning over residents and not bending down to wash lower extremities. We have lifting machines and transfer aids to try and minimise any injury, but you can never fully get away without having to handle people." (Site Manager) "… sometimes there's things that are just unavoidable like somebody twists the wrong way and it's going to happen regardless of what you've got in place." (Senior Manager, General) **Logistics: 18** ***Demands inherent in work tasks***: "… there still is a lot of climbing involved. When they drive the trucks onto the trailers, they have to climb around it to get straps over wheels and things like that …" (OHS Consultant/Advisor) "… they're not here, they're not monitored, they're all over the countryside so it's very hard to control someone that you don't see, you mightn't see for six months." (Senior Manager, OHS Specialist) "The product [being transported] and its awkward nature. (Site Manager)
MHDs	**Aged Care: 4** ***Demands inherent in work tasks:*** "Residents, their care needs change over time. They do get harder. They do get more demented. They do become more challenging. They do become more aggressive." (OHS Consultant/Advisor **Logistics: 3** ***Demands inherent in work tasks:*** "But the pressure comes from the nature of the business. When it's busy - like we're coming up to our busy season now - that's when we start to watch people [i.e. monitor their wellbeing]" (Senior Manager, OHS Specialist) ***Equipment:*** "The mesh we have– we don't have a Perspex panel on our driver door. We have a mesh panel so unfortunately people spit on drivers …" (OHS Consultant/Advisor)
Both	**Aged Care: 2** ***Client expectations:*** "The residents want what they want. In [this place] we have a higher-type clientele than some other homes, and we are definitely experiencing the increased demand with multiple things but, in particular, they want something done and they want it there and then and they want it done their way." (Site Manager) **Logistics: 6** ***Workers difficult to contact … poor communications:*** "Because our staff spend 95% of their day out … you can't take phone calls, you can't get onto a computer, and you really can't communicate with them." (Senior Manager, General)

perceptions and beliefs of general managers and others with OHS specialist roles about factors hindering more effective risk management in their own workplaces. These factors were categorised according to different components of the work system, using a worker-centred systems model (Fig. 2). Results indicate that barriers are distributed across most work system components, including some external influences.

One of the most striking findings was the high incidence of barriers categorised as psychosocial. These included: all factors in Work Organisation, Job Design and Management (Table 3); all factors External to the workplace (Table 6); and some Task/Equipment factors (Table 5: MHDs and Both). However, interviewees showed no awareness of the need to manage risk from most of the work-related

Table 6
Barriers related to External Factors.

Typical Comments on Barriers related to External Factors Context and numbers of interviewees making at least one such comment (n = 44)	
MSDs	**Aged Care: 6** ***Inadequate funding model***: "I think there is a general conflict between the commercial model by which aged care operates, which is a very lean resource model, and the requirements for safe handling and the manual movement of residents and equipment." (OHS Consultant/Advisor) ***Organisational structure … focus on accreditation:*** "The way the organisation is structured just does not lend itself to supporting health and safety and I think there is an over-emphasis on care of residents and not care for staff being balanced appropriately." (OHS Consultant/Advisor) **Logistics: 16** ***Lack of control over clients' workplaces***: "[Drivers have] exposure to say five different workplaces that are not our sites. Those things. We got a lack of control over some of the safety standards that may be on-site." (Senior Manager, OHS Specialist) ***Commercial imperatives***: "[Need to run} profitable businesses. That sounds terrible, but that's a limitation in itself because there are some pretty fantastic solutions out there, but all come with a lot of cost." (Site Manager) *Industrial relations issues:* "You'd change the roster and you'd introduce the option for part-time work … the unions just knocked back part-time drivers." (OHS Consultant)
MHDs	**Aged Care: 2** ***Inadequate funding model:*** "We get funded by government, so we can't pay more and we're in competition with the state-run hospitals that can afford to pay more." (Senior Manager, OHS Specialist) "The way the organisation is structured just does not lend itself to supporting health and safety and I think there is an over emphasis on care of residents and not care for staff being balanced appropriately." (OHS Consultant/Advisor) **Logistics: 9** ***Commercial imperatives:*** "So there's the intensity of the work. I think that we run such a lean business. We run a lean business because our profit margin's around two to three percent …" (Senior Manager, OHS Specialist) ***Lack of control over external operating conditions:*** "… peak hours will always be bad and [drivers] need to understand that sometimes jobs like these, it's a part of their package that it comes with some sort of environmental stresses." (OHS Consultant/Advisor) "Yeah, we can't control the behaviour of [public transport] passengers." (OHS Consultant/Advisor)
Both	**Aged Care: 5** ***OHS is a relatively low priority:*** "There absolutely *is* an incident reporting system, of course there is. It's just that it goes into a database which belongs to the quality team, because quality obviously is very important with aged care accreditation standards it has to comply with. So what is captured is really being captured to meet the needs of accreditation, not meet the needs of OHS and injury management." (Executive, OHS Specialist) "I think in reality the concept of health and safety in aged care is probably about 10 years behind where it needs to be quite clearly, and it has not been considered as an essential part of running the business." (OHS Consultant/Advisor) ***Inadequate funding model:*** "The funding model for aged care is, I think, chronically underfunded and under-staffed. (Executive, General) "… the government has made so many changes to the funding that your margin is pretty small. So you want to give great care, great food, and give people a value end of their life, and that all costs money, unfortunately." (Site Manager/Coordinator) **Logistics: 6** ***Competing priorities:*** "… we're in the process at the moment of becoming … an accredited customer service organisation, so there's a lot of talk about our customers, there's a lot of communications about our customers, and we need to turn the volume down on that, or else it is counter-productive to the discussion around personal safety. So it's some of those conflicting things that we're just trying to work through." (Senior Manager, OHS Specialist) ***Industrial relations:*** "… the union play a big part which–everything has to be run past them. They're like a doorstop for everything you try and do, unfortunately." (OHS Consultant/Advisor)

