

Developing a Framework for Understanding and Measuring Occupational Health & Safety Vulnerability

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Table of Contents

Background.....	4
Why do we need a measure of OH&S vulnerability?	4
Outlining a preliminary framework for measuring occupational health and safety vulnerability	5
Positioning our OH&S vulnerability framework between individual, occupational and workplace factors and subsequent work injury and illness	7
Research Objectives.....	8
Methods.....	9
Step One: Systematic search of literature for existing measures	9
Step Two: Focus groups	9
Step Three: Developing a pool of potential items to measure OH&S vulnerability	10
Results.....	11
Literature search results.....	11
Focus Group results.....	11
Selection of a pool of potential items for a measure of OH&S Vulnerability	17
Discussion	23
Strengths and limitations	23
Next Steps.....	24
Recommendations for WorkSafe Victoria	24
Conclusion	25
References	26

Background

Work-related injury and illness are an important public health concern. In Australia the direct and indirect costs of work-related injury and illness for 2008-09 has been estimated to be in excess of \$60 billion, with the majority of this cost being borne by injured workers and their families [1]. There are noted socioeconomic differentials in work injury rates with a higher burden of work injury among workers with lower levels of education [2-4]. Inequalities in work injury burden are also present across other labour market sub-groups. A higher risk of work injury have been demonstrated among younger workers [5,6], workers at the start of their employment [7,8], recent immigrants [9] and those in temporary employment relationships [10].

Occupational health and safety (OH&S) vulnerability can be defined as an increased risk of experiencing a work-related injury or illness [11,12]. As a result of their higher injury rates younger workers, new workers, temporary workers, immigrants and visible minorities are often labelled as vulnerable workers (see <http://www.cdc.gov/niosh/docs/96-115/worken.html#specials>; <http://www.iwh.on.ca/vulnerable-workers> and [13] as examples). However, this categorisation of workers does not identify the specific factors that place these workers at higher risk of experiencing a work-related injury. That is, much of the heightened OH&S risk (vulnerability) among these groups of workers (e.g. young workers, immigrants) can be explained by the circumstances surrounding them (such as the hazards they are exposed to, access to training or protection to help deal with these hazards, or power differentials between workers and employers which make them unable to refuse such conditions); with a minority (if any) of the excess risk due to unique, individual-level, risk factors within this category of workers [14,15]. It follows that if these groups of workers were subject to the same working conditions and protections as other groups of workers, very little of their elevated risk of work-related injury (vulnerability) would remain [5,7]. The purpose of this project was to develop a relevant set of domains and pool of potential items that could better measure the concept of OH&S vulnerability (or risk of work injury).

Why do we need a measure of OH&S vulnerability?

The advantages of developing a measure of OH&S vulnerability include:

1. Facilitating a better understanding of the contextual factors that create increased risk of work injury and illness. This includes broadening the focus from identifying the types of workers who are more likely to sustain injuries, to understanding and measuring the work these workers do, and the characteristics of the workplace or industries in which they are employed.
2. Allowing one to distinguish between vulnerability to work injury and the actual work injury or illness occurring. For a variety of reasons the relationship between increased vulnerability to work injury and illness and the occurrence of work injury and illness will not be one-to-one. That is, some workers who are at increased risk of injury may not actually get injured, while other workers who are not necessarily vulnerable to work injury or illness may be injured or become ill. While understanding the relationship between level of OH&S vulnerability and subsequent work injury is an important area of research, we feel that from a primary prevention perspective we should strive to make all workers less vulnerable to OH&S risk,

rather than being only focused on those that subsequently become injured or ill as a result of this increased risk.

3. This measure would enable those interested in OH&S injury prevention to estimate the prevalence of OH&S vulnerability in the labour market (or among labour market subgroups). This measurement could be undertaken either at one point in time, or be done over time (e.g. in response to population level interventions). While vulnerability may be associated with socio-demographic factors such as age or immigration status, it is important to understand the underlying factors that cause vulnerability, so that we can better design protective policies and practices. Further, using socio-demographic characteristics as a proxy for vulnerability does not allow the monitoring of changes in the proportion of the labour market who are vulnerable over time to be undertaken.
4. The development of a measure of OH&S vulnerability will lead to a greater understanding of the upstream determinants of work injury and illness among certain subgroups of the labour market in Victoria. This represents a conceptual integration of a social determinants framework with OH&S primary prevention principles. Specifically, the development of a measure congruent with our framework will allow the identification of the social and structural factors which lead to inequalities in work injury rates across labour market subgroups. Further, given the uneven distribution of OH&S risk and injury across labour market sub-groups the knowledge generated from this measure will provide OH&S policy makers and stakeholders with specific information that can be used to generate interventions that can reduce health inequalities in work injury in Victoria.

Outlining a preliminary framework for measuring occupational health and safety vulnerability

There is a general acceptance that dimensions that lead to workplace injury are broader than simply unsafe conditions in the workplace and unsafe actions taken by workers [16-18]. Below, we have outlined the four dimensions that form our preliminary concept of OH&S vulnerability. These are:

- the hazard potential faced by the worker;
- workplace or organisational level protections that are in place to protect the worker;
- worker awareness of hazards; and
- worker empowerment to actively participate in injury prevention.

We suggest that a measure of OH&S vulnerability would separately measure each of these dimensions, and then integrate them to better understand the relationships between each dimension, and to identify sections of the labour market that are most vulnerable to workplace injury.

We acknowledge that measures already exist that capture dimensions of our framework (e.g. hazards and workplace policies and procedures) (e.g. [19,20]). However, in the case of workplace policies and procedures this information is often collected from the perspective of the employer, and not the worker, with little information existing on whether

these perspectives differ. In addition, our third and fourth dimensions (worker awareness and empowerment to participate in injury prevention) are often assumed to be directly correlated with workplace policies and procedures. However, for particular groups of workers this may not be the case. Moreover, understanding the relationship between these four dimensions is pivotal to the development of effective OH&S primary prevention programs.

