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A Workplace Evaluation of a Participative Hazard Identification and Risk Management Toolkit for the Work-Related Musculoskeletal Disorders

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EXECUTIVE SUMMARY

BACKGROUND

Work-related musculoskeletal disorders (MSDs) and stress-related mental health problems constitute major occupational health and safety problems that are rapidly increasing in importance (Safe Work Australia, 2015). Both health disorders are influenced by work-related psychosocial hazards (i.e. factors causing stress), but risks arising from psychosocial hazards are very poorly managed by current workplace risk management practices.

To address the current gaps in workplace psychosocial hazard risk management, it is necessary to have a comprehensive diagnosis of the unique MSD hazard profiles of different jobs. The APHIRM toolkit was designed to enable this, based on results from a survey covering both physical and psychosocial hazards and an MSD risk indicator. The overarching aim of the current project was to evaluate the effectiveness of APHIRM in manufacturing employees. A secondary aim was to expand the current set of hazards and MSD outcome measures to include hazard items such as exposure to bullying and occupational violence, exposure to vibration, and a stress-related mental health outcome.

The original intention was for this project to be a randomised control trial, but the project commenced at the beginning of the COVID-19 pandemic in 2020, and this significantly impacted recruitment. Early in the project and in consultation with WorkSafe Victoria, a decision was made to include only implementation sites and not attempt to recruit further control sites after the original two dropped out.

The impact of running this project during the COVID-19 pandemic has been significant, but despite the challenges the project has delivered meaningful data and a newly expanded toolkit will be released in early 2023.

The specific aims and objectives of this project were to:

1. **Develop and field-test amendments to the APHIRM Toolkit survey, to enable its future use in managing stress-related mental health risk (MHDs) as well as risk of musculoskeletal disorders (MSDs).**

   Objective A: *Amend toolkit online survey*: to include a measure of workers' stress levels and additional items to ensure coverage of key hazards related to stress-related MHDs.

   Objective B: *Field-test new survey items* (all sites). In selected high-risk jobs in all participating workplaces: collect online data and conduct offline analyses to identify the hazards most strongly predictive of workers' stress levels. Obtain feedback on the new items from a sub-sample of workers surveyed.

2. **Process evaluation: evaluate quality of toolkit implementation** (intervention sites)

   Objective C. Document and review any problems encountered during toolkit implementations and evaluate quality of each implementation; identify the main contextual factors influencing implementation quality; investigate possible linkages between implementation quality and the toolkit's likely effectiveness.

3. **Confirm validity of toolkit risk indicators – dependent on nature and extent of workplace records*.**

   Objective D. Determine relationships between (a) stress levels and the incidence of documented MHDs (all sites), and (b) discomfort/pain levels and the incidence of documented MSDs (all sites).

4. **Conduct preliminary evaluation of outcomes of toolkit implementation**.

   Objective E. Evaluate effectiveness of toolkit procedures in reducing MHD and MSD risks within the project timeframe (intervention sites).

METHOD

This project focused on medium to large organisations in the manufacturing sector. Three large national organisations participated in the project, one from each of the following manufacturing sectors: pharmaceutical, food, and heavy vehicle. The APHIRM Toolkit was implemented in each organisation with a total of 10 workgroups participating. Eight workgroups consisted of factory workers (n = 74) and two workgroups consisted of tradespeople (n = 46). Only eight workgroups completed both rounds of survey data collection.

A summary of each of the project aims and the results is provided below.

Aim 1

An additional 5 hazard items and 12 stress-related outcome measures were added to the existing APHIRM Toolkit survey. Survey items were drawn from the Copenhagen Psychosocial Questionnaire (COPSOQ) and wording was adapted to suit the present context (as required to achieve good content validity). The hazard items which related to vibration were developed from a review of existing guidance material. Survey items were then incorporated into the existing APHIRM Toolkit software. Feedback was collected on the new items and the supporting guidance material. The expanded toolkit will be publicly available in early 2023. Future users of the APHIRM toolkit will be provided with three options to (1) address MSD risk, (2) address stress-related mental health risk and (3) address MSD and stress-related mental risk concurrently.

Aim 2

The process evaluation of the current project highlighted some key barriers to implementation of the toolkit. They included lack of resources (time to implement, lack of communication between workgroups, middle managers and senior managers, lack of OHS skill/knowledge among OHS advisors/business partners, and lack of integration into current systems. These findings will be used to inform improvements to guidance on future implementation of the APHIRM Toolkit.

Aim 3

We were unable to collect sufficient workplace records on MSDs and stress-related MHDs to confirm predictive validity (one aspect of criterion validity) of toolkit risk indicators. Evidence from this project does support concurrent, content and construct validity of the APHIRM Toolkit measures.

Aim 4

Although outcome evaluation was attempted, challenges arose due to the impact of COVID-19 on project timelines and the failure of participating organisations to implement some action plans. Although some changes were identified in hazard scores for workgroups and a range of good-quality risk controls were implemented by organisations, further longitudinal studies are needed to establish predictive validity of the measures.

NEXT STEPS

Implementation of this toolkit within an organisation requires support and commitment from senior leaders within the organisation. 'Implementation science' evidence is clear that to achieve successful outcomes from such changes, the processes that support the implementation of changes are as important as the nature of the changes themselves.

To support good-quality implementation and thereby achieve successful outcomes, the proposed future toolkit evaluation project will require industry partners that (a) have senior managers who are fully committed to achieving more effective risk management, and who are both willing and able to resource it adequately; and (b) have sufficiently high levels of "readiness for change" among personnel responsible for direct management of implementation procedures. Without these prerequisites, toolkit *implementation* may be of poor quality, as evidenced in some of the workgroups in the current project. A proposal for such a project will be developed and submitted later in 2023.

BACKGROUND

WORK-RELATED MUSCULOSKELETAL AND MENTAL HEALTH DISORDERS

Work-related musculoskeletal disorders (MSDs) are the largest OHS problem in many countries (Bevan, 2015), including Australia, where their annual total costs are calculated to be over $24 billion (Safe Work Australia, 2015). Stress-related mental health disorders (MHDs) constitute a second major workplace problem that is rapidly increasing in importance (Safe Work Australia, 2015). Both these health disorders are influenced by work-related psychosocial hazards (factors causing stress), but risks arising from psychosocial hazards are very poorly managed by current workplace risk management practices (Oakman et al., 2018).

Our recent research on Australian workplace MHD risk management practices found that workplaces rely heavily on strategies to support individual workers who are experiencing difficulties, rather than addressing risk at its workplace sources; that is, physical (manual handling) and psychosocial hazards (Oakman et al., 2018). In the case of MSDs, current practices largely ignore risk from work-related psychosocial hazards, despite the large body of research evidence that these hazards should be managed along with physical hazards (Eatough et al., 2012; Gerr et al., 2013; Gerr et al., 2014). For both MHDs and MSDs, current workplace strategies also fail to enable adequate worker participation, despite research showing that this is an important requirement (Burgess-Limerick, 2018; van Eerd et al., 2010). Further, there is a very low level of workplace compliance with the hierarchy of risk control, despite evidence that compliance achieves more effective risk reduction (Macdonald & Oakman, 2015).

A critical reason for these large evidence-to-practice gaps has been the absence of risk management tools that reflect research evidence and are suitable for routine workplace use (Barrero et al., 2009; David, 2005; Macdonald & Evans, 2006; Macdonald & Oakman, 2015; Roman-Liu, 2014; Takala et al., 2010; Whysall et al., 2004). The importance of this deficiency was confirmed by our recent research on 'Barriers to more effective prevention of work-related musculoskeletal and mental health disorders' (Oakman & Macdonald, 2019). The existing APHIRM Toolkit addresses this deficiency in the case of MSD risk management; the proposed project will amend the toolkit so that it also facilitates MHD risk management.

A PARTICIPATIVE HAZARD IDENTIFICATION AND RISK MANAGEMENT (APHIRM) TOOLKIT

This toolkit was designed to enable comprehensive diagnosis of the unique MSD hazard profiles of different jobs, based on results from a survey covering both physical and psychosocial hazards and an MSD risk indicator. Workers participate in developing risk control actions that are customised to their job's specific hazard profile and that target risk at its main sources, following online guidance which has amended the risk control hierarchy to cover both psychosocial and physical sources of risk. To promote its uptake and sustainable use in ordinary workplaces, it was formulated in accord

with a framework developed by the World Health Organization, and follows implementation science principles as summarised in the Quality Implementation Framework (Oakman & Macdonald, 2019). For further details see **www.aphirm.org.au**.

For each targeted job, members of the workplace Risk Management Team (RMT) are guided by the toolkit's interactive online procedures through the following steps (see Figure 1). They repeat this cycle annually.

- Survey workers (e.g. via their smartphones or paper-based if required) to quantify MSD risk level in terms of a validated discomfort/pain score (Macdonald et al., 2008), the self-reported incidence of any absence from work due to MSD pain (Rasmussen et al., 2013), and the severity of each of a comprehensive set of work-related physical and psychosocial hazards.
- Identify the subset of main hazards that are most closely linked to MSD risk level for that job, based on automated calculations by online toolkit software of hazard severity levels *and* correlations between hazard severity and discomfort/pain. Results are reported to toolkit users by automated online modules.
- For each main hazard, identify specific local causes and possible risk control actions to reduce risk – based on workers' responses (online and in workshops) to hazard-specific questions.
- Draft an action plan, using hazard-specific guidance (Guide to Risk Control Action document is provided in the toolkit) to maximise compliance with the hierarchy of risk control in order to maximise effectiveness.
- Brief general managers on the action plan, highlighting the importance of integrating implementation of risk control actions with existing business practices to promote their sustainability.
- Monitor and evaluate resultant actions and changes, based on feedback from workers and their managers.
- Evaluate outcomes, based primarily on comparison of initially measured MSD risk and hazard profiles with those measured at the start of the risk management cycle (first bullet point above). Satisfaction ratings by workers and their managers are also considered.

EXPANSION OF TOOLKIT MEASURES

To expand the toolkit measures to include a stress-related mental health outcome, a review of potential measures was undertaken. There are very few publicly and freely available measures that are suitable for workplace use. A review of workplace physical and psychosocial hazard identification tools identified that COPSOQ was the most highly published validated tool that was freely available (Oakman et al., 2022). The current APHIRM Toolkit includes several measures from COPSOQ (Burr et al., 2019), so it was decided to trial the stress scale from that tool in the current project.

Incorporating a stress outcome measure meant that some additional psychosocial hazard measures were needed to cover bullying and harassment, as these have been identified as important factors in

workplace stress. For these measures, we reviewed a range of guidance materials and developed three new hazard assessment items that address sexual harassment and bullying. Each of these items includes a brief explanation of key words in the question; wording of the questions and associated explanations was based on review of research and existing questionnaires that specifically address this topic. The questions are:

- *Have you OR someone else at your workplace experienced workplace aggression or violence by a co-worker, manager, or member of the public?*
  Workplace aggression or violence includes threats of violence; angry shouting or finger-pointing or invasion of personal space; intimidating new/young workers (e.g. hazing); and actual physical attacks, including by coughing or spitting.

- *Have you OR someone else at your workplace been bullied by a co-worker, manager, or member of the public?*
  Bullying includes repeated unpleasant teasing, or repeated actions or words that harass, humiliate, or unfairly target or exclude someone – in person or via social media, texts, etc.

- *Have you OR someone else at your workplace been sexually harassed by a co-worker, manager, or member of the public?*
  Sexual harassment is unwelcome sexual comments or actions – in person or via social media, texts, etc.

Respondents could answer using the following choices: Never, A Few times, Monthly, Weekly, Daily.

Vibration has been associated with increased MSD risk but was not included in the original version of the toolkit. To address this, an additional item on vibration was included.

In reviewing COPSOQ III as part of this project, we identified an additional item of relevance to the expanded toolkit – 'unpleasant arguments or conflicts at your workplace' (Burr et al., 2019).

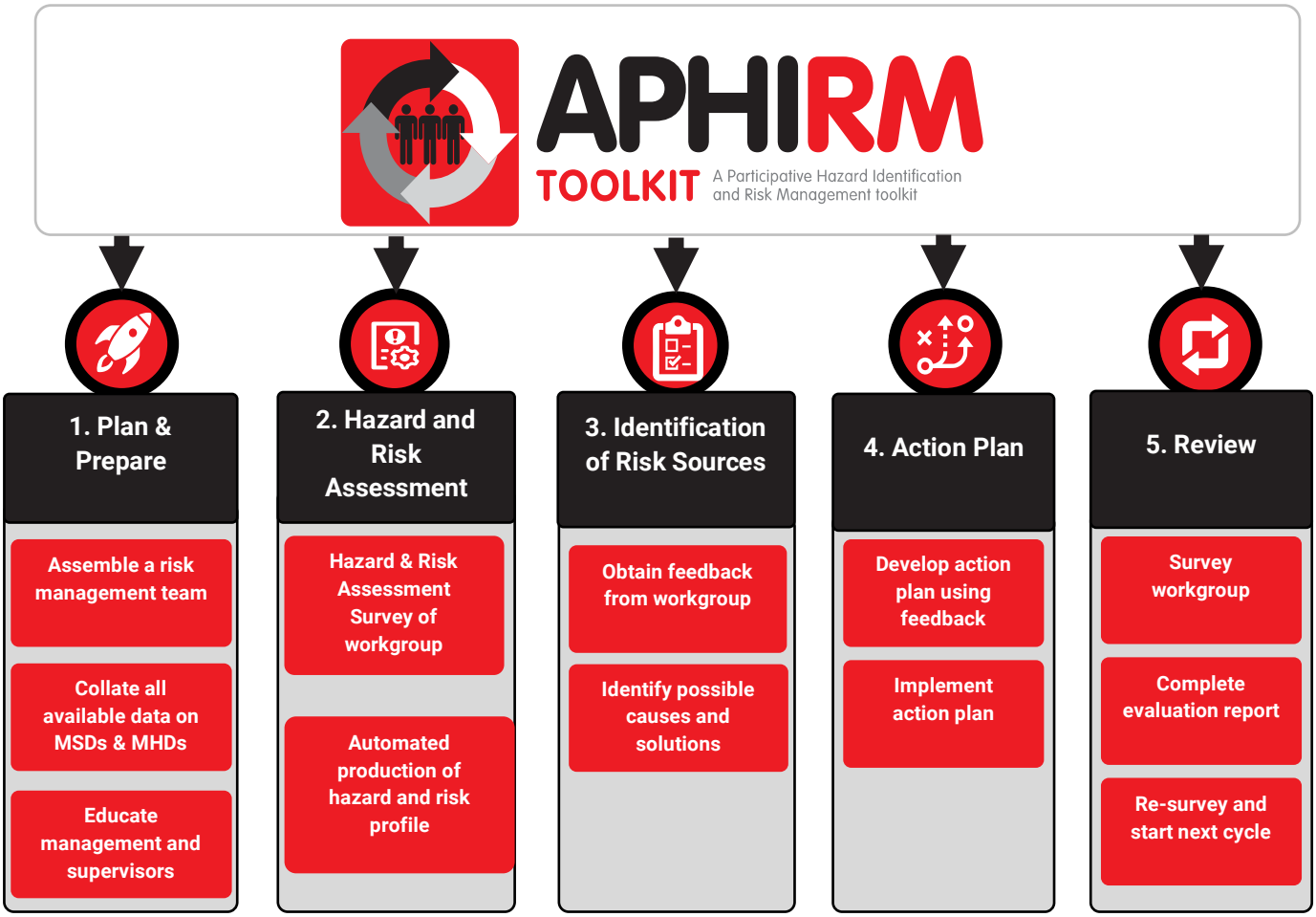

Figure 1: The APHIRM Toolkit process

AIMS & OBJECTIVES

The aims and objectives of this project were to:

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   Objective A: ***Amend toolkit online survey*****:** to include a measure of workers' stress levels and additional items to ensure coverage of major sources of risk for stress-related MHDs.