psychosocial hazards that are known to be important determinants of occupational stress and associated health problems (Macdonald, 2003). For example, one long-established model of factors causing problematic levels of workplace stress identifies key psychosocial hazards as: excessive work demands, inadequate levels of worker control or decision latitude, and inadequate levels of worker support from supervisors and colleagues (Karasek et al., 1998). An equally well-established model identifies the need to avoid a mismatch between the level of effort workers are required to expend and the level of recognition or reward they receive for this (Siegrist, 1996).

The only one of these hazards mentioned by interviewees was excessive workload: inadequate staffing and associated excessive workloads were widely mentioned as hindering efforts to improve risk management. They saw most of the reported psychosocial factors as largely or entirely beyond their own control, and were evidently unaware of available risk assessment and control procedures for psychosocial hazards. Consistent with this, these workplaces typically had many policies and procedures addressing MSD risk from biomechanical hazards arising from 'manual handling' work tasks but no specific procedures to assess and control risk from work-related psychosocial hazards (Oakman et al., 2018). Clearly, interviewees' lack of awareness of the nature of such hazards, and of procedures available to manage them, constitutes a fundamental barrier to improving current practices.

Further, many of the identified barriers in the Worker category (Table 4) were about 'bad attitudes' related to workers' willingness to take risky shortcuts rather than follow prescribed procedures. The great majority of interviewees saw attitudes to complying with OHS-related procedures as characteristics of the workers themselves – for example, the attitude that it is acceptable for an aged care staff member to move a resident by him or herself rather than wait for a colleague to assist, particularly when staffing levels are too low. There appeared to be no awareness of the large body of evidence that workplace psychosocial climate or culture (comprising a set of work-related psychosocial factors) is a major determinant of such attitudes; when a particular 'bad attitude' is widespread within the workforce, it should be understood as a product of how the work system overall is functioning (e.g. Kundu et al., 2016; Lyu et al., 2018).

This situation is unsurprising in view of participants' generally low levels of OHS education; even among those employed in OHS specialist roles, few had professional-level qualifications. OHS courses at sub-professional levels focus primarily on compliance with the relevant regulations, which is very inadequate preparation for managing MSD and MHD risk. Inadequate manager competence was a frequently reported barrier, seen as particularly problematic in relation to stress-related issues. This finding is consistent with evidence from Langenhan et al. (2013), and from research by Natali et al. (2008) who surveyed some EU stakeholders and reported that the need for skill development related to 'psychosocial risk' was recognised by over 80 percent of interviewees.