1. **Level of hazard potential:** A hazard is generally defined as a source of potential damage to a worker. This dimension includes measures of the amount of time a worker has to use dangerous equipment or materials, work in dangerous locations, or undertake work activities where there is a potential for injury (e.g. lifting heavy objects or working in static positions). There is a need within this dimension to gather information on the amount of time exposed to hazards, and the seriousness of the consequences of the hazard. For example, working at heights provides more serious consequences, than does working outdoors, although both might be considered hazards.
2. **Workplace/organisational level protections and policies:** This dimension deals with work-place level procedures that are in place to protect workers. It acknowledges that understanding OH&S risk needs to take into account both hazard exposures and prevention and control efforts that are in place within the workplace (hazard potential and hazard protection) [21-23]. Examples would include the systematic delivery of training on OH&S and worker rights; the labelling of hazardous materials within the workplace; the provision of safety equipment (e.g. safety guards for machines or personal protective equipment); and procedures to identify and replace defective equipment and collect and act on information about near miss incidents. We would further extend this dimension from the traditional examples above to also include specific policies or supports that address power differentials within the workplace (e.g. the presence and effectiveness of OH&S committee or representative within the workplace; or the systematic – and if required anonymous – collection of OH&S concerns from employees in the workplace).
3. **Worker awareness of occupational hazards:** The duty of making a worker's aware of the risks or hazards they are exposed to is embedded in the general duties of employers within the Occupational Health and Safety Act in Victoria [24]. Based on theoretical models in health behaviours, awareness is a key component of motivation to engage in health enhancing behaviours (or avoid unhealthy behaviours) [25,26]. As such, when workers are made aware of the hazards in their workplace, this will – in part – likely serve as a motivator to use personal safety protections (e.g. if workers are not provided with information on why or when safety protections should be used, it is unlikely they will use them, even if they are regularly made available). Examples of this dimension include if workers feel they are aware of the hazards involved in their job as well as those within their workplace.
4. **Worker level of empowerment to participate in injury prevention:** This dimension deals with an individual's capacity to protect themselves from

hazards at work. Examples include if workers feel that they could refuse unsafe work; or if they feel they can ask questions of their employer about perceived hazards in the workplace.

While these four factors will each be affected by the others, they are conceptually distinct. For example, for a given level of workplace protection against OHS hazards, there still may be a great deal of variation in the level of hazard potential (e.g., working at height is inherently riskier than not) or in worker empowerment to act (e.g., workers with language difficulties are less likely to speak up than other workers [27,28]). These dimensions could be combined together to describe the most vulnerable workers from an OH&S perspective. The rationale being that the most vulnerable workers will be those employed in workplaces with the highest hazard potential, where there are no formal procedures or policies in place to protect workers, where workers are not aware of these hazards, and/or do not feel empowered to participate in injury prevention.

We would suggest, however, that these four dimensions should be examined separately so that relationships between each dimension of vulnerability can be identified, and relationships between dimensions examined [19]. For example, if a workplace provides personal safety protections, but does not provide workers with information on why or when these protections should be used, we might expect a mismatch between level of protections in the workplace and the power to use them. As such, measuring these dimensions separately allows information to be generated on specific workplace factors (or worker factors) that can be improved to help protect workers (and subsequently reduce OH&S vulnerability). It follows that if we can identify the dimensions of OH&S vulnerability where there is the greatest variation, we can identify the areas that offer the greatest potential for reducing work injuries and illnesses [18] and inequalities in injury burden across labour market sub-groups. For example, if all workers are aware of their OH&S rights, then primary prevention programs designed to increase awareness of OH&S rights is unlikely to be effective in reducing injury risk or inequalities in injury burden in the labour market. As such, by assessing vulnerability across four dimensions we can assess where primary prevention resources should be targeted or tailored, and the groups of the labour market they should be directed towards.

Positioning our OH&S vulnerability framework between individual, occupational and workplace factors and subsequent work injury and illness

The advantage of developing a framework and measure of OH&S vulnerability is that by collecting this information together with information on worker, job and workplace characteristics, we can then better understand how and why certain individual, occupational or workplace factors are associated with higher rates of work injury. This framework is presented in Figure One. In this figure the four dimensions of OH&S vulnerability are located within the shaded boxes, with the grey dashed arrows indicating the reciprocal relationships between each dimension. As illustrated in the figure the four dimensions of vulnerability can elucidate the pathways through which worker, job and workplace characteristics are associated with increased injury risk – thus opening the “black box” between these characteristics and higher injury rates. For example, using this

framework one could examine if temporary employment relationships lead to increased risk of work injury through a lack of empowerment for workers to refuse unsafe work, that workers in these relationships are not provided with the same level of training or protections as employees in permanent work arrangements, or that temporary workers are required to work in more hazardous jobs [29]. Similar to the rationale for socio-demographic characteristics presented earlier, differences between temporary and permanent employees across one or more of the four domains of OH&S vulnerability might explain why temporary workers are more likely to be injured at work.