   Objective B: ***Field-test new survey items*** (all sites). In selected high-risk jobs in all participating workplaces: collect online data and conduct offline analyses to identify the hazards most strongly predictive of workers' stress levels. Obtain feedback on the new items from a sub-sample of workers surveyed.

2. **Process evaluation: evaluate quality of toolkit implementation** (intervention sites).

   Objective C. Document and review any problems encountered during toolkit implementations and evaluate quality of each implementation; identify the main contextual factors influencing implementation quality; investigate possible linkages between implementation quality and the toolkit's likely effectiveness.

3. **Confirm validity of toolkit risk indicators – dependent on nature and extent of workplace records**[1,2]

   Objective D. Determine relationships between (a) stress levels and the incidence of documented MHDs (all sites), and (b) discomfort/pain levels and the incidence of documented MSDs (all sites).

4. **Conduct preliminary evaluation of outcomes of toolkit implementation**.

   Objective E. Evaluate effectiveness of toolkit procedures in reducing MHD and MSD risks within the project timeframe (intervention sites).

RECRUITMENT STRATEGY

The manufacturing sector was identified by WorkSafe Victoria as a priority target area for MSD risk reduction. This project focused on medium to large manufacturing organisations, and recruitment occurred from March to July 2021. WorkSafe Victoria circulated an advertisement, asking interested organisations to register interest on a website, to various industry groups and the Victorian Chamber of Commerce and Industry. The Australian Manufacturing Workers Union was also contacted and asked to distribute the advertisement flyer, and LinkedIn was used to advertise the study. To participate in the project, organisations were required to:

- be in the manufacturing sector
- have over 50 employees
- be able to implement the APHIRM Toolkit in three workgroups of >20 workers
- have sites located in Victoria.

Twenty organisations contacted the research team via the online expression of interest registration form. Of these, five were recruited. Three organisations were rejected as they were not in the manufacturing sector, five organisations did not respond to follow-up contact, two organisations were too small, three organisations did not have the time to commit, and two organisations did not have sites in Victoria (Figure 2).

Initial contact with recruited organisations was made via the OHS Manager at a State or National level. Three organisations then delegated responsibility for project implementation to site-level OHS advisors. Organisations were randomly allocated to the intervention or control group. Organisations in the intervention group (n = 3) nominated two employees to attend an APHIRM Toolkit training workshop, which was held online due to COVID-19 lockdown restrictions. Ongoing restrictions also prevented site visits and face-to-face communication with participants, which created challenges for engaging participants. Both control groups withdrew from the study within the first three months of the project. One organisation had staffing difficulties and lacked the resources to continue participation. The other organisation had severe production challenges due to supply chain issues, and was forced to close operations.

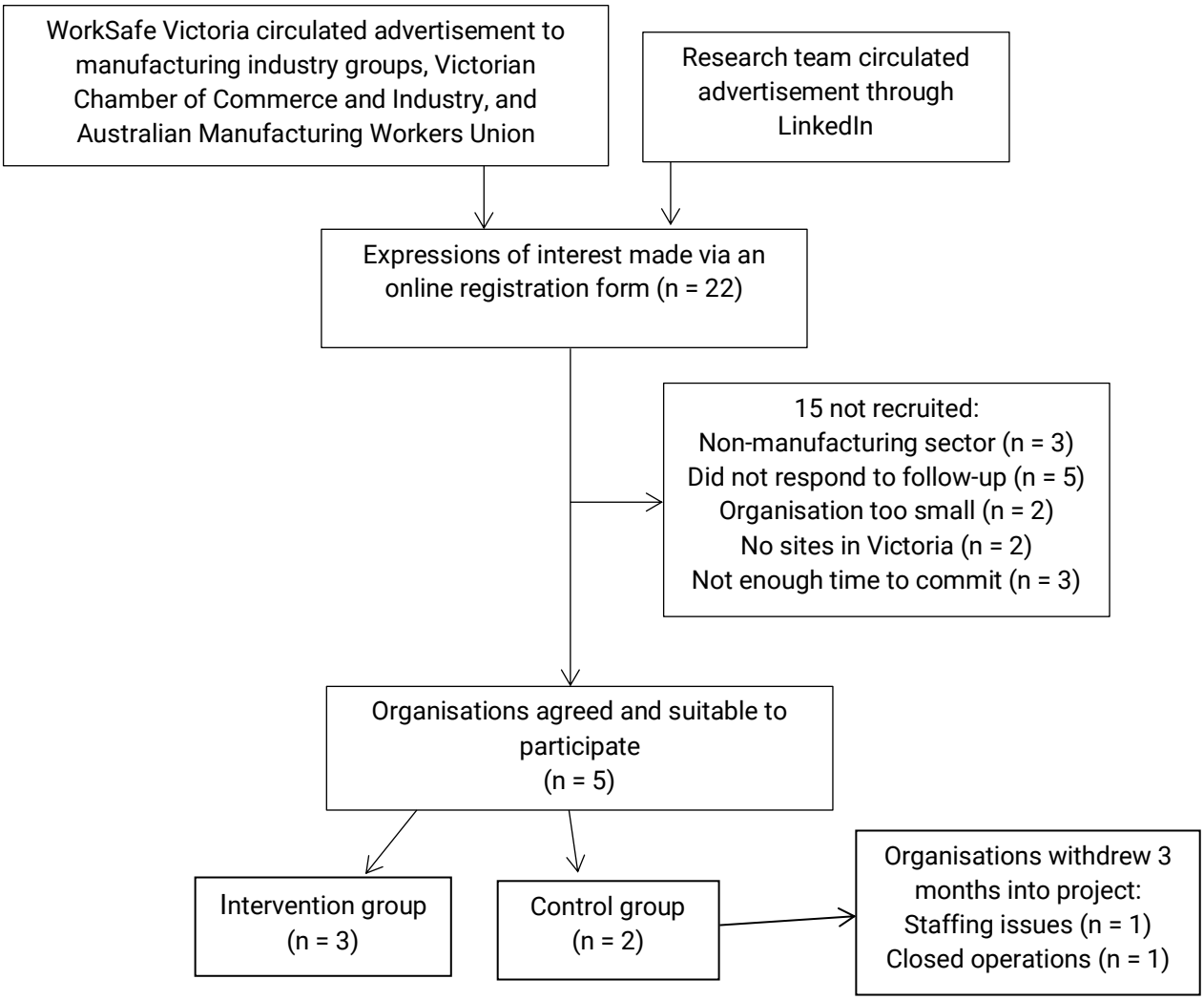

Figure 2: Recruitment strategy

PARTICIPANT DEMOGRAPHICS

Three large national organisations participated in the project, one from each of the following manufacturing sectors: pharmaceutical, food, and heavy vehicle. Two organisations operated a 24-hour production line. The data collection process is outlined in Figure 3.

The APHIRM Toolkit was implemented in each organisation with a total of 10 workgroups participating (refer to Table 1). Eight workgroups consisted of factory workers (n = 74) and two workgroups consisted of tradespeople (n = 46). However, Organisation A did not proceed with one of the workgroups that was located off-site (warehousing), due to difficulties in coordinating the implementation. Organisation B also did not proceed with one of its workgroups (night shift workers), due to logistical challenges in communication.

Participants using the online APHIRM Toolkit questionnaire are offered questions on providing demographic data (age and gender). This section of the survey is optional, in recognition that some respondents may not feel comfortable providing that data even though it is not provided to the workplaces. The demographic data is available only to the La Trobe University team, for research purposes. The paper version of the questionnaire did not have these questions. Hence, we are unable to report demographic data for the two organisations that had a 'no mobile phone' policy which prevented use of the online survey. Demographics of participating workers are described in Table 2.

Table 1: Summary of participant organisations

	Initial contact	**RMT lead**	**No. workgroups**	**Workgroup profile**
Org A	State HSE Manager (5 yrs in role, Grad Dip OHS)	Site HSE advisor (promoted to role from Production Manager, undertaking Cert IV OHS)	3	Factory operators WG 1: machine operators & bak WG 2: machine operators WG 3: warehouse workers
Org B	National HSE Manager	Site HSE advisor (engineer background, promoted to role internally, 3 yrs in role, undertaking OHS post-graduate qualification)	4	Factory operators WG 1: machine operators WG 2: machine operators WG 3: machine operators WG 4: machine operators
Org C	State HR business partner	State HR business partner (HSR training only formal OHS qualification)	3	Tradespeople WG 1: spray painters WG 2: fitters WG 3: welders

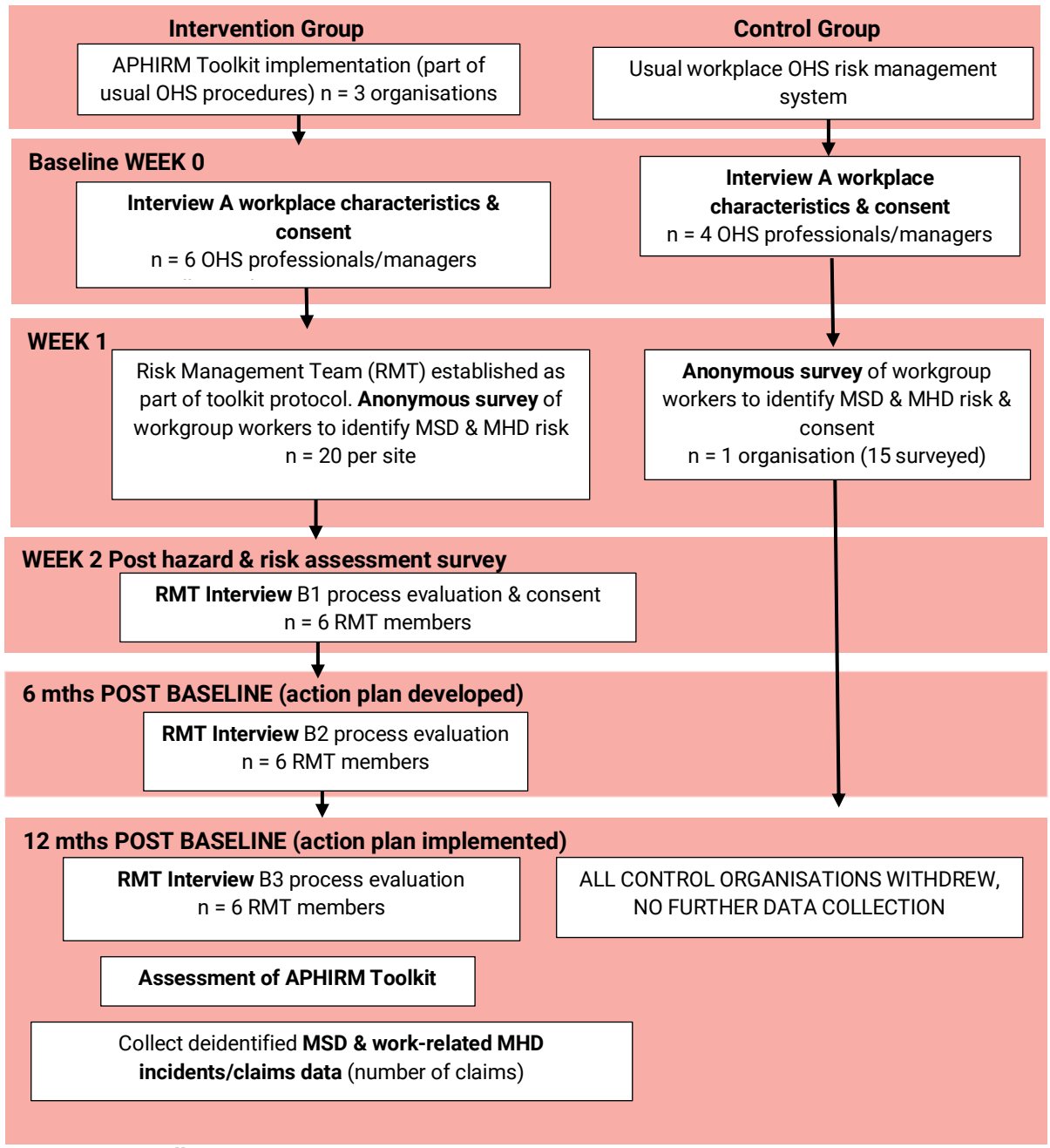

Figure 3: Data collection process

Table 2: Workgroup participant demographics (total respondents completing hazard identification surveys 1 & 2)

	No. of respondents	%
Gender		
Female	26	13
Male	169	85
Other	5	3
*No data provided **	*169*	
Age		
18–24	7	4
25–34	35	18
35–44	48	24
45–54	58	29
55–64	44	22
65+	5	3
*No data provided**	*172*	

* Paper version of survey did not enable collection of demographic data. In the online survey, demographic questions were optional.