Inadequate funding was often reported as a major barrier to more effective risk management and some interviewees linked this back to the Australian government's inadequate funding model for the residential aged care sector overall (Table 6), or to the over-riding need to run profitable businesses in the logistics/transport sector (Table 3). This evidence supports and extends that reported by Langenhan et al. (2013), who identified "competing priorities" (such as commercial concerns) and "insufficient resources" (inadequate knowledge, expertise, time and money) as two of three key barriers to incorporation of 'psychosocial risks' into organisations' strategic decision making. The

present study found that poor funding was considered by interviewees as the main cause of inadequate staff numbers, provision of sub-optimal equipment, and failure to implement 'mandatory' training programs.

Many interviewees commented on the low priority given to OHS issues. In one aged care organisation, for example, it was reported that incident reports were routinely collected but their primary purpose was to satisfy external accreditation standards, and this information was not used for OHS-related purposes. Such a situation reflects current accreditation procedures and criteria, which focus predominately on the quality of resident care; of the 44 points listed in the Australian Accreditation Standards for these facilities, only one directly relates to staff health and safety.

4.1. Strengths and limitations

This study appears to be the only one of its kind to have documented in detail the views of workplace-level stakeholders on their own OHS risk management practices and issues relating to their effectiveness. Use of semi-structured interviews elicited in-depth information from people with extensive knowledge of actual work practices and conditions in two industry sectors where researchers have identified a need for changes to achieve more effective prevention of MSDs and MHDs. Inclusion of participants from diverse roles within each organisation ensured that a wide range of insights and perspectives were included.

The time required for data collection and subsequent coding and analysis necessarily limited the number of participants and organisations that could be included in the study, which limits generalisability. In Australia, the residential aged care industry is highly regulated and the frameworks within which organisations operate differ across states, which also limits generalisability. On the other hand, the recent 'harmonisation' of OHS legislation across Australian states (Safe Work Australia, 2016b) would be expected to minimise variation across jurisdictions, thereby enhancing generalisability. Such differences also exist in the logistics/transport sector, although to a lesser extent.

During recruitment of organisations, the initial response rate to the letter sent by the state OHS regulator (asking interested organisations to contact the researchers) was very low, and was expected to produce a sample biased towards organisations that are generally 'good performers' in OHS terms. Similarly, the role played by the senior manager who initially contacted the researchers in recruiting other participants within their organisation might tend to produce results depicting the workplace more favourably, although any such effect would be small because apart from HSRs, there was usually only one person employed in the role requested by researchers (e.g. OHS Manager, Site Manager).

5. Conclusions and future directions

It has previously been established that to reduce current numbers of work-related MSDs and MHDs, workplace management practices need to address risk from work-related psychosocial hazards. This will require changes that can only be achieved with the active involvement of workplace managers, and the successful implementation of such changes will require that managers understand *why* changes are needed. The present study found that most interviewees were unaware that work-related psychosocial hazards affect MSD risk; this constitutes a fundamental barrier to improved practice, which will need to be addressed at an early stage of implementing the new MSDs risk management toolkit.

Managers' current lack of knowledge and skills relevant to work-related psychosocial issues was widely reported as a barrier to improved risk management practices, and other evidence supported this view. Many interviewees reported psychosocial factors (without labelling them as such) as barriers to improving OHS more generally, but they saw most of these factors as beyond their control. Importantly, they failed to mention the majority of well established, *work*-related psychosocial hazards, for which risk management procedures are available. Instead, they tended to focus on individual worker characteristics, such as what they perceived as 'poor attitudes'. Clearly there is a need for greater awareness among workplace managers that compliance with the established OHS risk control hierarchy requires strategies that address risks at their work-related sources rather than focusing on workers (Alli, 2008; SafeWork Australia, 2018), and that such strategies are likely to be more effective.

In light of this evidence, it appears that implementation of risk management procedures to address work-related psychosocial hazards, including the newly developed MSDs risk management toolkit, may require initial support from external sources of expertise, at least in the short term. This problem would be alleviated if more of the people employed as OHS specialists had professional-level qualifications. In addition, a need exists for ongoing professional development programs for both general and OHS specialist managers, to provide better coverage of requirements for effective MSD and MHD risk management.