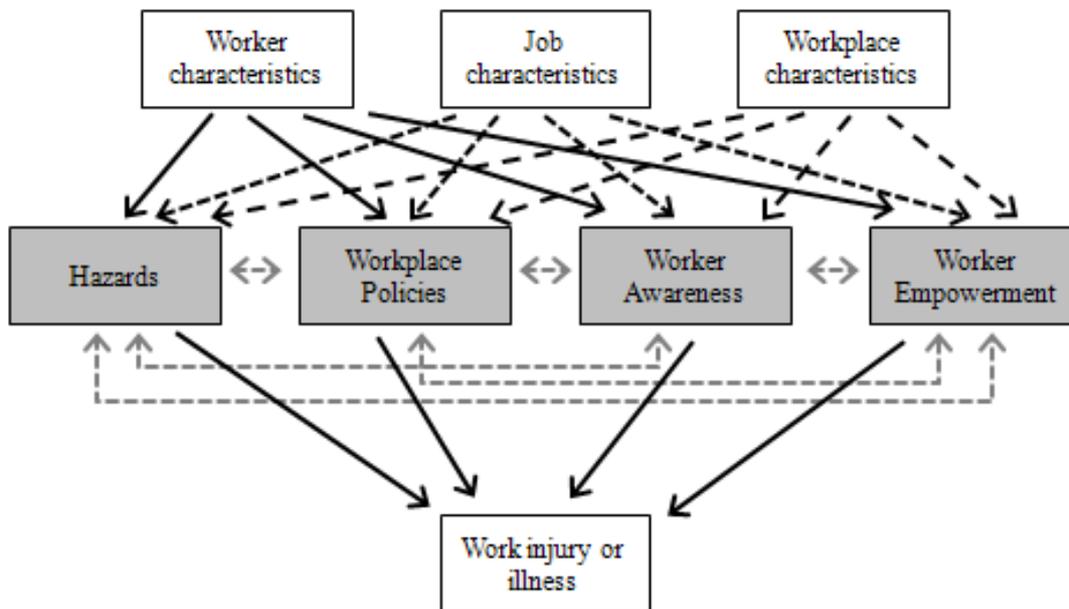


Figure One: Integrating OH&S vulnerability between worker, occupational and workplace characteristics and work injury

It is important to note that Figure One also acknowledges that each dimension of OH&S vulnerability can impact on other dimensions. For example, increases in work awareness or empowerment may lead to subsequent changes in hazards (e.g. replacing a hazardous material used in a production process to a less hazardous material), or changes in workplace protections. Moreover, the impact of empowerment may be affected by the degree of workers awareness. Similarly, increases in workplace protections may send a message to workers that safety is a priority within the workplace, and thus lead to greater worker empowerment to participate in injury prevention.

Research Objectives

The objective of this research project was to generate a set of domains and pool of potential items that build upon the framework for OH&S vulnerability presented in the previous section.

Methods

The first step in developing a new measure is to collate a set of potential items that might be included as part of the measure [30-32]. We developed a pool of potential items that are related to our conceptual framework of OH&S vulnerability through two steps: a systematic search of the peer- and non-peer-reviewed literature for existing measures on related concepts; and via focus groups discussions with relevant stakeholder groups. These two steps are described separately below.

Step One: Systematic search of literature for existing measures

A literature search was conducted using several databases containing literature from a number of disciplines. These included: MEDLINE, EMBASE (medical literature), PsycINFO (psychological literature), Sociological abstracts (sociological literature), ABI Inform, Business Source Premier (business/management literature), EconLit (economic literature), Social Service Abstracts (social work and social service literature). Our search strategy will focus on articles or reports that measure one or more of the domains within our conceptual framework: OH&S hazards; workplace level protections; worker awareness; and worker participation in OH&S. This search strategy was based on a framework and measurement filter strategy developed by the Consensus-based Standards for the selection of health Measurement Instruments (COSMIN) group [33]. As the controlled vocabularies differ significantly in these databases, search terms were customized for each, so that the controlled vocabularies were used whenever possible. Databases listed above yielded both peer-reviewed and non-peer reviewed literature. In addition we searched organisational websites and subject directories for grey literature.

At the completion of the search strategy we downloaded all references and removed duplicates. Articles were then reviewed for relevance using the title and abstract. After excluding articles that did not measure one of our dimensions of OH&S vulnerability, we reviewed relevant articles and extracted information on the instrument that was used to assess the factor of interest. A complete list of questionnaires was then collated within each domain and reviewed by the Investigator team to identify any missing instruments.

Step Two: Focus groups

The main advantage of a focus group is the opportunity to observe the participants interact on a particular topic [34]. Focus groups can be used to examine similarities and differences in the respondents' opinions and experiences through group discussion, rather than inferring these differences from comparison of individual interviewees. Four focus groups were conducted as part of this study. One focus group included employer representatives, one included members of WorkSafe Victoria, one included employees and one employee representatives. Each focus group contained between four and seven participants. By having relatively homogenous participants participating in a given focus group, our focus groups can be considered as a form of in-depth group interview concerning our OH&S vulnerability framework [35]. That is we believed that policy makers, employers, employee representatives and employees would each bring a unique perspective and differing levels of experience in relation to OH&S vulnerability.

The objective of each focus group was to obtain feedback on our vulnerability conceptual framework and types of questions we should ask within each of our four domains. We specifically sought feedback on the following areas during each focus group:

- What were the factors that participants think lead someone to be at risk of work injury?
- Did the participants feel that our conceptual framework was congruent with their beliefs about factors that lead to work injury?
- Did participants see utility in developing such a measure?
- What types of questions should be asked within each domain?
- Did participants think that a worker-level measure of OH&S vulnerability was feasible (i.e. could workers answer questions in each of the areas we had proposed)?

Each focus group was transcribed and de-identified. We then thematically analysed the transcripts to identify areas that were supportive of our conceptual framework and discussion that identified areas where our conceptual framework could be improved.

Step Three: Developing a pool of potential items to measure OH&S vulnerability

At the end of our focus groups members of the Investigator Team (which included the three project investigators, two additional investigators in Canada, and a research assistant in Canada and in Victoria) were provided with a summary of the focus group discussions relevant to each of the dimensions of our conceptual framework and a list of the instruments and questions identified in the literature search. Using this information each investigator identified 20 items that they thought best captured the dimensions, given the feedback we received in the focus group discussion. Where applicable investigators were also invited to suggest new or modified questions, if none of the questions identified captured an aspect of a dimension that was considered important by one of the focus groups. The goal of this stage of the development was to reduce the pool of items to a much smaller group that could be pilot tested. Here we were looking to identify items that were highly ranked by most participants (to retain), or items that were lowly ranked by most participants (to exclude).