Actions and results are reported below, separately for each aim.

AIM 1. TOOLKIT AMENDMENT AND FIELD TESTING

> **Objective A: Amend toolkit online survey** to include a measure of workers' stress levels and additional items to ensure coverage of major sources of risk for stress-related MHDs.
>
> **Objective B**: **Field-test new survey items** (all sites). In selected high-risk jobs in all participating workplaces: collect online data and conduct offline analyses to identify the hazards most strongly predictive of workers' stress levels. Obtain feedback on the new items from a sub-sample of workers surveyed.

An additional five hazard items and 12 stress-related outcomes measures were added to the existing APHIRM toolkit survey (see Table 3). Survey items were drawn from the Copenhagen Psychosocial Questionnaire (COPSOQ) and wording adapted to suit the present context (as required to achieve good content validity). The hazard item related to vibration was developed from a review of existing guidance material. Survey items were then incorporated into the existing APHIRM Toolkit software.

Table 3: Additional new survey items

Hazard items (5 new items)	**Response scale**
Work with vibrating tools OR in a vehicle that vibrates	Never/hardly ever, Rarely, Sometimes, Often, Almost all the time
How often do you find	
There are **unpleasant arguments or conflicts** at your workplace?	Never, A few times, Monthly, Weekly, Daily
During the last 6 months, have you OR someone else at your workplace experienced workplace aggression or violence by a co-worker, manager or member of the public? Workplace aggression or violence includes threats of violence; angry shouting or finger-pointing or invasion of personal space; intimidating new/young workers (e.g. hazing); and actual physical attacks, including by coughing or spitting. **During the last 6 months, have you OR someone else at your workplace been bullied by a co-worker, manager or member of the public?** Bullying includes repeated unpleasant teasing, or repeated actions or words that harass, humiliate, or unfairly target or exclude someone – in person or via social media, texts, etc. **During the last 6 months, have you OR someone else at your workplace been sexually harassed by a co-worker, manager or member of the public?** Sexual harassment is unwelcome sexual comments or actions – in person or via social media, texts, etc.	Never, A few times, Monthly, Weekly, Daily
Stress measures (12 items)	**Response scale**
During the last 6 months, how often have you … Felt worn out? Been physically exhausted? Been emotionally exhausted? Felt tired? Had problems relaxing? Been irritable? Been tense? Had problems concentrating? Found it difficult to think clearly? Had difficulty in taking decisions? Had difficulty with remembering? Had difficulty in falling or staying asleep?	Never, Occasionally, Sometimes, Often, Almost always

Qualitative feedback on the new survey questions, on new sections in the 'Guide to selecting risk control actions', and on overall satisfaction with survey procedures was obtained from OHS managers, workers and members of the APHIRM risk management team via face-to-face and online semi-structured interviews. There were eight participants – three managers, two supervisors (who also worked on the factory floor) and three OHS consultants. In addition, one worker approached researchers to provide impromptu feedback.

Our questions and a summary of responses are shown in Tables 4 and 5. No major issues were identified. Participants provided positive feedback about the new stress measure items. However, one participant (worker) was not sure if the questions applied to time at work or after work hours. The same participant suggested adding a question related to the stress of staying awake at work, as they work a 2am–11am night shift and find it stressful to stay awake when doing the repetitive factory operator work. (NB: It is expected that this problem would be identified via the toolkit's data analysis algorithm, which automatically calculates the relationship between responses to the survey item on highly repetitive work and the stress score.)

Table 4: Interview questions about new questionnaire items

Evaluation of new items in the APHIRM toolkit questionnaire	Summary of responses
How easy or difficult was it to understand this question? Please explain/suggested changes	Fine
Did the definitions, written underneath the question, make sense? Suggested changes?	Violence/aggression: Unsure of 'hazing' meaning, add pushing and shoving
Did you understand how the rating system worked? Suggested changes?	Yes, no problems identified
Did you feel comfortable answering those questions? If not, why not? Suggested changes?	Factory guys may not answer honestly about 'taking time off work due to stress' due to macho culture.

Table 5: Interview questions about the guidance for new risk controls

Question	Responses	
	Yes	No
Did you look at the 'Guide to selecting risk controls' which is contained in the toolkit? If not, why not?	4	4 = no time, didn't know about it
Did you use the Guide? If so, was it helpful?	6	2 = no time
Did you understand the suggested actions for the new items?	8	
Did you find the suggested actions useful?	8	
Do you have any other examples you could add?	1 = encourage people to seek help if feel uncomfortable about a situation before it escalates to more serious harassment	7

Hazard and Risk Assessment survey responses from each workgroup were then analysed to examine the response rates of the new hazard items and the stress outcome measure to identify if there were any patterns of non-responding for the new items. It was found that response rates for the current hazard items and physical discomfort outcome measures were 94–96% on average. For the new hazard measures, the average response rate was 93%, and for the mental health outcome measures the range was 92–94%. No statistically significant difference was found between the new measures and existing ones.

Table 6 shows the Cronbach's alphas for each of the APHIRM factors, based on the original items and recalculations using the current data, and new additional items as highlighted by an asterisk (*). The APHIRM factors were calculated using existing data (see document "Validity of the APHIRM Toolkit Hazard and Risk Assessment Survey"). For the current analysis, the following assumptions were made. Vibration was added to Physical Task Demands Whole Body and "There are unpleasant arguments or conflicts at your workplace" was added to Role Conflicts & Emotional Demands. The three items on bullying and harassment were considered as a new factor which will be confirmed when more data is available. The addition of the new items did not have a negative impact on construct reliability.

Table 6: Reliability of hazard factors (existing and new items)

APHIRM factor	APHIRM Toolkit item	Cronbach's α Original APHIRM data	Cronbach's α Manufacturing data
1A. QSL: Quality of Supervision & Leadership (10 items)	Arguments/problems are sorted out in a fair way	0.92	0.93
	People here are treated fairly		
	Employees can trust information that comes from management		
	Work is shared out fairly between people		
	Support from supervisor		
	Your work is noticed and appreciated by your supervisor or manager		
	Senior management attitudes		
	Communication with supervisor		
	Feedback on performance		
	Consultation about changes in your job		
1B. JDO: Job Development Opportunities (7 items)	Opportunities for learning new skills	0.85	0.82
	Opportunities to use your skills		
	Amount of variety in the work you do		
	Opportunities for promotion		
	Sufficient training for the job		
	Flexibility of working hours		
	Influence on decisions about your work (e.g. what you do, how you do it, how much of it)		
2. PTDWB: Physical Task Demands Whole Body (8 items)	Push or pull things	0.88	0.85
	Squat or kneel while you work		
	Lift or carry things that are heavy		
	Work in twisted or awkward postures		
	Work with arms raised above shoulder level		
	Work so hard or fast that you get a little out of breath		
	Work with your body bent forward		
	Work standing in one position		
	Work with vibrating tools/equipment OR in a vehicle that vibrates*		
3. WQP: Workload: Quantity & Pace (6 items)	Have to work at a fast pace for the whole shift	0.85	0.78
	Too much work to do in the available time		
	Have to go faster to meet deadlines or target quotas		
	Have to work very fast		
	Get behind with your work		
	Have enough time to complete all your work well		
4. RCED: Role Conflicts & Emotional Demands (5 items)	People disagree about the correct way to do some things	0.71	0.78
	As part of your work, you have to help people who are upset or unhappy		
	Some parts of your job seem unnecessary or a waste of time		
	Your work puts you in emotionally disturbing or upsetting situations		
	People take short cuts to get things done, rather than use correct procedures		
	There are unpleasant arguments or conflicts at your workplace*		
5. MCSW: Meaningful & Clearly Specified Work (4 items)	The work you do is important	0.78	0.72
	Your work is meaningful … doing it well makes a difference to people		
	You know exactly what work you are expected to do and how to do it		
	Your work goals and responsibilities are clear		
6.PE: Physical Environment (6 items)	Physical environment hazards (noise, light, temperature, etc)	0.83	0.82
	Facilities for breaks, meals		
	Exposure to physical danger		
	Work stations and work space		
	Equipment, tools, IT or software		
	Health & safety		
7. PTDHF: Physical Task Demands Hands/Fingers (3 items)	Use your hands or fingers to hold or grip things	0.67	0.64
	Keep repeating the same movements, every minute or so		
	Have to make very precise movements to place things accurately		

8. CR: Co-worker Relationships (2 items)	How well you work with your co-workers	0.87	0.85
	How well you get on with your co-workers		
9. PS: Prolonged Sitting (1 item)	Work sitting still without moving around	NA	NA
10. BH: Bullying & Harassment (3 items) NB: this will be confirmed via factor analysis with a larger dataset when available	Workplace aggression / violence*	NA	0.74
	Workplace bullying*		
	Workplace sexual harassment*		

* New items in the expanded toolkit

AIM 2. EVALUATION OF TOOLKIT IMPLEMENTATION PROCESSES

> **Objective C.** Document and review any problems encountered during toolkit implementations and evaluate quality of each implementation; identify the main contextual factors influencing implementation quality; investigate possible linkages between implementation quality and the toolkit's likely effectiveness.

The expanded APHIRM Toolkit was initially implemented in five manufacturing organisations. However, two organisations withdrew early in the project: one organisation had staffing issues and the other closed operations due to COVID-19-related supply chain issues. LTU researchers supported implementation through regular site visits, attending risk management meetings and assisting with APHIRM survey data collection.

Qualitative data for process evaluation were collected through observation and semi-structured interviews using a schedule based on the Normalisation Process Theory (NPT) framework domains (summarised in Table 7). An interview schedule was devised by the research team, with questions based on this framework, to obtain feedback. Data were then analysed using the NPT framework to evaluate the process of toolkit implementation (May et al., 2009).

Table 7: Normalisation Process Theory framework summary

NPT domains	Description
Coherence	The ways that people make sense of the work of implementing and integrating a complex intervention (workgroup understanding what it is about)
Cognitive participation	How they engage with the intervention (the buy-in to support the implementation)
Collective action	How they enact the intervention (workers participating in the process)
Reflexive monitoring	How they appraise its effects (feedback on the process and effects of the intervention)

A total of 23 interviews were conducted with participants from each of the three organisations at three time points during the project. Interviews ranged from 11 to 60 minutes. Responses from the interviews were categorised into Yes, No and Unclear for each of the NPT framework domains. Table 8 presents results separately for each organisation. The greatest challenges were encountered in the Collective Action domain, particularly in relation to support and competing priorities.

Table 8: Implementation evaluation summary

	Org A	Org B	Org C
Coherence (makes sense)			
Expected APHIRM to be useful	O	G	G
Workers & management understood the purpose & process of APHIRM	G	G	G
APHIRM fits within the overall goals & activity of the organisation	G	G	G
Cognitive Participation (commitment and engagement)			
Sustained leadership to drive APHIRM implementation	G	G	G
Senior management support for adoption of APHIRM	G	G	G
General attention to/acceptance of APHIRM in workplace	G	O	G
Collective Action (facilitating use of APHIRM)			
Extra personnel & resources available (e.g. time for survey & RMT meetings)	R	G	G
Major competing priorities	R	O	R
Usability & compatibility with other business systems	G	G	G
RMT functions effectively	O	O	O
Action plan implementation supported	O	O	O
Reflexive Monitoring (value of APHIRM)			
Support for action implementation (incl. resources)	R	G	G
Staff satisfied with APHIRM implementation	G	O	–
Improvements suggested	R	G	G
Valued by workers	G	G	O
Valued by management	G	O	G
Perceived benefits of using APHIRM	G	G	G

G [green] = more Yes than No
O [orange, Unclear] = equal No and Yes
R [red] = more No

Further analysis of interview data was undertaken to identify key barriers and enablers of implementation within each of the four NPT domains (Table 9). The largest number of barriers (7) was reported for the Collective Action domain followed by Reflexive Monitoring (4), Cognitive Participation (4) and Coherence (1). Details of relevant factors are provided in Appendices A and B.

Table 9: Summary of factors affecting implementation

Barriers	Enablers
Lack of communication with workgroup Previous or current negative experiences with management Not enough resources Lack of faith in OHS system Lack of communication between floor and management Lack of resources for action implementation Lack of organisation culture to support change in attitude/engagement of workers Negativity about actions Previous negative experiences	Good resources and guidance in the toolkit Communication from RMT lead Support of senior management Participative approach of toolkit – consulting workers Communicating with workgroup Maintain momentum so can see outcomes Toolkit usability (e.g. easy to set up and use) Support of line managers Complements existing system/approach to safety
Lack of communication from senior management	Involve multiple departments from the organisation
COVID-related issues	Perceiving benefits - establishing good rapport - Identifying hazards that wouldn't normally expect – proactive approach and not relying on safety checklists and incident reporting - Engaging management in MSD risk management
Lack of senior management support	Regular safety meetings
Industrial relations issues	Organisational support for action implementation
Lack of commitment from some RMT members	
Competing commercial priorities	

A manager and HSE advisor from each of the organisations (n = 6) were asked if they expected to continue implementation of the toolkit. Consistent with issues identified with 'Collective action', there were conflicting responses within each of the organisations (Table 10). In organisation A, the HSE advisor was not planning to continue the implementation of APHIRM Toolkit; however, their manager did plan to continue using the toolkit due to its holistic approach and automated reporting. In organisations B and C, the HSE advisors both wanted to continue using the toolkit due to its focus on the worker perspective and ability to identify hazards previously not recognised. However, the production managers (who had no decision-making authority) in each organisation did not expect their organisation to continue use of the toolkit. HSE advisors in organisations B and C reported that the upcoming changes to OHS regulations, involving the need to address psychosocial hazards, was an external influence on their decision to continue the use of APHIRM. However, organisation B said its decision to focus on psychosocial hazards pre-dated the announcement of regulation changes.