It seems likely that inadequate funding and resultant inadequate staffing will be the most difficult barriers to surmount when implementing the required changes to MSD and MHD risk management, because these are strongly influenced by factors external to the workplace – that is, accreditation or compliance requirements, and/or the overarching requirement for commercial viability. Many comments made it clear that OHS is given lower priority than these requirements, and OHS-related expenditures are often seen to be in conflict with commercial needs. In fact, there is evidence that the contrary is more often the case (e.g. British Safety Council, 2014; International Social Security Association, 2013; Oxenburgh and Marlowe, 2005), and government regulators have developed guidance on how to prepare a business case in support of OHS requirements (e.g. Australian Safety and Compensation Council, 2007). It appears that such evidence and practices have not yet had any substantial impact within the industry settings investigated in the present study. To address this issue, it may be helpful to prepare case studies customised for typical work organisations in industry sectors being targeted for change.

Finally, it is worth considering some implications for OHS professional bodies of the reported influences on OHS of aged accreditation criteria and government funding models. The importance of external influences on OHS is well recognised in the case of workers' health-related behaviours external to the workplace, and some workplaces have implemented 'total worker health' programs targeting these sources of risk (Anger et al., 2015). The external factors identified in the present study operate by influencing work organisation, job design and management rather than directly affecting workers' health. However, both types of external factors affect OHS outcomes, and on this basis it can be argued that OHS professionals can be regarded as legitimate stakeholders within a broader system of factors influencing health (Culyer, 2005; Rouse, 2008). As such, OHS professional bodies should be involved, along with worker representatives, in the decision-making processes determining accreditation criteria and funding models.

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References

Alli, B.O., 2008. Fundamental Principles of Occupational Health & Safety. International Labour Office, Geneva Retrieved September, 2018, from. http://www.ilo.org/wcmsp5/groups/public/@dgreports/@dcomm/@publ/documents/publication/wcms_093550.pdf.

Anger, W., Elliot, D., Bodner, T., Olson, Rl, Rohlman, D.S., Truxillo, D.M., et al., 2015. Effectiveness of total worker health interventions. J. Occup. Health Psychol. 20 (2), 226.

Australian Safety and Compensation Council, 2007. Guidance on preparing a simple business case. Retrieved February 9, 2018, from. https://www.safeworkaustralia.gov.au/system/files/documents/1702/guidancepreparingsimpleohsbusinesscase_2007_pdf.pdf.

Borys, D., Cowley, S., Tepe, S., Morrell, A., Macdonald, W., 2012. Systems. In: HaSPA (Health & Safety Professionals Alliance) (Ed.), The Core Body of Knowledge for Generalist OHS Professionals. Safety Institute of Australia, Tullamarine.

British Safety Council, 2014. The business benefits of health and safety: a literature review. Retrieved 10 July, 2018, from. https://www.britsafe.org/media/1569/the-business-benefits-health-and-safety-literature-review.pdf.

British Standards Institute, 2011. PAS 1010:2011 Guidance on the Management of Psychosocial Risks in the Workplace. BSI, United Kingdom.

Braun, V., Clarke, V., 2006. Using thematic analysis in psychology. Qual. Res. Psychol. 3 (2), 77–101.

Canadian Standards Association, 2013. Psychological Health and Safety in the Workplace - Prevention, Promotion, and Guidance to Staged Implementation. CAN/CSA-z1003-13/BNQ 9700-803. CSA, Ottawa, Ontario.

Comcare, 2008. Working Well: an Organisational Approach to Preventing Psychological Injury. Australian Government, Canberra Retrieved 9 July 2018, from. https://www.comcare.gov.au/_data/assets/pdf_file/0005/41369/PUB_47_Working_well_v2.pdf.

Culyer, A.J., 2005. Involving stakeholders in healthcare decisions – the experience of the national Institute for clinical excellence (NICE) in england and wales. Healthc. Q. 8 (3), 54–58.

Eatough, E., Way, J., Chang, C., 2012. Understanding the link between psychosocial work stressors and work-related musculoskeletal complaints. Appl. Ergon. 43 (3), 554–563.

Gerr, F., Fethke, N.B., Anton, D., Merlino, L., Rosecrance, J., Marcus, M., Jones, M.P., 2014. A prospective study of musculoskeletal outcomes among manufacturing workers: II. Effects of psychosocial stress and work organization factors. Hum. Factors 56 (1), 178–190.

Health and Safety Executive, 2012. What are the Management Standards for work related stress? Retrieved 19 March, 2015, from. http://www.hse.gov.uk/stress/standards/.