Results

Literature search results

The initial literature search identified 9,771 articles that met our search criteria. These articles were randomly separated into four groups with each group of articles reviewed by a trained reviewer. Before reviewing commenced the four reviewers and the principal investigator reviewed a sample of 100 articles to determine if they should be included for further review or not. Discrepancies between reviewers were discussed and resolved before the reviewing of the main group of articles commenced. After the initial title and abstract screening 688 selected for further data extraction. A total of 343 articles examined measures of level of hazards; 264 articles examined policies and protections; 188 worker awareness; and 126 worker empowerment. Note that a given article could cover more than one of the dimensions. These articles were further reviewed by the investigator team, and 83 articles were selected to have full-text review and have measured extracted (59 articles covering level of hazards; 30 organisational policies and procedures; 25 worker awareness; and 29 empowerment). After detailed review scales were extracted from 58 articles (26 covering level of hazards; 28 covering organizational policies and procedures; 19 covering worker awareness; and 29 covering empowerment). These articles were supplemented with measures included in WorkSafe Victoria's Hazard Exposure Surveillance Survey; WorkSafe Victoria's Worker's Perception of Safety and Future Improvements Survey; The European Agency for Safety and Health and Work's measure of worker participation in occupational health and Safety [36]; The Occupational Health and Safety Self-Diagnosis Questionnaire [37]; The Survey of Perceived Organisational Support [38]; and the Team Learning Questionnaire [39], which were not identified in the original literature review search.

Focus Group results

Participants across all focus groups generally agreed with our original premise that there is a need to think more broadly than demographic characteristics and hazard exposures when determining workers who are vulnerable to workplace injury. Examples of the need to broaden the concept of OH&S vulnerability past individual characteristics is demonstrated in the following comments from different focus groups

“your ... survey [is trying] to get information that basically ends up [with] what the dimensions are of a crappy job, so that then the crappy job becomes the target, not the label of a demographic.”

(Employee representative focus group)

“I was relieved when we're not focusing on the characteristics of the workers themselves, because I've never thought of vulnerability as being meaningful in that way”

(Policy maker focus group)

“But the vulnerable worker thing to me, I think, just creates a perception that it’s the worker that’s the problem[however] it is about the environment”

(Employer focus group)

“..when there is a serious incident then comes out ... the level of information that the worker had, the level of understanding of the task, the level of understanding of what the hazard is, the understanding of the procedures, if there were any in place, and if these procedures were any good”

(Employee representative focus group)

However it was noted that factors such as fatigue and the ability to communicate with co-workers and understand safety messages are important factors to consider in terms of risk of work injury. Questions to assess these characteristics should be included along with questions assessing the various dimensions of vulnerability as part of a comprehensive survey

“I think one of the things that’s glaringly omitted from this is demographic capability to read and speak English, level of education relevant to the type of work being undertaken. Possibly issues like how far they have to travel to get to the workplace and how they get to the workplace: they’re catching the train for three or four hours a day may place them in a vulnerable position”

(Policy maker focus group)

In general when asked to describe what they thought lead to some workers having an increased risk of injury, participants in each focus group mentioned various dimensions of our proposed OH&S vulnerability framework. For example, congruent with our hypothesised framework we heard that the increase in precarious and temporary employment make lead to workers being less likely to raise OH&S safety concerns in their workplace.

“Well, it might be that. I mean, obviously, if you’re on a job from day-to-day, and you need the money then I think your ability to talk to somebody, but whether you feel that that would be in your interest to talk to somebody. Obviously, I would think that if you did raise certain issues it might jeopardise you working the next day”

(Policy maker focus group)

“When a casual comes in and pass the induction stage, want to convert that casual position into a full-time position. Now, the question in his head is, how do I go about it? And, so, sometime down there safety attitude then falls by wayside because I want to look good, I’m a good

productive worker, so I can look good down there in my probationary period But if I abide by the rules, like do it as safely as possible, the manager might perceive me down there as a slow worker, or too much of a fudgy-budgie sort of thing like that. So that is the attitude down there we have at the moment.”

(Employee focus group)

“[employers] are willing to engage labour hire people to do work they wouldn’t get their own people to perform, but then a worker gets into those situations and there’s a fear factor. If I talk up about unsafe work practices am I going to lose my job, and with that aspect played into it, they’re probably less willing to come forward”

(Employer focus group)

We did, however, receive feedback that the language currently used to describe various dimensions may need to be modified to better articulate the dimension in question. An example of such a suggestion, from the employee representative focus group is below

“I might phrase it: are workers empowered to ensure that they are protected from hazards of work? And the question that I would like to ask would then be: Well, do you expect answers when you ask about it? And do you expect some actions to be taken when you ask about it, or do you expect to be sacked, or do you expect to be punished, or do you expect to be ignored?”

(Employee representative focus group)

We received numerous comments that particular aspects of organisations need to be emphasised, both due to these measures often being overlooked in relation to OH&S and because they were not currently clearly articulated in our framework.

One such area was the management commitment to OH&S in the organisation. Below are quotes from the various focus groups that speak to this area.

“Very few executive or directors would be able to articulate in an authentic way what their obligations are in respect of occupational health and safety But if they had to sit in front of shareholders and explain how the balance sheet was looking ... they’ve got it covered. .. [There is a] deferment of responsibility for matters surrounding health and safety”

(Employee representative focus group)

“The difference I see [between workplaces with good safety performance and bad safety performance] is the fundamental understanding of issues of health and safety at one site is far more embedded in managers and executives than the other site”

(Employee representative focus group)

“I just feel that there’s something missing here. I feel it is around that senior management commitment and culture. Just reading through it, it’s very focused on workers. I just feel there needs to be a bit more emphasis on what is the culture? What are the officers of the business doing? What does their due diligence look like?”