Table 10: Ongoing toolkit use

	Senior Manager	Production Manager	HSE Adviser	Reported reason for not continuing	Observed barriers	Observed facilitators
Org A	Yes	N/A	No	No extra time allocated, too many other demands	High-pressure environment 24-hour food production, staff shortages, HSE advisor limited understanding of risk management – APHIRM not incorporated into safety system	Senior manager support
Org B	N/A	No	Yes	Too many competing priorities (new systems, production pressures)	Lack of understanding by middle management. Focus on identification of hazards but not evaluation (this applies to all sites – limited 12-month follow-up)	Highly driven and organised HSE advisor
Org C	N/A	No	Yes	Not enough staff resources to coordinate implementation	Lack of understanding by middle management	Integrated toolkit into an existing safety committee. Very engaged line managers

AIM 3. VALIDITY OF TOOLKIT RISK INDICATORS

Aim 3 of this project was to confirm the predictive validity of toolkit risk indicators (i.e. the musculoskeletal discomfort/pain score and the new stress score) in accord with Objective D.

> **Objective D.** To determine (a) the relationship between surveyed workers' stress levels and the incidence of documented mental health incidents or claims across all sites; and (b) the relationship between surveyed workers' discomfort/pain levels and the incidence of documented MSDs across all sites.

As previously highlighted, workplace documentation of both MSD and MHD claims and associated information about the work performed by affected individuals was inadequate to achieve these objectives. This outcome was flagged as a possibility in the project application, which specified that achievement of this aim was "dependent on nature and extent of workplace records".

However, criterion validity has two components – predictive and concurrent. As outlined above, predictive validity could not be established but concurrent validity was examined; results are shown in Table 11. Concurrent validity is demonstrated when two assessments agree or a new measure is compared favourably with one that is already considered valid. For this purpose, the new hazard items were examined in relation to the stress outcome which is drawn from COPSOQ which has been validated and is a widely used and accepted measure. All four new psychosocial hazard scores are significantly related to the stress measure, providing evidence to support concurrent validity.

Table 11: Univariate associations between conflict, stress and harassment measures and stress outcome score

Measure	*B*[a] (SE *B*)
Workplace conflict	
Almost never	Ref.
Seldom	4.40* (1.36)
Sometimes	6.74* (1.29)
Often	10.33* (1.65)
Almost always	15.19* (2.76)
Workplace violence/aggression	
Never	Ref.
A few times	3.69* (1.14)
Monthly	10.78* (3.63)
Weekly	8.13* (2.80)
Daily	8.46 (4.77)
Workplace bullying	
Never	Ref.
A few times	7.04* (1.22)
Monthly	8.12* (3.79)
Weekly	8.34* (2.24)
Daily	9.58* (4.14)
Workplace sexual harassment	
Never	Ref.
A few times	10.98* (2.09)
Monthly	5.41 (6.57)
Weekly	15.01* (4.18)
Daily	-[b]

[a]Mean difference in stress score
[b]No observations
*Significant at the 0.05 level

On the basis of the results shown in Table 11, we will make some changes to the response categories for the questions on violence, bullying and sexual harassment. The new response choices will be: Never, Seldom, Sometimes, Often, Very often. These response categories will more closely reflect the response categories for other items in the survey. In addition, it would be expected that the responses for these items would be linear in nature; that is, high exposure would result in higher stress levels, as shown for the workplace conflict item. The responses show some inconsistencies and support the need for some changes. These will be monitored as further data is collected.

We have also developed a report on the nature of validity as it applies to each of the APHIRM Toolkit's hazard and risk assessment survey, based on this project. That report is entitled *Validity of the APHIRM Toolkit Hazard and Risk Assessment Survey.* It reviews evidence of the validity of each survey component – hazard assessment, discomfort/pain assessment, and stress assessment – and for each component it reviews evidence of construct, content and criterion validity.

The following is an extract from *Validity of the APHIRM Toolkit Hazard and Risk Assessment Survey*. A complete copy of that report is provided as a separate attachment; it is also freely available on the APHIRM Toolkit website.

VALIDITY OF THE APHIRM TOOLKIT'S STRESS SCORE

Construct and content validity. Occupational or work-related stress is a complex, multidimensional phenomenon defined by the World Health Organization as "the response people may have when presented with work demands and pressures that are not matched to their knowledge and abilities and which challenge their ability to cope" (World Health Organization, 2020). This WHO definition of stress reflects a large body of research which has concluded that: "The experience of stress is therefore defined by, first, the person's realisation that they are having difficulty coping with demands and threats to their well-being, and, second, that coping is important and the difficulty in coping worries or depresses them" (Cox et al, 2000, p.42). It has also been clearly established that chronically high stress increases the risk of 'burnout' with associated work performance deficiencies and health problems including MSDs (Edu-Valsania et al, 2022).

The new APHIRM survey scale to assess 'stress' was formulated to assess the construct as outlined above. All except one of its 12 items are from the following COPSOQ 'Health and Well-being' domain scales:

- *Stress* (3 items: problems relaxing, been tense, been irritable)
- *Cognitive Stress* (4 items: difficulty with thinking clearly, concentrating, making decisions, remembering)
- *Burnout* (4 items: worn out, physically exhausted, tired, emotionally exhausted).

The 12th APHIRM survey item is "Had difficulty in falling or staying asleep", which is from the *General Well Being Questionnaire* (GWBQ) that was used by Cox and colleagues to evaluate effects on workers of using WOAQ to improve psychosocial hazard management. This item was selected instead of the 4-item COPSOQ 'Sleeping Troubles' scale, aiming to keep survey length to a minimum. GWBQ (and WOAQ) items were developed for use in workplace risk management so their content validity was assumed to be adequate – confirmed by process evaluation during trialling in Australian manufacturing workplaces.

Factor analysis of the responses currently available from trialling this new APHIRM scale in manufacturing workplaces confirm its construct validity. As shown in Table 12, results identified three factors corresponding to the above three COPSOQ scales. The additional 'Difficulty Sleeping' item fell within the factor corresponding to COPSOQ *Cognitive Stress*, which is consistent with the known effects of insufficient sleep on cognitive capacities and performance.

Table 12: Factors identified by analysis of the APHIRM survey 'Stress' scale.

Factor	Survey item	Factor loading	Mean (SD)	Cronbach α
COPSOQ *Cognitive Stress* scale plus GWBQ *Sleeping Difficulties* item	Had difficulty in making decisions	.838	0.81 (0.901)	.895
	Had difficulty with remembering	.825	0.80 (1.003)	
	Found it difficult to think clearly	.824	0.92 (0.989)	
	Had problems concentrating	.766	1.09 (1.029)	
	Had difficulty falling or staying asleep	.536	1.14 (1.122)	
COPSOQ *Burnout* scale	Been physically exhausted	.890	1.59 (1.163)	.915
	Felt worn out	.872	1.66 (1.181)	
	Felt tired	.761	2.09 (1.104)	
	Been emotionally exhausted	.743	1.60 (1.199)	
COPSOQ *Stress* scale	Been irritable	.819	1.33 (1.185)	.900
	Been tense	.728	1.41 (1.170)	
	Had problems relaxing	.694	1.49 (1.167)	

Criterion validity. As discussed above in relation to the APHIRM discomfort/pain measure, it would be helpful to investigate criterion (predictive) validity in relation to workplace records of mental health-related incidents or claims records, since such evidence would be seen as highly relevant by workplace managers. Previous research on the criterion validity of the COPSOQ scales used in this APHIRM scale have demonstrated validity in terms of this kind of evidence: for example, the stress scale was found to be predictive of long-term sickness absence (Pejtersen et al, 2014). Measures of burnout have also been found to predict sickness absence (e.g. Peterson et al, 2011).

AIM 4. CONDUCT PRELIMINARY OUTCOME EVALUATION

Objective E: Evaluate effectiveness of toolkit procedures in reducing MHD and MSD risks within the project timeframe (intervention sites).

Changes in individual hazard scores are reported in Appendix C, separately for each workgroup. The initially identified top (worst) 10 hazards for each workgroup were compared with those identified 12 months after toolkit implementation. Hazard levels in a workgroup where there was a high level of engagement in toolkit implementation were compared with those in a workgroup with minimal implementation of their risk control action plan. High level of engagement was typified by an RMT leader who followed the toolkit process in a timely manner, communicating with all levels of the organisation to obtain a high survey response rate and completing each of the five stages within the 12-month cycle. Low engagement was characterised by an RMT lead who did not initiate each of the toolkit processes (required constant follow-up by the LTU research team), did not actively communicate with all levels of management, and did not complete each of the five stages. They only addressed the top five hazards and didn't fully implement the action plan. Table 13 shows that in the workgroup with the high level of engagement, only one of the initially identified top 10 hazards remained as one of the worst hazards after 12 months. By comparison, five of the initially identified top 10 hazards in the workgroup with low engagement and minimal implementation remained in the top 10 list after 12 months.

Table 13: Top 10 hazards

Top 10 MSD hazards – high engagement workgroup	
Survey 1	**Survey 2**
Often work hard/fast enough to get a bit breathless	Exposure to physical danger
Often work with twisted or awkward postures	Work can be emotionally disturbing or upsetting
Have to work very fast	Have to do some things that seem unnecessary
Often push or pull things with some force	Often work with body bent forward
Have to cope with upset/unhappy people	Arguments and problems not sorted out fairly
Opinions differ on 'correct' way to do some tasks	Low job satisfaction
Too much work for time available	People here are not treated fairly
Work at fast pace for whole shift	Not enough variety in the work
Poor balance between work and home life	Often lift or carry moderately (or very) heavy things
Problems with physical surroundings: noise, light, temperature etc	**Have to cope with upset/unhappy people**
Top 10 MSD hazards – low engagement workgroup	
Survey 1	**Survey 2**
Keep repeating same movements/actions, very repetitive	Lack of promotion opportunities
Work not appreciated by supervisor or manager	**Often push or pull things with some force**
Often work with twisted or awkward postures	**Keep repeating same movements/actions, very repetitive**
Work can be emotionally disturbing or upsetting	**Often work with twisted or awkward postures**
Often lift or carry moderately (or very) heavy things	Often hold or grip things with hands or fingers
Often push or pull things with some force	Not enough training for the job
Problems with health and safety	Lack of opportunities for learning new skills
Not enough variety in the work	**Often lift or carry moderately (or very) heavy things**
Often work with body bent forward	Exposure to physical danger
Lack of consultation about changes	**Lack of consultation about changes**

Note: Hazard items that remain in the top 10 after 12 months are bolded.

Pain and stress scores for each organisation are reported in Tables 14 and 15. As expected within this project's short timeframe (particularly the short time between implementation of a risk control action and the second survey), no statistically significant changes (T-test) were observed in these scores. However, four of the workgroups reported reductions in pain/discomfort levels. For the stress outcome, two workgroups reported reductions in stress levels.

In organisation A, a new executive manager who commenced during the project was highly supportive of the APHIRM Toolkit and adopted a very hands-on approach. In organisation B, a large meeting was held to collect feedback and develop the action plan. There was a very open discussion with lots of ideas exchanged; it was the first time a forum had been held where staff could provide feedback on an issue that was specifically raised as a problem through the survey. In organisation C, the workgroup with the largest large drop in score (4.9) implemented some major engineering changes to the welding jigs being used. It also implemented a communication board to share the changes made to the processes as a result of the use of the APHIRM Toolkit.

Table 14: Change in pain score by workgroup

Workgroup	Avg pain S1	Avg pain S2	Difference	*p*
Org A WG 1	13.1	15.1	2.0	0.628
Org A WG 2	22.0	20.5	-1.5	0.817
Org B WG 1	13.8	12.9	-1.0	0.799
Org B WG 2	13.1	17.7	4.6	0.338
Org B WG 3	11.9	14.0	2.2	0.378
Org C WG 1	21.6	21.2	-0.4	0.936
Org C WG 1	10.7	10.8	0.1	0.975
Org C WG 1	16.1	11.2	-4.9	0.108

Table 15: Change in stress score by workgroup

Workgroup	Avg stress S1	Avg stress S2	Difference	*p*
Org A WG 1	16.0	17.6	1.6	0.697
Org A WG 2	18.6	19.1	0.5	0.906
Org B WG 1	15.9	18.0	2.1	0.606
Org B WG 2	15.6	19.4	3.8	0.378
Org B WG 3	13.8	13.5	-0.3	0.884
Org C WG 1	17.2	19.0	1.8	0.788
Org C WG 1	11.4	13.5	2.1	0.347
Org C WG 1	16.5	12.7	-3.8	0.228

Note: The participating organisations were asked to provide claims and injury data.

As requested, we have reported the top 10 hazards for two of the workgroups – one that was highly engaged and one that was not – and the types of actions taken to address these using the conventional hierarchy of risk controls (Table 16). A problem with this conventional hierarchy is that administrative controls are ranked low in the hierarchy, but this is inappropriate for many of the hazards that affect both MSD and MHDs. The APHIRM Toolkit *Guide to Choosing Risk Control Actions* applies an amended hierarchy which focuses on addressing *the source* of the hazard and associated risk, and often it is administrative actions that can best achieve this. An example of the effective use of an administrative control may be where a supervisor has poor communication skills, in which case risk would be addressed *at its source,* in accord with principles underpinning the hierarchy of risk control, by a program of training and perhaps related administrative actions to help the supervisor improve their skills. Similarly, changes in job design to give workers increased autonomy when dealing with problems may well be the most appropriate way to address risk *at its source*.