International Labour Organisation, 2012. Stress Prevention at Work Checkpoints: Practical Improvements for Stress Prevention in the Workplace. International Labour Organisation, Geneva, Switzerland.

International Labour Organisation, 2015. Global trends on occupational accidents and diseases. Retrieved February 9, 2018, from. http://www.ilo.org/legacy/english/osh/en/story_content/external_files/fs_st_1-ILO_5_en.pdf.

International Network of Safety and Health Practitioners, 2017. The occupational health and safety professional capability framework. A global framework for practice. Retrieved September 2018, from. https://www.inshpo.org/docs/INSHPO_2017_Capability_Framework_Final.pdf.

International Social Security Association, 2013. Calculating the international return on prevention for companies: costs and benefits of investments in occupational safety and health. Retrieved July 10, 2018, from. https://www.issa.int/en/details?uuid=f070f204-5fbd-4017-8afb-e07d98ba53ba.

Karasek, R., Brisson, C., Kawakami, N., Houtman, I., Bongers, P., Amick, B., 1998. The Job Content Questionnaire (JCQ): an instrument for internationally comparative assessments of psychosocial job characteristics. J. Occup. Health Psychol. 3, 322–356.

Kundu, S.C., Yadav, B., Yadav, A., 2016. Effects of safety climate, safety attitude, and safety performance on firm performance: a study of an automobile firm. Int. J. Bus. Manag. 11 (12), 135.

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 (7), 1163–1174.

Langenhan, M.K., Leka, S., Jain, A., 2013. Psychosocial risks: is risk management strategic enough in business and policy making? Saf. Health Work 4 (2), 87–94. https://doi.org/10.1016/j.shaw.2013.04.003.

Leka, S., Cox, T. (Eds.), 2008. PRIMA-EF: Guidance on the European Framework for Psychosocial Risk Management. World Health Organisation, Geneva, Switzerland.

Leka, S., Jain, A., Iavicoli, S., Di Tecco, C., 2015. An evaluation of the policy context on psychosocial risks and mental health in the workplace in the european union: achievements, challenges, and the future. BioMed Res. Int. 18. https://doi.org/10.1155/2015/213089.

Lyu, S., Hon, C.K., Chan, A.P., Wong, F.K., Javed, A.A., 2018. Relationships among safety climate, safety behaviour, and safety outcomes for ethnic minority construction workers. Int. J. Environ. Res. Publ. Health 15 (3), 484.

Macdonald, W., 2003. The impact of job demands and workload on stress and fatigue. Aust. Psychol. 38 (2), 102–117.

Macdonald, W., 2012a. Conceptual framework for development of a toolkit for prevention of work-related musculoskeletal disorders. Work 41 (Suppl. 1) 3933-36.

Macdonald, W., 2012b. Models of causation: health determinants. In: Health and Safety Professionals Alliance (Ed.), The Core Body of Knowledge for Generalist OHS Professionals. Tullamarine. Safety Institue of Australia, Victoria.

Macdonald, W., Evans, O., 2006. Research on the Prevention of Work-related Musculoskeletal Disorders: Stage 1 Literature Review. Department of Employment and Workplace Relations, Canberra, Australia.

Macdonald, W., Evans, O., Armstrong, R., 2007. Research on the Prevention of Work-related Musculoskeletal Disorders – Stage 2. A Study of a Small Sample of Workplaces in High Risk Industries. Department of Employment and Workplace Relations, Canberra, Australia Project No. CIR 1001439-07.

Macdonald, W., Munk, K., Evans, O., 2003. Ergonomics Approaches to the Prevention of Musculoskeletal Disorders. An Analysis and Critical Review of Existing National, and Regional Standards and Guidelines. Report prepared on behalf of the International Ergonomics Association for the International Labour Organisation, Geneva.

Macdonald, W., Oakman, J., 2013. Musculoskeletal disorders: using the evidence to guide practice. J. Health Serv. Res. Pol. 5 (2), 7–12.

Macdonald, W., Oakman, J., 2015. Requirements for more effective prevention of work-related musculoskeletal disorders. BMC Muscoskel. Disord. 16 (1), 1–9. https://doi.org/10.1186/s12891-015-0750-8.

Marras, W., Cutlip, R., Burt, S., Waters, T., 2009. National occupational research agenda (NORA) future directions in occupational musculoskeletal disorder health research. Appl. Ergon. 40 (1), 15–22.