(Employer focus group)

“You can have a health and safety management system that is binding [but] it lives on a shelf, never gets looked at; it’s not worth the bloody paper it’s written on, and then you’ve got the other end of the scale where you’ve got smaller businesses that don’t need to engage someone on a permanent basis or to develop a system but they’re focused on health and safety. They have a culture within the business that’s focused on safety. And that is in a lot of senses where health and safety systems start from”

(Employer focus group)

The issue of management/employer commitment to OH&S was also raised under the area of awareness, as illustrated in the following quotes. Based on these comments we would suggest that questions within the dimension of awareness need to also capture a workers knowledge of their employers responsibilities and if they are aware of the processes to take if they encounter OH&S problems in their workplace.

“you’ve got things about are they aware of their rights and responsibilities? But, also, are they aware of whose duty it is to do things? What is it that the employer has to be doing? Do they know that the employer has to do these certain things”

(Employee representative focus group)

“And then not being able to think about what to do about it, or if they were feeling uneasy, which a lot of people said, “I didn’t think it was safe,” but they’ll say that in hindsight, but they didn’t know what to do about it or where to go”

(Employee focus group)

However, questions concerning the commitment of an employer to OH&S need to be carefully worded, as illustrated in this quote from the employer focus group

“and I have problems with organisations that say they put safety first, because nobody goes into business for the purposes of safety. Even a safety consultant needs to make money “We think about safety whenever we do anything in this business”; to me is a much better

message or question than ,”is the business prepared to put my safety ahead of productivity”

(Employer focus group)

While workplace hazards were identified as a key component of health and safety risk, participants in all focus groups commented that the assessment of hazards need to be broadened from physical hazards to important psychosocial hazards such as bullying, harassment and the pace of work. Examples of such comments are provided below

“So I think that there is a very great need for awareness of OH&S not just being physical but being emotional/mental as well”

(Employee focus group)

“And then the even more significant issue around psychosocial psychological injury stuff, where how on earth do you put in place, and a lot of organisations just say, “Oh, it’s too hard” to put in place processes to deal with psychological risk”

(Employer focus group)

“And just pressure I saw this situation in fact last night, a worker who said, “I’ve missed my break; I often miss my break.” And you say, “Well, no, I think after two hours you need to see that it’s part of your job to have a 10-minute break and have something to eat and drink and be prepared to go on.” And she was saying, “Oh, but the work doesn’t get done.” Like she’d rather go without a break and finish on time than have a break”

(Employee focus group)

“couple of other hazards: bullying and harassment I think is a part that really needs to be looked at”

(Policy maker focus group)

Two issues that were raised consistently as being important to any measure of OH&S risk were a belief that an employer would act on safety concerns and there is a commitment to consultation in relation to OH&S issues in the workplace. These issues were often raised in relation to the dimension of empowerment to participate in injury prevention, although aspects of consultation were also raised in discussions of policies and procedures. If employees believe that nothing would result from raising concerns then they will be less likely to engage in formal practices related to injury prevention in their workplace. A commitment to consultation by employers was also seen as pivotal in ensuring that workplaces are safe. Both action and consultation have previously been identified as key responsibilities under the 2004 Occupational Health and Safety Act, with key themes in the act including “involving workplace parties” (consultation) and “dealing with health and safety issues” (action) [24]

Quotes emphasising the need to assess the belief that action would result in OH&S issues were raised are presented below

“And the importance that they [the manager/supervisor or OH&S representative] are perceived to have on OH&S, too, because a lot of people say, “Oh, I’m not going to bother telling the OH&S rep because they don’t really seem to care or do anything about it anyway.””

(Employee focus group)

“the extent really to which any issue that gets raised, assuming they have the confidence to raise them, actually gets dealt with, because it’s all very well and good to be able to raise issues, but if nothing actually happens about the issues then I think that’s a key determinant”

(Policy maker focus group)

“it comes back to that culture thing, that there are processes, there are genuine consultative and genuine commitment to actually having issues that are raised addressed and having outcomes. So workers don’t feel they have to take it all on themselves. They know how to do things through the system. And that’s really important there in terms of empowerment”

(Employee representative focus group)

“does your supervisor or manager ... actually either deal with or talk about safety with you and your workmates”

(Policy maker focus group)

“What does the employer do when an issue is raised, whether directly or indirectly? You need to sort of capture that part of the environment that’s part of consultation, but if a matter is raised what actions are taken by the supervisor, by the manager?”

(Policy maker focus group)

Quotes emphasising the need for questions to assess a worker’s belief that the employer or management in the workplace are committed to consultation are presented below

“hazards can vary from a dangerous piece of machine, all the way to a SunSmart policy, so it’s really the culture of the workplace, and that can only improve by the consultation”

(Policy maker focus group)

“One of the things that I think that you’ve missed here sort of slightly in under practices, but the whole issue about consultation. And that can be

under practices in terms of how does your employer make decisions about what needs to be done, whether about what's purchased, or how to address issues"

(Employer representative focus group)

"workers are the best ones to tell you what the hazards and risks are, but they've got to be encouraged to speak up and engaged so as to get some meaningful discussion at workplaces, and I think there's a failure of regulators to promote that you need to consult more than anything else"

(Employer focus group)

"first of all management need to set up a consulting framework. It's all very well to talk about the word consultation, but it's got to work in practice. So they need to create the environment to encourage input"

(Policy maker focus group)