Table 16: Action controls for highly engaged workgroup vs lower engagement workgroup

Hazard	Types of Actions (n)	Example of action control
Highly engaged workgroup		
Often work hard/fast enough to get a bit breathless	Eng (2)	Have additional people on the floor
Often work with twisted or awkward postures	Elim (7) Admin (1)	Provide automated stacking and stay lifter
Have to work very fast	Elim (1) Admin (1)	Purchase more tooling
Often push or pull things with some force	Elim (1)	Purchase a tug
Have to cope with upset/unhappy people	Admin (2)	Review the process for purchasing parts
Opinions differ on 'correct' way to do some tasks	Admin (1)	Create standards for regular tasks
Too much work for time available	Admin (1)	Create best practice standards for sharing between teams
Work at fast pace for whole shift	Eng (2) Admin (1)	Keep extra person in the team
Poor work–life balance	Admin (1)	Communicate how to get help
Problems with physical surroundings: noise, light, temperature etc	Elim (2) Admin (1)	Fix the lights in the drying room
Lower engagement workgroup*		
Keep repeating same movements/actions, very repetitive	Elim (1) Eng (2) Admin (1)	Investigate infrastructure
Work not appreciated by supervisor or manager	Eng (1) Admin (2)	Organise a Donut Day
Often work with twisted or awkward postures	Eng (1) Admin (1)	Turn trolleys around
Work can be emotionally disturbing or upsetting	Sub (1)	Replace problem equipment
Lack of consultation about changes	Eng (3) Admin (1)	Maintenance MANAGER to attend team meetings

***** Only five hazards were addressed in this workgroup and actions were not fully implemented.

The participating organisations were asked to provide claims and injury data for the preceding four years (Table 17). Only one organisation provided this data in a meaningful format. Another provided combined data. Despite multiple requests, the third organisation did not provide any data. Due to these inadequacies, further analysis was not possible, although it is proposed for a future longitudinal research project on a larger scale.

Table 17: Claims and injury data

	2018/2019				2019/2020				2020/2021				2022			
	Claims		Injuries		Claims		Injuries		Claims		Injuries		Claims		Injuries	
	MSD	MH	MSD	MH	MSD	MH	MSD	MH	MSD	MH	MSD	MH	MSD	MH	MSD	MH
A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
B	-	1	-	-	-	-	-	-	6	-	95*	-	44	1	31	0
C	-	-	-	-	23	0	66	0	22	0	78	0	14	0	55	0

***** Combined data for 2018–2021.

GENERAL SUMMARY

Implementation quality varied between the organisations, and between workgroups within organisations. High-quality implementation was defined as implementing the toolkit within the specified timeframe, engaging all levels of the organisation, obtaining a high response rate for each of the toolkit surveys, developing and implementing effective control actions, and completing each of the five toolkit stages.

Organisation A had difficulties in providing sufficient resources for the implementation, both in terms of time and staff to assist in the process of administering the toolkit and implementing actions. This was partly explained by the 24-hour food production nature of the business, which led to challenges when trying to engage workers. The RMT lead responsible for toolkit implementation had a huge workload with limited support to conduct risk management activities, and limited skills and understanding of work health and safety principles. Most of their time was spent undertaking reactive tasks, with limited understanding that the APHIRM Toolkit was a risk management tool which could be incorporated into their existing WHS strategy and possibly replace some of the less effective risk management methods. The LTU research team provided some assistance with toolkit administration; however; the organisation did not actively seek assistance and was slow to respond to contact from the research team. The experience of this organisation highlighted the importance of having an RMT lead with sufficient WHS skills and knowledge, and dedicated time and resources to implement the toolkit. Further research into the risk management experiences of manufacturing businesses with fast production turnover may provide further knowledge about how to overcome these barriers.

The implementation of the APHIRM Toolkit in organisation B was led by a very competent HSE advisor who facilitated a high level of engagement with levels of management across the business. Although a member of the research team attended risk management meetings, the HSE advisor operated independently and required only limited assistance in the first 12 months of the toolkit cycle. They were highly effective in engaging workgroups and achieved high hazard survey response rates. Senior management was highly engaged in the development of the action plan; this provided a forum for workers to explain the nature of the hazards and allowed management the opportunity to address concerns. The support of senior management was a great facilitator in the success of the APHIRM Toolkit implementation, as was the enthusiasm and excellent communication skills of the RMT lead who established good rapport with the line managers.

Organisation C had the most assistance from the research team. The RMT lead (state HR business partner) had very limited WHS skills and knowledge; however, they were very engaged and enthusiastic about the APHIRM Toolkit implementation. There was good rapport and communication between the RMT lead and the supervisors of the workgroups. The supervisors were particularly engaged and proactive in developing and taking responsibility for control actions. The RMT was essentially the safety committee that met weekly; it comprised supervisors, production manager, HSR, and state HR business partner. The incorporation of the toolkit implementation into the existing safety

framework enabled a smooth integration and provided regular opportunities to monitor the progress of the toolkit. One of the workgroups in this organisation was particularly successful in implementing numerous elimination and engineering controls to address physical hazards. Despite having limited control actions to address the psychosocial hazards in the top 10 list, two of these ('poor senior management attitudes', 'lack of support from supervisor') reduced significantly. This can possibly be explained by the engagement of workers in the toolkit process (through the hazard survey and feedback survey) which provided them with an opportunity to be heard. The process of addressing the physical hazards involved management consultation with workers, which also may have meant workers felt acknowledged and supported.

All organisations valued the survey and particularly liked the automated reporting of the top 10 hazards. They appreciated the consultative nature of the process and acknowledged the benefits, which included the identification of hazards that were previously not recognised. However, they seemed to struggle with the follow-up evaluation at the completion of the action plan implementation. The response rates for the hazard surveys at the 12 month follow-up were significantly lower than for the first survey, and the research team was required to make numerous requests to ensure final surveys were completed. Identifying the hazards and developing the actions were the priorities for participants. There seemed to be less value placed on evaluating the action controls.

When considering the differences between participating organisations, it appears that the level of knowledge and skill of the RMT lead is a strong determinant of the success of the implementation. In addition, the amount of dedicated time and resources to overall MSD risk management has a big impact on the success of the implementation.

LIMITATIONS

Many of the workers at some of the participating organisations were from non-English speaking backgrounds and had low literacy levels – this can create challenges when surveying workers in factory floor roles. However, several workgroups undertook the survey in a group situation where a research team member could assist with question explanations.

KEY POINTS AND NEXT STEPS

1) EXPANSION OF THE TOOLKIT BASED ON FIELD TESTING

- The five new hazard items and 12-item stress scale will be incorporated into an expanded version of the APHIRM Toolkit and will be publicly available in early 2023.
- Future users of the APHIRM Toolkit will be able to select from the toolkit for the prevention of MSDs, stress-related mental health problems or both.
- Based on participant feedback, a new control action for sexual harassment will be included in the 'Guide to Risk Controls' document which is available in the toolkit.
- Feedback from participants suggested some modifications to the currently available toolkit. These changes include: some additional reporting functions (modified summary of action plan), improved integration with existing safety systems (ability to export reports from the toolkit into Excel), capacity to select hazards from the top 10 that are then available in the action plan, improved progress reporting within the software, and wording changes to improve usability.

2) PROCESS EVALUATION

The following key barriers to effective implementation of APHIRM Toolkit were identified.

- Inadequate resources (time to implement).
- Inadequate communication between workgroups, middle managers and senior managers.
- Inadequate OHS skill/knowledge of OHS advisors/business partners.
- Lack of integration of toolkit procedures with those of existing safety system or safety committee – particularly with the toolkit being seen as a stand-alone activity and additional source of workload rather than as part of the regular risk management strategy.

3) VALIDITY OF TOOLKIT RISK INDICATORS

- Tentatively planned analyses that would have evaluated predictive validity of both the discomfort/pain score and the stress score in relation to workplace records of claims proved not to be practicable due to inadequate workplace records.
- As part of a separate project, a summary of evidence relating to the construct, content and criterion validity of all three components of the APHIRM hazard and risk assessment survey has been produced and is provided to WSV separately from the report on the present project.

- The results from the present project and from the separate project referred to above – the APHIRM Toolkit Hazard and Risk Assessment Survey – demonstrates validity for use in managing risks of work-related MSDs and other stress-related physical and mental health problems.

4) OUTCOME EVALUATION

- Organisations that implemented elimination/substitution/engineering actions to control physical hazards experienced some changes in the top 10 hazards reported over the 12-month period.

- Although we evaluated some risk controls utilising the conventional hierarchy of risk control to MSD and MHD risk control actions, it does not fit particularly well where risk arises from psychosocial hazards. Changes to the conventional hierarchy to promote control of psychosocial hazards *at their sources* are required to achieve more effective risk management. With imminent introduction of Victoria's new requirements for management of risks from psychosocial hazards, such change is now urgent.

FINAL COMMENTS

- A large-scale, longitudinal evaluation of the impact on hazard and risk levels of implementing the expanded APHIRM Toolkit, with funding from external sources, is an important next step.
- Implementation of this toolkit within an organisation requires support and commitment from senior leaders within the organisation. Implementation science evidence shows that to achieve successful outcomes from such changes, the processes which support their *implementation* are as important as the *nature* of the changes themselves.
- To support good-quality implementation and thereby achieve successful outcomes, the proposed future toolkit evaluation project will require industry partners who: (a) have senior managers who are fully committed to achieving more effective risk management, and who are both willing and able to resource it adequately; and (b) have sufficiently high levels of "readiness for change" among personnel responsible for direct management of implementation procedures. Without these prerequisites, toolkit *implementation* may be of poor quality, as evidenced in some of the workgroups in the current project. A proposal for such a project will be developed and submitted later in 2023.

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APPENDICES

APPENDIX A: FACTORS IMPEDING IMPLEMENTATION

Coherence	**Cognitive participation**	**Collective Action**	**Reflexive monitoring/appraisal**
Lack of communication with workgroup *I think it's sort of a bit of a whispery thing, like okay, so what is it about? Not really - no, I don't think they understand. ID 21* *I'll say that they recognise certain things have happened, but not that – I think they'll see the link. So we need to communicate that to them. ID14* *I don't know if they think it's a good idea yet, because they haven't seen anything concrete or printed, or anything like that. So, they're not 100% aware, it's just the bits and pieces I feedback to them from the meetings ID25*	Previous or current negative experiences with management I*'d say over the last five years they've been through a few different management styles, so they'll tend to be cautious about things until they actually see something going on and then they'll really buy into it.* ID20 *we talk and we complain but nothing happens. So there is that element there that people have almost given up* ID 21 *I was talking with risk management team member for the next department, that person was really open to telling me, like, oh, but you know some of the people are not going to participate or they will start complaining about, oh, yeah, we've been telling them about this issue for many many years, and they've never done anything about it.ID07* *I mean, we do have meetings about a particular issue, they don't seem to have the answers, and they say, "We'll get back*	Not enough resources *always very much understaffed here. We always have been. I probably wouldn't put more resource in; it's about sharing that task to the appropriate owners, but also not overloading some of those owners ID 19* It's more about getting people involved to do certain things…we've got our engineering team that are designing and implementing scenarios in the manufacturing space … our manufacturing engineers are even less resourced to do so	Not enough communication with workgroup *I don't necessarily think the workers understand the toolkit because they're not seeing it ID14* *I'd be tipping – middle management would probably value it more than both other ends of the spectrum…I couldn't tell you on the higher end, but yeah, I would say that, yeah, there's a middle ground there that values it higher than others because they're probably the ones pushing it…ID23*

	to you," and then it sort of gets lost from there.ID25		
	Lack of faith in OHS system *we've had previous OH&S people that have been sort of like, you know - sort of spineless, if I can say it that way, where they're too worried about their job ID 21*	Lack of communication between floor and management *When someone complains and says, "This is impractical," the bosses just walk off. It's like okay, well, you know, all right. Yeah. It's got to have - there's got to be a bit more bite. But I mean, look, I totally get the whole trying to make things smoother and flow and trying to remove problems but you've got to also have that two-way thing where the bosses listen and where the actual staff are doing the right thing so that there's not that sort of, like, the wall up ID 21* *not as aware probably as they should be, but yes, because that also might be me as well, because I just tend to do the group or the affected people, but you know what I mean. So, yeah, I should probably catch up with our regional manager as well and let him know….I just know how busy he is. It wasn't like an oversight or anything. It's just, I guess, conscious of how busy everybody is, ID02*	Lack of resources for action implementation *Actions, you've just got to try and fit them in the best you can. Is there time given? I'd say potentially yes. Did we actually identify that time given? Probably no. ID23*
	Lack of organisation culture to support change in attitude/ engagement of workers *I'm not 100% sure that they see the point of doing it until we get a bit deeper into it and they see more actions, and then we*	Negativity about actions *And formulations that are done by the scientists and whatever. I don't think they actually take into account the human element, like how it's going to be done. Like, this is what we've got to do but you*	Previous negative experiences *it's showing the guys that there is actually an interest in it and we are trying to do it for them, not – well, we're trying to do it for both parties. And the reason it will be a slow burn is because there's a hell of a*

	get buy-in. The culture here might not be used to that kind of thing. ID23	*do it and it takes six shifts. It's not really worthwhile.ID 21*	*lot of negativity that is associated with the previous regime. ID23*
	Lack of communication from senior management *If any [Communication from senior management] – no. And the start of this was probably driven by [production manager].ID23*	COVID related issues *Yeah, we get ups and downs with times that are busy and bad, but it's also about not enough personnel around. I mean, the company would love to hire more people, they're just not there ID24* *The biggest impact being COVID and staff shortages as a result – that's been our biggest impact. That's not a competing priority. ID14* *…the staff turnover, experience, not having enough people but still trying to maintain the output.ID23* *So, that was a bit of an influence in the whole situation because you can't get any consistency and you can't talk to people in a group, as such because half the team's away sick. ID25* *It's a bit tricky [scheduling RMT meetings]. Given the fact they are from different shifts, and given the fact that in last couple of months the COVID really took a hold so every single time I would try, sometimes I would try to schedule and all of a sudden one person is still in isolation, one just tested positive and only one is available. So you try to postpone it ID07*	Lack of senior management support *get some kind of a monthly at least, or bi-monthly gathering with the people on the floor, and with the more senior people, not just the not so senior people, but the people that could potentially make the decision… and get them to explain the situation, rather than hearing it second-hand.ID 25*

		it's been a really difficult market from a recruitment retention perspective ID 14	
		Industrial relations issues *I think it's a bit of a sticky one at the moment because of what's been going on with the EBA … there's a lot of stuff going on, we'll put it that way. So there's a bit of resentment. "What am I getting out of it?" So I think once the EBA and everything is sorted, this process is going to be a hell of a lot smoother. ID23* *I think that had a big impact on it, as well. I'd say more senior people would have been focussing on that, than any of these, trying to resolve a lot of these issues. So, I think that was a big one, the EBA ID25*	
		Lack of commitment from some RMT members *If we met more frequently, more actions are going to be – if you put a deadline on stuff, stuff gets done. We meet ad hoc when we can. There's plenty of excuses to not action these things and today was probably a bit of a – one of those things… if it's not forefront in your mind, it's just not going to get done. ID23* *And I think that the ad hoc nature of it [meetings] results in lack of accountability. ID23* *some people haven't either had time or forgotten about it, or haven't made a*	

		point to follow things up, which is sometimes a bit disappointing when that happens. To me, dragging that kind of thing out, doesn't sit well with me. It should be sorted out, especially if it's related to a hazard type scenario. They should be right on it, make it a priority.ID25	
		Competing commercial priorities *…at the end of the day, they're committed to contracts. And if things like this fall by the wayside because we've got other prior commitments that actually keep the doors open, then that's just – that's how I see it. ID23*	