Meyers, D.C., Durlak, J.A., Wandersman, A., 2012. The quality implementation framework: a synthesis of critical steps in the implementation process. Am. J. Community Psychol. 50 (3–4), 462–480.

Natali, E., Deitinger, P., Rondinone, B., Iavcoli, S., 2008. Exploring stakeholders' perceptions on social policies, infrastructures and social dialogue in relation to psychosocial risks. In: Leka, S., Cox, T. (Eds.), The European FFramework for Psychosocial Risk Management: PRIMA-EF. United Kingdom: I-. WHO Publications.

Nieuwenhuijsen, K., Bruinvels, D., Frings-Dresen, M., 2010. Psychosocial work environment and stress-related disorders, a systematic review. Occup. Med. 60 (4), 277–286.

NRC & Institute of Medicine, 2001. Musculoskeletal Disorders and the Workplace: Low Back and Upper Extremities. National Academy Press, Washington, D.C.

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.

Oakman, J., Rothmore, P., Tappin, D., 2016. Intervention development to reduce musculoskeletal disorders: is the process on target? Appl. Ergon. 56, 179–186.

Oakman, J., Bartram, T., 2017. Occupational health and safety management practices and musculoskeletal disorders in aged care: are policy, practice and research evidence aligned? J. Health Organisat. Manag. 31 (3), 331–346.

Oakman, J., Macdonald, W., Bartram, T., Keegel, T., Kinsman, N., 2018. Workplace risk management practices to prevent musculoskeletal and mental health disorders: what are the gaps? Saf. Sci. 101, 220–230.

Oxenburgh, M., Marlow, P., 2005. The Productivity Assessment Tool: computer-based cost benefit analysis model for the economic assessment of occupational health and safety interventions in the workplace. J. Saf. Res. 36 (3), 209–214.

Prochaska, J.O., DiClemente, C.C., 1982. Transtheoretical therapy: toward a more integrative model of change. Psychother. Theory Res. Pract. 19 (3), 276.

Rouse, W.B., 2008. Health care as a complex adaptive system: implications for design and management. Bridge – Washington-National Acad. Eng. 38 (1), 17–25.

Safe Work Australia, 2015a. Disease and injury statistics by type. Retrieved February 9, 2018 from. https://www.safeworkaustralia.gov.au/statistics-and-research/statistics/disease-and-injuries/disease-and-injury-statistics-type.

Safe Work Australia, 2015b. Work related mental disorders profile. Retrieved July 10, 2018 from. https://www.safeworkaustralia.gov.au/system/files/documents/1702/work-related-mental-disorders-profile.pdf.

Safe Work Australia, 2016a. Statistics on Work-related musculoskeletal disorders. Retrieved July, 2018, from. https://www.safeworkaustralia.gov.au/system/files/documents/1702/statistics_on_work-related_musculoskeletal_disorders.pdf.

Safe Work Australia, 2016b. Explanatory memorandum – model work health and safety bil. Retrieved July 10, 2018, from. https://www.safeworkaustralia.gov.au/system/files/documents/1705/model-whs-act-explanatory-memorandum-1august2016.pdf.

Safe Work Australia, 2018. How to manage work health and safety risks: code of Practice. Retrieved July, 2018, from. https://www.safeworkaustralia.gov.au/system/files/documents/1806/code_of_practice_-_how_to_manage_work_health_and_safety_risks.pdf.

Siegrist, J.A., 1996. Adverse health effects of high-effort/low-reward conditions. J. Occup. Health Psychol. 1, 27–41.

Singleton, W.T., 1974. Man-machine Systems. Penguin.

Way, K., 2012. Psychosocial hazards and occupational stress. In: HaSPA (Health and Safety Professionals Alliance) (Ed.), The Core Body of Knowledge for Generalist OHS Professionals. Safety Institute of Australia, Tullamarine, VIC.

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 (4), 343–351.

Whysall, Z.J., Haslam, C., Haslam, R., 2007. Developing the stage of change approach for the reduction of work-related musculoskeletal disorders. J. Health Psychol. 12 (1), 184–197.

Wilson, J.R., 2014. Fundamentals of systems ergonomics/human factors. Appl. Ergon. 45 (1), 5–13. https://doi.org/10.1016/j.apergo.2013.03.021.