Selection of a pool of potential items for a measure of OH&S Vulnerability

Taking into account the feedback we received from the Focus Groups, the Investigator Team selected up to 20 items each from the pool of potential questions identified through the literature search in Step One of the proposal. In the following tables we have listed items which were endorsed by at least two members of the research team, or items that had been suggested by an Investigator based on the focus group feedback. Additional work (beyond the funding for this project) further reduce this set of potential items into a more feasible measure of OH&S vulnerability that comprises approximately 15 questions per dimension, which will be pilot tested using a separate source of funding. The pilot testing of these items among workers (in Ontario) will allow us to further reduce the number of items in our measure to approximately 20 in total (across all dimensions)

Table One: Potential items to examine the occupational health and safety vulnerability, by dimension of vulnerability (**items which were retained in the measure to be pilot tested are bolded**)

Level of hazard potential

1. In your main job, how often are you exposed to an unmanageable workload (daily; weekly; monthly; 3-monthly; 6-monthly; yearly; never)
 2. **In your main job, how often do you have to manually lift, carrying or push items heavier than 20kg at least 10 times during the day (daily; weekly; monthly; 3-monthly; 6-monthly; yearly; never)**
 3. **In your main job how often do you have to do repetitive movements with your hands or wrists (packing, sorting, typing) for a least 3 hours during the day (daily; weekly; monthly; 3-monthly; 6-monthly; yearly; never)**
 4. **In your main job, how often do you have to work using a vibrating tool for at least 2 hours during the day (daily; weekly; monthly; 3-monthly; 6-monthly; yearly; never)**
 5. **In your main job, how often are you subjected to persistent criticism of your work and effort (daily; weekly; monthly; 3-monthly; 6-monthly; yearly; never)**
 6. In your main job, how often do you have your opinion and views ignored (daily; weekly; monthly; 3-monthly; 6-monthly; yearly; never)
 7. In your main job, how often are you given tasks with unreasonable or impossible targets or deadlines (daily; weekly; monthly; 3-monthly; 6-monthly; yearly; never)
 8. **In your main job, how often do you have to perform work tasks, or use work methods, that you are not familiar with (daily; weekly; monthly; 3-monthly; 6-monthly; yearly; never)**
 9. **In your main job, how often do you work at a height that is 2 metres or more above the ground or floor? (daily; weekly; monthly; 3-monthly; 6-monthly; yearly; never)**
 10. **In your main job, how often do you interact with hazardous substances such as chemicals, flammable liquids and gases (daily; weekly; monthly; 3-monthly; 6-monthly; yearly; never)**
 11. In your main job, how often do you perform manual handling tasks that may involve repetitive movements (with people, animals or objects) such as packing, typing, assembling, cleaning, sorting, lifting, pulling, pushing, using hand-tools, and operating machinery or equipment? (daily; weekly; monthly; 3-monthly; 6-monthly; yearly; never)
 12. **In your main job, what often do you have to work in a bent/twisted work posture (daily; weekly; monthly; 3-monthly; 6-monthly; yearly; never)**
 13. **How often do you have to work very fast? (daily; weekly; monthly; 3-monthly; 6-monthly; yearly; never)**
 14. Do you have free access to all the tools and protective gear you need to do your work? (yes/no)
 15. **How often does your job cause you mental pain or discomfort? (daily; weekly; monthly; 3-monthly; 6-monthly; yearly; never)**
 16. **How often does your job cause you physical pain or discomfort? (daily; weekly; monthly; 3-monthly; 6-monthly; yearly; never)**
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17. **How often do you have to concentrate very hard to perform your work without any mistakes? (daily; weekly; monthly; 3-monthly; 6-monthly; yearly; never)**
 18. **In your main job how often do you work in noise levels that are so high that you have to raise your voice when talking to people less than one meter away (daily; weekly; monthly; 3-monthly; 6-monthly; yearly; never)**
 19. **How often do you have to stand for more than two hours in total (daily; weekly; monthly; 3-monthly; 6-monthly; yearly; never)**
 20. How physically demanding has your job been over the last 3 months? (response scale TBC)
 21. How often do you experience pain as a result of your work? (daily; weekly; monthly; 3-monthly; 6-monthly; yearly; never)
 22. In the last 3 months have you had a 'close call' of an injury? (never; once; twice; three times or more)
 23. How often have you participated in leisure time physical exercise/sports per week, during last year (daily; weekly; monthly; 3-monthly; 6-monthly; yearly; never)
 24. How often do you feel so tired that it impacts your work? (daily; weekly; monthly; 3-monthly; 6-monthly; yearly; never)
 25. **How often do you come to work fatigued? (daily; weekly; monthly; 3-monthly; 6-monthly; yearly; never)**
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Organisational policies and procedures

Please tell me how much you agree or disagree with the following statements (strongly agree, agree, disagree, strongly disagree)

1. **My workplace spends time and money on improving safety**
2. The workplace and equipment are well maintained
3. The safety training programs at my workplace are useful and help prevent injuries
4. In my workplace safety problems are investigated quickly
5. **At my workplace there is regular communication between workers and supervisors about safety issues**
6. In my workplace there are regular checks and reviews of injury prevention plans and safe work procedures
7. **At my workplace everyone receives the necessary occupational health and safety training when starting the job, changing jobs or using new techniques**
8. **At my workplace, workplace safety is given high priority by the management**
9. In my workplace occupational health and safety rules and procedures are strictly followed by the management
10. In my workplace corrective action is always taken when the management is told about unsafe practices
11. **At my workplace managers/supervisors do not show interest in the safety of workers**
12. In my workplace safe conduct is considered as a positive factor for job promotions
13. In my workplace there exists very healthy competition among the employees to find out and report unsafe condition and acts

14. At my workplace there is an active and effective health and safety committee

15. Employees at my workplace receive the necessary training to be able to identify and control risks and resolve problems

16. I receive the necessary support to conduct my job safely (e.g. training, feedback, instructions, procedures)

17. At my workplace occupational health and safety policy changes (e.g. procedures, rules) are made known to the employees