APPENDIX B: FACTORS ENABLING IMPLEMENTATION

Coherence	**Cognitive participation**	**Action**	**Reflexive monitoring/appraisal**
Good resources and guidance *I found it easier than some of the stuff that even we've used for our surveys and stuff. It was easy to use, clear, easy to understand. ID 20*	Support of senior management *…the two day shift Production Managers, we're basically left alone to just do what we need to do on the floor, including the APHIRM kit…the GM, and my boss, they're both supportive of getting some of these safety initiatives across the line.ID 19*	Support of line managers *Working with [line manager] has been really easy. Like, I'll just say, "Look, I need some people to do the feedback, to go through the sessions," and he makes time. ID 02* *very positive – I mean, the operations director – he's fully supportive of what*	Benefits perceived: Identifying hazards that wouldn't normally expect – proactive approach and not relying on safety checklists and incident reporting. *it's almost from a different angle, I guess, which is helpful, because then you identify things that you wouldn't normally have seen. ID19*

		the guys are doing, their actions – the corrective actions that they're doing … and other resourcing, and allocating money to it ID14	easy to set up and track actions *It's easy to update in terms of the actions, the way it's presented, and you can have multiple work groups.ID14* Establishing good rapport and overwriting (?) previous negative experiences *a bit of using this tool will probably be a good way to break down that barrier and show them that's it's actually about them. ID23* Engaging management *They're aware about the problems, but for some of them it was like a trigger like ohh yeah, we can actually do something about it. It looks like it's so obvious, but you just just, you know, pass that hazard and you don't really pay attention because you've been in that area so many times. But all of a sudden someone who is on the job and has to deal with that. Hazard is telling you. No, it's actually something really important for me. Can you get it fixed? ID07*
Communication from RMT lead *So before they even commenced I caught up with supervisors, team leaders and frontline managers. So some of my managers are of course high up in the hierarchy, but they are not the ones that are dealing with the operators all the*	Participative approach of toolkit – consulting workgroup *the fact that we actually wanted their feedback and we want to dig deeper, they really, really liked that. ID02*	Complements existing system/approach to safety *It's extra work, but like I mentioned at the start, if we can identify the value added, eliminate the non-value added, and just focus on the tasks that really do give something back to the business, then it*	Advantages of regular safety meetings *That's why we have the team meetings, that's why we have these meetings, so we can get stuff out, vent, action it, get support, so nobody has a breakdown moment. ID 24*

time. It's more team leaders and supervisors. They are amongst the team and people trust them like 100%. So I caught up with every single one and I explained what the project is about ID07	*I think that they've [managers] been sold really easily on this one, especially when I explained that we're going to do it for each department, or sometimes if the department is - we can have for each shift separately. So, we're going to get the information, the feedback, what doesn't work in their departments instead of just really generic one ID07* *Normally as a company we don't use surveys exclusively just on safety. We try to do more of safety walks and safety identifications and things like that. So from that point of view, it was different, and those sort of things are more taken up at a higher level from the supervisors and management rather than people on the floor unless there's an injury or they specifically identify something. So it was nice to see what the guys on the floor have an issue with.ID20*	*fits. I think most of the actions that we come up with do fit. ID 19* *We've got a similar system. Like, you know, we will raise a hazard and we'll find corrective actions and do investigations and things like that. I guess to me it's more of proactive. ID02* *each week there's the safety meeting and in the main, it's looking at the hazard reports, the incident reports and resolving those, and … from time to time, have allocated it to this project – like today – and we'll do that again in the coming weeks and keep things moving.ID14* *So it's part of our routine anyway to facilitate this. This just gets absorbed into that. So it's not an impost on anyone's time or work.ID14* *But in general, for myself to catch up with someone else outside the meetings, to follow up on tasks, it's not something that takes a lot of time because I would be catching up with them anyway because I've got some other questions not related to that project. ID07*	
	Communicating with workgroup *They feel like, oh, it's just another survey. 'We'll answer the questions and nobody is going care about what we are saying.' But*	Involve multiple departments from the organisation *I would say probably someone from HR because a few of the findings are more related to psychosocial and possibly someone from CI or engineering, because*	Support for action implementation *I mean the guys themselves are doing a lot of the work. We will sometimes ask for engineering support, depending on the task. I think with [acting production manager] being part of the engineering*

	then I explain it to them, that the survey is just for your department…ID07 *having couple of the people who were part of the team and they saw how it looks and I think it helped a lot because first of all we could get more buy in from the workers because they could spread the word, you know, amongst the the rest of the workers ID07*	*quite often you will search for some engineering controls, ID 07*	*team, he's been able to elicit a lot of support there. ID14* *in terms of rolling some of the hazard issues out and resolving them, I think the company's quite willing to do that, no matter what the cost is, within reason I suppose, they're happy to spend the money if it's going to help people and prevent injuries.ID25* *They're extremely engaged and proactive, so for a couple of the actions, even during when we were discussing the action plan, they were saying like 'ohh yeah, we started or someone is working on this one' ID07* *[there were no extra resources needed] It was kind of distributed across. So even for the tasks that was across all shifts, it means that some of the task were like assigned to line managers from back shifts just to make sure that it's spread across and it's not only with the day shift people…So just to make sure that the whole workload is managed.ID07* *However, for the equipment, it's more how we can modify the existing one, how we can redesign. That's why Engineering is involved … we are actually replacing a lot of equipment right now…there is going to be a huge upgrade in the next couple of months ID07*

			I had that full support from the senior management and all the frontline managers were really helpful and they were really engaged. I believe they saw the benefits and they understood the process ID07
	Maintain momentum so can see outcomes *Yeah, they liked what it was. So they felt more involved, which was good, and yeah, once they see improvements - so if we get this action plan in place and they say that the next couple of months they'll see bits and pieces of things going on, that will help them to start to buy into more of it as well. ID20*	Consultation *as long as it's really collaborative with them. If they can come up with their own ideas and solutions, that will help as well, ID20*	Suggested improvements *if there was a library of case studies, for example, where this was an effective solution, then that could be a positive just from a learning perspective. And that could be linked to types of manual handling injury and then remedies ID14* *it's trying to get the way to connect the plans that are … within the software and being able to kind of like extract them so we can put them into different system you know like if you've got the system for like action tracker because it's much easier and you can set-up like it's due or overdue you can assign the person within the system… I think if you can download it into like Excel spreadsheet and then upload into different system, I think that would be it would be huge improvement. ID07*
	Usability/ positive aspects of tool	Aspects of the toolkit *What's good is that the guys see the actions happening, they're more encouraged to put more up again later*	Aspects of the toolkit *I think this has been a good idea, the way it's been set up and designed.ID25*

	For measuring our performance, our outcome, reminding us, not forgetting anything, it's a great tool. ID24 *They did [understand the reason behind the toolkit] because it also allows them to express themselves with confidence of not being any backlash. So, they're more confident to speak their mind when it's a survey, especially when it's confidential ID24* *You can identify similar hazards using different methods, including you know, inspections, regular gemba walks, or even just requesting employees to look around before they commence on a task to look for some hazards, but quite often it if you don't have it listed somewhere, it doesn't cross your mind, especially psychosocial hazards ID07* *They just want to know more relevant issues in their own area.ID25*	*on. So, as long as we do our part, and with your encouragement and making sure that we meet, and we all like to say that we've done something every time it comes up. ID24*	*but it's the first time when it was really focused on safety because we had multiple surveys, different aspects, but it was the first one which was quite big and for them, as I mentioned before, being anonymous is a big thing because when they feel it's not, that we're gonna go drill down and find who exactly answered, they kind of like, trust more and they're more open. ID07*
		Support of senior managers I*'m allowed to stop the guys for half an hour when I want, to have a meeting because I like to involve the guys in each procedure. ID24* *to participate in this meeting, that's not an issue, but the guys, yeah, they did get plenty of time to fill in the surveys and the company made a point of it, to do it during company time ID25*	

APPENDIX C: MEAN HAZARD SCORES BY WORKGROUP

Hazards are bolded if their mean score is in the top 10 for survey 2. Green indicates p<0.05. Red=hazard increased in survey 2, blue=decreased. Intensity of colour denotes degree of difference.

Org A workgroup 1

Hazard	Mean S1	Mean S2	Difference	p
Often push or pull things with some force	4.0	3.9	-0.1	0.769
Often hold or grip things with hands or fingers	3.8	3.6	-0.1	0.765
Keep repeating same movements/actions, very repetitive	3.7	3.6	-0.1	0.816
Often lift or carry moderately (or very) heavy things	3.7	3.2	-0.5	0.167
Problems with physical surroundings: noise, light, temperature, etc	3.7	3.2	-0.5	0.167
Lack of promotion opportunities	3.5	3.8	0.3	0.430
Lack of consultation about changes	3.4	3.3	-0.1	0.792
Work not appreciated by supervisor or manager	3.3	2.9	-0.4	0.336
Often work with twisted or awkward postures	3.3	3.4	0.1	0.861
Have to work very fast	3.2	3.2	0.0	0.945
Can't trust information from management	3.2	3.1	-0.2	0.694
Problems with health and safety	3.2	2.8	-0.5	0.286
Lack of opportunities for learning new skills	3.2	3.3	0.1	0.836
People here are not treated fairly	3.2	2.7	-0.5	0.280
Arguments and problems not sorted out fairly	3.2	2.6	-0.6	0.124
Exposure to physical danger	3.2	3.4	0.2	0.506
Not enough training for the job	3.1	3.4	0.3	0.514
Poor senior management attitudes	3.1	2.8	-0.4	0.382
Lack of feedback on performance	3.0	3.1	0.0	0.955
Go faster for deadlines or target quotas	3.0	3.1	0.1	0.709
Work not distributed fairly between people	3.0	3.0	0.0	1.000
Problems with work stations or workspace	3.0	2.7	-0.3	0.426
Have to cope with upset/unhappy people	3.0	3.1	0.2	0.681
Often make precise movements to place things accurately	3.0	2.5	-0.5	0.256
Lack of support from supervisor	3.0	2.4	-0.6	0.195
Poor equipment, tools, I.T. or software	3.0	3.1	0.1	0.785
Lack of opportunities for using my skills	3.0	2.8	-0.2	0.647
Work can be emotionally disturbing or upsetting	2.9	2.4	-0.5	0.203
Opinions differ on 'correct' way to do some tasks	2.9	2.7	-0.2	0.652
Poor communication with supervisor	2.9	2.5	-0.4	0.283
Lack of influence on decisions about work	2.9	2.9	0.0	1.000
Work at fast pace for whole shift	2.9	2.9	0.0	1.000
Not enough variety in the work	2.9	2.7	-0.2	0.617
Too much work for time available	2.8	3.3	0.5	0.196
Often squat or kneel while working	2.8	2.9	0.1	0.802
Lack of flexibility of working hours	2.8	2.8	0.0	0.926
Often work with body bent forward	2.7	2.4	-0.4	0.385
Poor balance between work and home life	2.7	2.7	0.0	0.882

Unpleasant arguments or conflicts	2.6	2.4	-0.2	0.670
To get things done, people don't always use 'correct' procedure	2.6	2.6	0.0	1.000
How well I do my work makes no difference to people	2.6	2.6	0.0	1.000
Often work hard/fast enough to get a bit breathless	2.6	2.1	-0.4	0.222
Problems with facilities for taking breaks	2.6	2.9	0.3	0.426
Low Job Satisfaction	2.6	2.4	-0.2	0.602
Often work with arms raised above shoulder level	2.5	2.1	-0.5	0.232
How people get on personally or socially	2.5	2.3	-0.2	0.591
Work goals and responsibilities are not clear	2.4	2.1	-0.3	0.327
Often work standing still, no moving around	2.4	2.3	-0.1	0.677
Get behind with work	2.4	2.5	0.2	0.660
Not enough time to get all work done	2.3	2.7	0.4	0.252
Have to do some things that seem unnecessary	2.3	2.6	0.4	0.362
Don't know what is expected of me	2.2	2.0	-0.2	0.575
How people work as a team	2.2	2.4	0.2	0.579
Workplace aggression / violence	1.8	1.4	-0.4	0.187
Workplace bullying	1.8	1.3	-0.5	0.209
The work I do is not important	1.7	1.6	-0.1	0.765
Vibrating tools, equipment or vehicles	1.6	1.4	-0.3	0.382
Often work sitting still with little or no moving	1.5	1.1	-0.4	0.133
Workplace sexual harassment	1.1	1.1	0.0	0.780