18. At my workplace incidents and accidents are investigated quickly in order to improve safety

19. At my workplace occupational health and safety systems and plans are evaluated

20. At my workplace employees are always involved in decisions affecting their health and safety

21. At my workplace the effectiveness of training programs is evaluated

22. At my workplace jobs are designed with safety considerations in mind

23. At my workplace everyone has the tools and/or equipment they need to complete their work safely

24. At my workplace those who act safely receive positive recognition

25. At my workplace those in charge of safety have the authority to make the changes they have identified as necessary

26. At my workplace workers and supervisors have the information they need to work safely

27. At my workplace, health and safety is considered to be at least as important as production and quality

28. At my workplace, everyone (employees, supervisors and managers) values ongoing safety improvement

29. At my workplace formal safety audits at regular intervals are a normal part of our business

30. At my workplace systems are in-place to identify, prevent and deal with psychosocial (bullying, job pace) hazards at work

31. At my workplace systems are in-place to identify, prevent and deal with physical (e.g. noise, equipment) hazards at work

32. At my workplace managers and supervisors follow up on employee suggestions and initiatives to improve safety

33. At my workplace Lip service is paid to safety until something happens

34. At my workplace workers and supervisors are given the information they need to work safely

35. At my workplace communication about health and safety procedures are provided in a way that I can understand

36. At my workplace management consider that employees' participation and involvement is fundamental to health and safety.

Worker awareness

Please tell me how much you agree or disagree with the following statements (strongly agree,

agree, disagree, strongly disagree)

1. Employees are taught to be aware of and to recognise potential health hazards at my workplace
2. I follow safety rules and standard operating procedures at my workplace
3. **I am clear about what my rights and responsibilities are in relation to workplace safety**
4. **I am clear about my employers' rights and responsibilities in relation to workplace safety**
5. I understand the safety rules for my job
6. **I have been training in the standard safety procedures involved in all my work tasks**
7. **I know how to perform my job in a safe manner**
8. **I use the standard safety procedures for my work tasks every time I do my work**
9. I know how to maintain or improve workplace health and safety
10. **I have the knowledge to assist in solving any safety concerns at my workplace**
11. **I know what the necessary precautions are that I should take while doing my job**
12. **I know what the potential hazards are which are associated with my job**
13. **I don't know what procedures to follow if I noticed a potential hazard in my workplace (e.g. who to report the hazard to)**
14. I believe that safety at workplace is a very important issue
15. At my workplace employees are told when they do not follow good safety practices
16. I am comfortable with my ability to identify, and correct, work conditions that I feel are unsafe in my workplace
17. I have the knowledge to assist in solving safety concerns at my workplace
18. I can foresee hazards
19. I am aware of my legal rights and responsibilities regarding safety matters
20. Safety materials are written at a level that I can understand
21. Safety training is delivered in a way that I can understand
22. **I am aware of who I should talk to if I feel my working conditions might damage my physical health**
23. **I am aware of who I should talk to if I feel my working conditions might damage my mental health**
24. **I always follow safety rules and standard operating procedures at my workplace**
25. I am aware of the important occupational health and safety hazards involved in my job
26. **I worry that there are hazards involved in my job that I don't know about**
27. **I am aware that some hazards can cause injuries at work, but other hazards might affect a person over months or years after first being exposed.**

Empowerment and participation

Please tell me how much you agree or disagree with the following statements (strongly agree,

agree, disagree, strongly disagree)

1. **I feel free to voice concerns or make suggestions about occupational health and safety at my workplace**
 2. My co-workers care about work safety
 3. Employees are involved in creating guidelines for procedures and instruction manuals
 4. Employees participate actively in devising, executing and monitoring safety plans
 5. At my workplace, workers are encouraged to think about ways in which job tasks could be done with less chance of causing an injury
 6. **It is normal for me and my co-workers to discuss and/or report safety problems with our supervisors or managers**
 7. At my workplace, workers are encouraged to participation in safety decision-making
 8. **I speak to co-workers at risk and encourage them to fix safety problems**
 9. At my workplace I feel encouraged to tell my co-workers to report safety concerns
 10. At my workplace I feel encouraged not to take shortcuts when carrying out my work
 11. **I am thanked for reporting safety incidents or near misses**
 12. Management encourages employees here to participate in decisions which affect their safety
 13. Management makes sure that each and everyone can influence safety in their work
 14. Management never asks employees for their opinions before making decisions regarding safety
 15. **I receive the necessary support to conduct my job safely (e.g. training, feedback, instructions, procedures)**
 16. **I use all necessary safety equipment to do my job**
 17. **Nobody at work ever takes shortcuts in relation to safety**
 18. Management operates and open door policy on safety issues
 19. There is sufficient opportunity to discuss and deal with safety issues in meetings
 20. The target and goals for safety performance in my workplace are not clear to the workers
 21. **I voluntarily carryout tasks or activities that help to improve workplace safety**
 22. I do not sincerely participate in identifying safety problems
 23. **I feel free to ask for safety information about my job**
 24. I am able to get information on OH&S when I want it
 25. **If I noticed a workplace hazard I would point it out to my supervisor**
 26. I could take a break or pause from my work if I was concerned that the pace of work might lead to an injury
 27. **I know that I can stop work if I think something is unsafe and management will not give me a hard time**
 28. **I have enough time to complete my work tasks safely**
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Discussion

The objective of this research project was to obtain feedback on a framework for OH&S vulnerability that had been developed by our research team, and to generate a set of domains and pool of potential items for a measure of OH&S vulnerability. Our original conceptual framework of OH&S vulnerability contained four related domains. These were the level of exposure to hazards faced by the worker; the workplace level policies and procedures that are in place to protect workers at the employee's workplace; the worker's awareness of the risks and hazards they are exposed to at work; and the individual's capacity to protect themselves from hazards at work. Comments from participants in all focus groups were generally supportive that each of the dimensions in our conceptual framework were important factors that lead to risk of work injury. However, we did receive important guidance on the need to: broaden our dimensions of hazard exposure to incorporate both physical and psychological hazards; broaden worker awareness to be more than just hazards; and to specifically focus on issues related to employer commitment in OH&S, a belief that the employer would act to correct OH&S concerns raised by workers, and an active consultative process related to OH&S. The inclusions of these dimensions within our framework would more closely align our framework with the duties of employers as outlined in the Victorian Occupational Health and Safety Act [24].