Org A workgroup 2

Hazard	Mean S1	Mean S2	Difference	p
Keep repeating same movements/actions, very repetitive	4.0	4.0	0.0	1.000
Often work standing still, no moving around	3.9	2.9	-1.1	0.021
Often work with body bent forward	3.7	3.1	-0.7	0.166
Problems with physical surroundings: noise, light, temperature, etc	3.7	3.8	0.1	0.771
People here are not treated fairly	3.6	2.9	-0.7	0.082
Often hold or grip things with hands or fingers	3.6	3.3	-0.3	0.561
Lack of promotion opportunities	3.6	3.1	-0.4	0.242
Exposure to physical danger	3.5	3.2	-0.3	0.400
Unpleasant arguments or conflicts	3.4	2.8	-0.6	0.137
Often work with twisted or awkward postures	3.4	3.1	-0.4	0.482
Work not appreciated by supervisor or manager	3.4	3.5	0.1	0.787
Arguments and problems not sorted out fairly	3.4	3.0	-0.4	0.392
Often make precise movements to place things accurately	3.4	3.3	-0.1	0.780
Poor equipment, tools, I.T. or software	3.4	2.8	-0.5	0.185
Have to cope with upset/unhappy people	3.3	3.2	-0.1	0.818
Problems with health and safety	3.3	2.8	-0.5	0.282
Lack of influence on decisions about work	3.2	3.0	-0.2	0.630
Often lift or carry moderately (or very) heavy things	3.2	3.1	-0.1	0.832
Have to work very fast	3.1	3.4	0.2	0.615

Not enough training for the job	3.1	2.7	-0.5	0.374
Work not distributed fairly between people	3.1	2.8	-0.3	0.498
Often push or pull things with some force	3.1	3.0	-0.1	0.890
Can't trust information from management	3.0	2.3	-0.8	0.077
Lack of feedback on performance	3.0	2.8	-0.2	0.673
Problems with work stations or workspace	3.0	2.6	-0.4	0.258
Poor communication with supervisor	3.0	2.4	-0.6	0.131
Lack of opportunities for learning new skills	3.0	2.8	-0.2	0.688
Lack of flexibility of working hours	3.0	2.5	-0.5	0.168
Lack of opportunities for using my skills	3.0	2.6	-0.4	0.329
Work can be emotionally disturbing or upsetting	2.9	2.5	-0.4	0.341
How well I do my work makes no difference to people	2.9	2.1	-0.8	0.045
Often squat or kneel while working	2.9	2.6	-0.2	0.623
Lack of consultation about changes	2.9	3.1	0.3	0.481
Too much work for time available	2.8	2.6	-0.2	0.575
Problems with facilities for taking breaks	2.8	2.8	0.0	0.952
Go faster for deadlines or target quotas	2.7	2.8	0.0	0.937
Work at fast pace for whole shift	2.7	3.1	0.3	0.364
Opinions differ on 'correct' way to do some tasks	2.7	2.7	0.0	0.948
Often work sitting still with little or no moving	2.7	1.8	-0.9	0.036
Not enough variety in the work	2.7	2.4	-0.3	0.490
Poor senior management attitudes	2.7	2.6	-0.1	0.828
To get things done, people don't always use 'correct' procedure	2.6	2.9	0.3	0.535
Lack of support from supervisor	2.6	2.6	-0.1	0.846
Don't know what is expected of me	2.5	1.8	-0.7	0.089
Work goals and responsibilities are not clear	2.4	2.0	-0.4	0.263
Vibrating tools, equipment or vehicles	2.4	2.2	-0.2	0.666
Poor balance between work and home life	2.4	2.3	0.0	0.947
Have to do some things that seem unnecessary	2.4	2.5	0.1	0.785
Often work with arms raised above shoulder level	2.4	2.4	0.0	0.927
The work I do is not important	2.3	1.6	-0.7	0.085
How people work as a team	2.3	2.4	0.2	0.740
Low Job Satisfaction	2.2	2.1	-0.1	0.802
Get behind with work	2.2	2.4	0.2	0.694
How people get on personally or socially	2.2	2.3	0.1	0.814
Often work hard/fast enough to get a bit breathless	2.1	2.3	0.2	0.686
Not enough time to get all work done	1.9	2.6	0.8	0.051
Workplace bullying	1.7	1.6	-0.1	0.796
Workplace aggression / violence	1.6	1.8	0.2	0.618
Workplace sexual harassment	1.1	1.1	0.1	0.640

Org B workgroup 1

Hazard	Mean S1	Mean S2	Difference	p
Keep repeating same movements/actions, very repetitive	4.4	3.7	-0.7	0.080
Often push or pull things with some force	4.3	3.9	-0.4	0.514
Work not appreciated by supervisor or manager	4.1	4.0	-0.1	0.819
Often hold or grip things with hands or fingers	4.0	3.7	-0.3	0.612
Lack of promotion opportunities	3.9	4.6	0.6	0.228
People here are not treated fairly	3.9	3.7	-0.2	0.807
Arguments and problems not sorted out fairly	3.9	3.7	-0.2	0.780
Often lift or carry moderately (or very) heavy things	3.9	3.4	-0.4	0.468
Lack of feedback on performance	3.8	3.7	-0.1	0.862
Often work with twisted or awkward postures	3.8	3.6	-0.2	0.763
Poor senior management attitudes	3.8	3.4	-0.3	0.632
Can't trust information from management	3.7	3.0	-0.7	0.281
Often squat or kneel while working	3.7	3.1	-0.5	0.344
Lack of opportunities for learning new skills	3.7	3.7	0.0	0.968
Lack of opportunities for using my skills	3.7	3.0	-0.7	0.166
Have to work very fast	3.6	2.9	-0.8	0.040
Exposure to physical danger	3.6	3.4	-0.1	0.718
Lack of support from supervisor	3.6	3.1	-0.4	0.558
Work not distributed fairly between people	3.5	3.3	-0.2	0.727
Often make precise movements to place things accurately	3.5	3.1	-0.4	0.438
Problems with physical surroundings: noise, light, temperature, etc	3.5	3.1	-0.4	0.535
Problems with health and safety	3.5	3.4	-0.1	0.924
Poor equipment, tools, I.T. or software	3.4	3.3	-0.2	0.804
Not enough variety in the work	3.4	2.6	-0.8	0.122
Lack of flexibility of working hours	3.4	3.1	-0.2	0.675
Go faster for deadlines or target quotas	3.3	2.6	-0.7	0.102
Lack of influence on decisions about work	3.3	3.1	-0.1	0.862
Lack of consultation about changes	3.3	2.9	-0.4	0.383
Have to cope with upset/unhappy people	3.2	3.3	0.1	0.826
Often work with body bent forward	3.1	2.6	-0.6	0.358
Not enough training for the job	3.1	2.6	-0.6	0.280
Poor communication with supervisor	3.1	3.4	0.3	0.646
Work at fast pace for whole shift	3.1	2.4	-0.6	0.228
Too much work for time available	3.0	2.4	-0.6	0.301
Problems with work stations or workspace	3.0	3.3	0.3	0.573
Low Job Satisfaction	2.8	3.0	0.2	0.716
Work can be emotionally disturbing or upsetting	2.8	2.9	0.0	0.940
Often work with arms raised above shoulder level	2.8	2.6	-0.2	0.661
Problems with facilities for taking breaks	2.8	2.7	-0.1	0.858
Often work standing still, no moving around	2.8	2.1	-0.6	0.274
Poor balance between work and home life	2.7	2.6	-0.1	0.779
Have to do some things that seem unnecessary	2.7	3.3	0.6	0.366

Unpleasant arguments or conflicts	2.7	2.9	0.2	0.784
How well I do my work makes no difference to people	2.5	3.0	0.5	0.455
To get things done, people don't always use 'correct' procedure	2.4	2.7	0.3	0.642
Opinions differ on 'correct' way to do some tasks	2.4	3.3	0.8	0.104
Not enough time to get all work done	2.4	2.4	0.1	0.912
Get behind with work	2.3	2.6	0.3	0.621
Vibrating tools, equipment or vehicles	2.3	3.3	1.0	0.182
Work goals and responsibilities are not clear	2.3	2.0	-0.3	0.568
Often work sitting still with little or no moving	2.3	2.3	0.0	0.952
Often work hard/fast enough to get a bit breathless	2.3	2.3	0.0	0.940
The work I do is not important	2.0	1.9	-0.1	0.790
How people work as a team	2.0	2.4	0.4	0.255
Don't know what is expected of me	1.9	1.6	-0.3	0.471
How people get on personally or socially	1.9	2.3	0.4	0.266
Workplace aggression / violence	1.7	1.9	0.2	0.675
Workplace bullying	1.6	1.6	-0.1	0.875
Workplace sexual harassment	1.1	1.9	0.8	0.009

Org B workgroup 2

Hazard	Mean S1	Mean S2	Difference	p
People here are not treated fairly	3.9	3.2	-0.7	0.209
Work not appreciated by supervisor or manager	3.9	3.6	-0.3	0.567
Lack of promotion opportunities	3.9	4.1	0.2	0.692
Can't trust information from management	3.8	2.7	-1.1	0.082
Often push or pull things with some force	3.8	4.8	1.0	0.007
Lack of opportunities for using my skills	3.8	3.4	-0.4	0.406
Keep repeating same movements/actions, very repetitive	3.7	4.1	0.4	0.344
Exposure to physical danger	3.7	3.7	0.0	0.926
Lack of opportunities for learning new skills	3.7	3.5	-0.2	0.740
Have to work very fast	3.5	3.2	-0.3	0.548
Poor senior management attitudes	3.5	3.3	-0.2	0.747
Poor communication with supervisor	3.5	3.4	-0.1	0.895
Lack of influence on decisions about work	3.4	3.3	-0.1	0.819
Often lift or carry moderately (or very) heavy things	3.4	4.2	0.8	0.043
Lack of flexibility of working hours	3.4	3.9	0.5	0.298
Work at fast pace for whole shift	3.3	3.2	-0.1	0.757
Work not distributed fairly between people	3.3	3.0	-0.3	0.528
Lack of support from supervisor	3.3	3.4	0.1	0.899
Poor equipment, tools, I.T. or software	3.3	3.4	0.1	0.887
Go faster for deadlines or target quotas	3.3	3.2	-0.1	0.905
Arguments and problems not sorted out fairly	3.3	3.1	-0.2	0.775
Not enough variety in the work	3.3	2.6	-0.7	0.175
Problems with physical surroundings: noise, light, temperature, etc	3.2	3.9	0.7	0.143
Lack of feedback on performance	3.2	3.7	0.5	0.353
Problems with health and safety	3.2	3.8	0.6	0.226
Lack of consultation about changes	3.2	3.4	0.2	0.685
Have to do some things that seem unnecessary	3.1	2.5	-0.6	0.175
Problems with work stations or workspace	3.1	3.3	0.2	0.664
Unpleasant arguments or conflicts	2.9	2.6	-0.3	0.426
Often work with twisted or awkward postures	2.9	3.9	1.0	0.078
Often work with arms raised above shoulder level	2.9	3.6	0.7	0.147
Often hold or grip things with hands or fingers	2.9	4.3	1.4	0.011
Problems with facilities for taking breaks	2.9	3.0	0.1	0.761
Often squat or kneel while working	2.8	3.8	1.0	0.076
Not enough training for the job	2.8	2.8	0.0	1.000
To get things done, people don't always use 'correct' procedure	2.7	2.6	-0.1	0.767
Too much work for time available	2.7	3.5	0.8	0.111
Poor balance between work and home life	2.7	2.7	0.0	0.933
Have to cope with upset/unhappy people	2.7	3.1	0.4	0.331
Opinions differ on 'correct' way to do some tasks	2.7	3.5	0.8	0.015
Often work hard/fast enough to get a bit breathless	2.7	3.2	0.5	0.349

Vibrating tools, equipment or vehicles	2.7	2.7	0.0	0.956
Low Job Satisfaction	2.6	2.6	0.0	1.000
How well I do my work makes no difference to people	2.6	1.8	-0.8	0.117
Often make precise movements to place things accurately	2.6	3.8	1.2	0.022
Often work with body bent forward	2.5	3.4	0.9	0.103
Often work standing still, no moving around	2.4	3.0	0.6	0.297
Work goals and responsibilities are not clear	2.3	2.3	0.0	0.929
How people work as a team	2.3	1.9	-0.4	0.290
How people get on personally or socially	2.2	2.1	-0.1	0.751
Work can be emotionally disturbing or upsetting	2.1	3.0	0.9	0.093
Get behind with work	2.1	2.1	0.0	0.927
Not enough time to get all work done	2.1	2.0	-0.1	0.877
Workplace aggression / violence	1.9	1.6	-0.3	0.406
Often work sitting still with little or no moving	1.9	2.3	0.4	0.510
Workplace bullying	1.9	1.6	-0.3	0.512
The work I do is not important	1.9	1.5	-0.4	0.370
Don't know what is expected of me	1.5	2.3	0.8	0.044
Workplace sexual harassment	1.2	1.3	0.1	0.585

Org B workgroup 3

Hazard	Mean S1	Mean S2	Difference	p
Often hold or grip things with hands or fingers	3.6	3.5	-0.1	0.666
Have to work very fast	3.5	3.3	-0.1	0.632
Problems with physical surroundings: noise, light, temperature, etc	3.4	3.4	-0.1	0.843
Often work with body bent forward	3.4	3.4	0.0	0.904
Keep repeating same movements/actions, very repetitive	3.4	3.8	0.4	0.157
Lack of influence on decisions about work	3.4	3.4	0.1	0.845
Often squat or kneel while working	3.3	3.4	0.0	0.876
Lack of promotion opportunities	3.3	3.1	-0.3	0.381
Often push or pull things with some force	3.3	3.2	-0.1	0.644
Exposure to physical danger	3.2	3.2	-0.1	0.818
Often make precise movements to place things accurately	3.2	3.3	0.1	0.569
Too much work for time available	3.1	2.5	-0.6	0.030
Work at fast pace for whole shift	3.1	3.0	-0.1	0.819
Often work with arms raised above shoulder level	3.1	2.8	-0.3	0.330
Work not appreciated by supervisor or manager	3.1	2.7	-0.4	0.199
Lack of flexibility of working hours	3.0	3.2	0.2	0.478
Can't trust information from management	3.0	2.3	-0.6	0.010
Arguments and problems not sorted out fairly	3.0	2.6	-0.4	0.104
Work not distributed fairly between people	3.0	2.5	-0.5	0.077
Lack of opportunities for learning new skills	3.0	2.4	-0.5	0.059
People here are not treated fairly	2.9	2.5	-0.4	0.110
Go faster for deadlines or target quotas	2.9	2.7	-0.2	0.542