Based on the focus group feedback we propose the following changes to our conceptual framework:

- The dimension of hazard potential needs to explicitly focus on both the physical and psychosocial environment of the worker
- The area of perceived employer commitment to OH&S needs to be captured within the dimension of policies and procedures
- Questions on employer practices in relation to consultation need to be captured within the dimension of policies and procedures
- Questions on a belief that an employer would act on health and safety issues raised by workers need to be captured either within the dimension of policies and procedures or within the dimension of empowerment
- The domain referred to as "awareness of hazards" should be broadened to be "occupational health and safety awareness" as it should also include awareness of rights and responsibilities related to occupational health and safety.

In addition we also received feedback cautioning us to be careful with the wording used in describing our dimensions and the questions to be included in our measure not to take into account the shared responsibility of employers and employees in relation to occupational health and safety. This guidance will be included as we move the development of our framework forward.

Strengths and limitations

The results of this project, however, should be interpreted given the following strengths and limitations. It is possible that our systematic scan of the literature may have missed some measures, or that important measures or questions may have been omitted as part of the review process. While this is always a possibility, we attempted to make our search

strategy as inclusive as possible (which is reflected in the number of abstracts reviewed). In addition, stakeholders and investigators were invited to suggest new items as part of the feedback when reviewing the preliminary list of items. Participants in our focus groups were recruited using a convenience based strategies, and as such, may not be representative of all workers, employers or OH&S policy makers in Victoria. This is a challenge for all focus groups, given the time commitment and resources required from participants and researchers to conduct and participate in these forums. However, drawing a representative sample of workers, employers or policy makers may have led to a more stagnated and less illuminating discussions in our groups, than recruiting participants who are interested in the topic area. As such, the depth of discussion within our groups was enhanced from our sampling strategy. The development of our measure has the strength of being based in an *apiori* conceptual framework, with potential items being identified using a rigorous process. In addition, we received feedback on our conceptual framework and measure from multiple groups, at multiple stages of our research project. In addition, we believe that this involvement has led to the development of a stronger theoretical model and more comprehensive and relevant set of items to measure OH&S vulnerability.

Next Steps

This development grant has enabled to research team to secure funding from the Canadian Institutes for Health Research to further reduce our pool of vulnerability items and to administer a survey of approximately 60 items measuring occupational health and safety vulnerability (approximately 15 items per dimension) to a sample of approximately 300 workers. This pilot testing will allow us to further reduce the number of items contained in our measure by examining the factor structure of the items and any redundancy across measures or floor or ceiling effects among items. This smaller measure (likely around 20 to 25 items in total) will be included in a survey which also includes other important demographic, worker, occupational and workplace characteristics (e.g. age, literacy, gender, employment relationship, multiple job holding, membership in a union, occupation, industry and size of workplace). This measure will be administered to a sample of approximately 1,000 workers in Ontario and 1,000 workers in British Columbia in the first half of 2014. This results of these next steps will enable us to further examine our conceptual framework, as well as the ability to examine the distribution of responses across individual items, the relationship between items, the relationship between our four domains, and most importantly how our domains are related to worker, occupational and workplace characteristics. As such, an opportunity exists for WorkSafe Victoria to also fund a similar survey which would both allow the further development of our measure to include workers from Victoria, and would also provide an opportunity to compare levels of our different domains of occupational health and safety vulnerability across three jurisdictions (Victoria, Australia; Ontario, Canada and British Columbia, Canada).

Recommendations for WorkSafe Victoria

Participants of focus groups noted that WorkSafe Victoria is already engaged in hazard surveillance, and that this survey captures information on both physical and psychosocial hazards, and on the employee's perception of the effectiveness of control measures for particular hazards. However, there is not currently any survey that we are aware of the routinely captures issues regarding employee perceptions of their employers commitment

to OH&S, their belief that their employer would act on safety issues if they were raised, or the level of consultation in relation to OH&S issues. These issues were seen by members of our focus groups as being pivotal to a workers risk of injury (OHS vulnerability). The inclusion of items, or a survey among workers to assess these areas would provide valuable information on OH&S risk and the level of adherence to the responsibilities of employers set out in the Victorian Occupational Health and Safety Act of 2004. As noted above, an opportunity currently exists for our measure to be developed further in the Victorian context, and would also allow for a comparison of the level of occupational health and safety across our domains of vulnerability between Victoria and the province of Ontario in Canada.

Conclusion

In conclusion in this project we have further developed a conceptual framework for measuring occupational health and safety vulnerability. The funding provided by WorkSafe Victoria, through ISCRR has enabled us to modify some of our OHS vulnerability dimension and develop a series of questions within each dimension. The development of this measure was identified as important given that there is not currently routinely collected information on workplace policies and procedures that demonstrate a commitment to OHS (at the worker level), level of consultation in relation to OHS, or an individual worker's capacity to ask question about, and participate in health and safety so as to ensure they are protected from hazards at work. Opportunities exist to further develop our measure in the Victorian context by administering a survey containing some of the items included in this report to a sample of Victorian workers. This would enable more information to be gathered about the relationship between individual items within domains, and the relationship between each of our domains with each other, and with worker, occupational and workplace characteristics. There would also be opportunities to compare levels of occupational health and safety vulnerability between the state of Victoria and the province of Ontario in Canada.

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