Lack of feedback on performance	2.9	2.3	-0.5	0.027
Poor equipment, tools, I.T. or software	2.9	2.6	-0.3	0.318
Lack of consultation about changes	2.9	2.4	-0.5	0.025
Often lift or carry moderately (or very) heavy things	2.9	2.7	-0.2	0.563
Often work with twisted or awkward postures	2.8	2.9	0.0	0.947
Lack of opportunities for using my skills	2.8	2.9	0.1	0.717
Have to cope with upset/unhappy people	2.8	2.7	-0.1	0.714
Not enough variety in the work	2.8	2.5	-0.3	0.238
How well I do my work makes no difference to people	2.8	2.5	-0.2	0.400
Poor senior management attitudes	2.7	2.4	-0.3	0.241
Get behind with work	2.7	2.2	-0.5	0.048
Problems with health and safety	2.7	2.1	-0.6	0.035
Poor balance between work and home life	2.7	2.6	-0.1	0.643
Often work hard/fast enough to get a bit breathless	2.6	2.2	-0.4	0.099
Problems with work stations or workspace	2.6	2.9	0.3	0.192
Often work standing still, no moving around	2.5	2.4	-0.1	0.673
Lack of support from supervisor	2.5	1.9	-0.7	0.017
Not enough time to get all work done	2.5	2.3	-0.2	0.600
Work goals and responsibilities are not clear	2.5	2.0	-0.5	0.034
Have to do some things that seem unnecessary	2.5	2.2	-0.3	0.255
Not enough training for the job	2.4	2.4	-0.1	0.789
Opinions differ on 'correct' way to do some tasks	2.4	2.4	0.0	0.928
Problems with facilities for taking breaks	2.4	2.2	-0.2	0.372
Work can be emotionally disturbing or upsetting	2.4	2.3	-0.1	0.789
Low Job Satisfaction	2.3	2.0	-0.3	0.158
Unpleasant arguments or conflicts	2.3	2.3	0.0	0.921
To get things done, people don't always use 'correct' procedure	2.3	2.1	-0.1	0.607
Poor communication with supervisor	2.2	2.1	-0.1	0.600
Vibrating tools, equipment or vehicles	2.2	2.0	-0.2	0.449
How people get on personally or socially	2.1	2.0	-0.2	0.473
How people work as a team	2.1	1.8	-0.3	0.204
Don't know what is expected of me	2.1	1.9	-0.2	0.318
The work I do is not important	1.9	1.6	-0.3	0.145
Often work sitting still with little or no moving	1.7	1.7	0.0	0.881
Workplace bullying	1.4	1.5	0.1	0.571
Workplace aggression / violence	1.3	1.5	0.2	0.179
Workplace sexual harassment	1.1	1.0	-0.1	0.244

Org C workgroup 1

Hazard	Mean S1	Mean S2	Difference	p
Often hold or grip things with hands or fingers	4.8	4.1	-0.7	0.071
Vibrating tools, equipment or vehicles	4.5	4.7	0.2	0.527
Keep repeating same movements/actions, very repetitive	4.2	3.7	-0.6	0.202
Often squat or kneel while working	4.2	4.2	0.0	0.931

Often work with arms raised above shoulder level	4.1	3.8	-0.3	0.474
Often make precise movements to place things accurately	3.7	3.6	-0.1	0.753
Problems with physical surroundings: noise, light, temperature, etc	3.7	3.8	0.1	0.790
Often work with twisted or awkward postures	3.6	3.9	0.3	0.572
Often work with body bent forward	3.3	3.5	0.2	0.575
Often work hard/fast enough to get a bit breathless	3.3	3.0	-0.3	0.447
Exposure to physical danger	3.2	3.5	0.3	0.432
Lack of promotion opportunities	3.2	3.4	0.2	0.573
Have to work very fast	3.2	3.3	0.2	0.677
Lack of influence on decisions about work	3.2	2.6	-0.6	0.208
Work not appreciated by supervisor or manager	3.0	3.5	0.5	0.298
Not enough variety in the work	3.0	3.1	0.1	0.859
Can't trust information from management	2.9	3.3	0.3	0.191
People here are not treated fairly	2.9	3.2	0.3	0.497
Lack of opportunities for learning new skills	2.9	3.3	0.3	0.389
Arguments and problems not sorted out fairly	2.8	3.1	0.3	0.432
Often work standing still, no moving around	2.8	2.8	0.0	0.913
Poor equipment, tools, I.T. or software	2.8	3.9	1.1	0.013
Go faster for deadlines or target quotas	2.8	3.7	1.0	0.033
How well I do my work makes no difference to people	2.8	2.5	-0.3	0.414
Work at fast pace for whole shift	2.8	3.0	0.2	0.578
Often push or pull things with some force	2.8	3.5	0.8	0.081
Problems with health and safety	2.8	3.3	0.5	0.283
Lack of feedback on performance	2.6	2.7	0.1	0.774
Poor senior management attitudes	2.6	3.1	0.5	0.139
Have to cope with upset/unhappy people	2.5	2.5	0.0	0.992
Often lift or carry moderately (or very) heavy things	2.5	2.9	0.3	0.344
Lack of consultation about changes	2.5	3.3	0.7	0.038
Low Job Satisfaction	2.5	2.0	-0.5	0.169
Poor balance between work and home life	2.5	2.3	-0.1	0.731
Have to do some things that seem unnecessary	2.5	3.0	0.5	0.192
Work not distributed fairly between people	2.5	3.1	0.6	0.137
Not enough training for the job	2.5	2.8	0.3	0.394
Lack of flexibility of working hours	2.5	2.7	0.3	0.399
Too much work for time available	2.4	2.9	0.5	0.190
Work goals and responsibilities are not clear	2.4	2.7	0.3	0.366
Lack of opportunities for using my skills	2.4	2.5	0.1	0.630
Get behind with work	2.3	2.5	0.2	0.719
To get things done, people don't always use 'correct' procedure	2.3	2.6	0.3	0.560
Opinions differ on 'correct' way to do some tasks	2.3	2.8	0.5	0.198
Problems with work stations or workspace	2.3	2.9	0.6	0.122
Lack of support from supervisor	2.2	2.8	0.6	0.230
How people work as a team	2.2	2.3	0.1	0.798
How people get on personally or socially	2.2	2.1	0.0	0.955

Poor communication with supervisor	2.2	2.9	0.8	0.087
The work I do is not important	2.1	2.0	-0.1	0.854
Problems with facilities for taking breaks	2.1	2.3	0.2	0.633
Don't know what is expected of me	1.8	1.9	0.0	0.948
Unpleasant arguments or conflicts	1.8	2.5	0.7	0.133
Not enough time to get all work done	1.8	2.4	0.6	0.056
Work can be emotionally disturbing or upsetting	1.8	2.3	0.6	0.175
Often work sitting still with little or no moving	1.8	1.8	0.0	0.920
Workplace aggression / violence	1.2	1.6	0.4	0.183
Workplace sexual harassment	1.1	1.2	0.1	0.592
Workplace bullying	1.0	1.7	0.7	0.032

Org C workgroup 2

Hazard	Mean S1	Mean S2	Difference	p
Often hold or grip things with hands or fingers	4.2	3.7	-0.5	0.104
Often squat or kneel while working	3.9	3.6	-0.3	0.200
Lack of promotion opportunities	3.5	3.4	-0.1	0.815
Vibrating tools, equipment or vehicles	3.4	3.4	0.0	0.985
Poor equipment, tools, I.T. or software	3.4	3.2	-0.2	0.583
Often make precise movements to place things accurately	3.3	3.3	0.0	0.952
Not enough training for the job	3.3	3.2	-0.1	0.807
Often work with body bent forward	3.2	2.9	-0.3	0.222
Poor senior management attitudes	3.2	3.1	-0.1	0.727
Problems with work stations or workspace	3.2	2.9	-0.3	0.377
Work not appreciated by supervisor or manager	3.2	3.2	0.0	0.982
Work not distributed fairly between people	3.2	2.8	-0.3	0.344
Often work with twisted or awkward postures	3.1	3.2	0.1	0.735
Problems with physical surroundings: noise, light, temperature, etc	3.1	3.4	0.3	0.408
Exposure to physical danger	3.1	3.1	0.1	0.789
Arguments and problems not sorted out fairly	3.0	3.0	0.0	0.903
Often push or pull things with some force	3.0	3.1	0.1	0.660
Lack of opportunities for learning new skills	3.0	2.9	-0.1	0.705
Can't trust information from management	2.9	3.1	0.2	0.499
Lack of feedback on performance	2.9	2.8	-0.2	0.584
Have to work very fast	2.9	3.3	0.4	0.087
Go faster for deadlines or target quotas	2.9	3.2	0.3	0.357
Too much work for time available	2.8	2.8	0.0	0.975
Work goals and responsibilities are not clear	2.8	2.4	-0.4	0.173
Lack of consultation about changes	2.8	2.9	0.1	0.789
Poor balance between work and home life	2.7	2.1	-0.6	0.021
Lack of influence on decisions about work	2.7	2.7	-0.1	0.802
Keep repeating same movements/actions, very repetitive	2.7	2.8	0.1	0.870
Problems with health and safety	2.7	2.6	-0.1	0.747
Lack of opportunities for using my skills	2.7	2.3	-0.3	0.255

Often work with arms raised above shoulder level	2.6	3.0	0.4	0.210
Low Job Satisfaction	2.6	2.3	-0.3	0.411
Poor communication with supervisor	2.6	2.5	-0.1	0.801
Get behind with work	2.5	2.3	-0.2	0.580
Have to cope with upset/unhappy people	2.5	2.9	0.3	0.287
To get things done, people don't always use 'correct' procedure	2.5	2.8	0.3	0.371
How well I do my work makes no difference to people	2.5	3.0	0.4	0.190
Often work standing still, no moving around	2.5	2.8	0.3	0.481
Lack of support from supervisor	2.5	2.5	0.0	0.965
People here are not treated fairly	2.5	2.7	0.2	0.442
Work at fast pace for whole shift	2.5	2.7	0.2	0.417
Often lift or carry moderately (or very) heavy things	2.5	2.8	0.3	0.304
Not enough variety in the work	2.5	2.6	0.2	0.594
Have to do some things that seem unnecessary	2.4	2.5	0.1	0.797
Opinions differ on 'correct' way to do some tasks	2.4	2.8	0.4	0.185
Don't know what is expected of me	2.3	2.2	-0.1	0.594
How people work as a team	2.3	1.8	-0.5	0.083
Lack of flexibility of working hours	2.2	2.7	0.5	0.185
Unpleasant arguments or conflicts	2.1	2.2	0.1	0.695
The work I do is not important	2.0	2.0	0.0	1.000
Problems with facilities for taking breaks	2.0	2.8	0.8	0.013
How people get on personally or socially	2.0	2.0	0.0	1.000
Work can be emotionally disturbing or upsetting	1.9	2.7	0.8	0.013
Not enough time to get all work done	1.9	2.5	0.5	0.136
Often work sitting still with little or no moving	1.9	2.0	0.0	0.976
Often work hard/fast enough to get a bit breathless	1.9	2.4	0.4	0.126
Workplace aggression / violence	1.4	1.4	0.0	0.902
Workplace bullying	1.4	1.4	0.0	0.902
Workplace sexual harassment	1.0	1.1	0.1	0.223

Org 3 workgroup 3

Hazard	Mean S1	Mean S2	Difference	p
Lack of promotion opportunities	4.1	3.4	-0.6	0.046
Often hold or grip things with hands or fingers	4.0	4.1	0.1	0.711
Often work with body bent forward	3.7	3.7	0.0	0.898
Can't trust information from management	3.7	2.8	-0.8	0.013
Often squat or kneel while working	3.7	3.5	-0.1	0.728
Vibrating tools, equipment or vehicles	3.7	3.4	-0.3	0.490
How well I do my work makes no difference to people	3.5	3.1	-0.4	0.186
Lack of influence on decisions about work	3.4	3.2	-0.2	0.543
Often work with twisted or awkward postures	3.4	3.6	0.2	0.427
Keep repeating same movements/actions, very repetitive	3.3	3.3	0.0	0.985
Too much work for time available	3.3	2.8	-0.5	0.147
Often push or pull things with some force	3.3	3.5	0.2	0.395

Problems with work stations or workspace	3.3	2.8	-0.5	0.048
Problems with physical surroundings: noise, light, temperature, etc	3.3	2.9	-0.4	0.238
Poor equipment, tools, I.T. or software	3.3	2.8	-0.5	0.104
Have to work very fast	3.2	2.5	-0.6	0.036
Work not appreciated by supervisor or manager	3.2	2.8	-0.3	0.345
Work not distributed fairly between people	3.2	2.9	-0.2	0.466
Go faster for deadlines or target quotas	3.1	2.6	-0.5	0.072
Poor senior management attitudes	3.1	2.5	-0.6	0.094
Often make precise movements to place things accurately	3.1	3.7	0.7	0.063
Exposure to physical danger	3.1	2.9	-0.1	0.605
Not enough training for the job	3.1	2.8	-0.3	0.399
Often work with arms raised above shoulder level	3.0	3.0	0.0	0.896
Lack of consultation about changes	3.0	2.8	-0.2	0.484
Lack of opportunities for learning new skills	3.0	2.8	-0.2	0.541
Lack of flexibility of working hours	3.0	2.7	-0.3	0.339
Arguments and problems not sorted out fairly	3.0	2.6	-0.4	0.202
Opinions differ on 'correct' way to do some tasks	2.9	2.7	-0.3	0.301
Problems with health and safety	2.9	2.5	-0.4	0.112
Not enough variety in the work	2.9	2.7	-0.2	0.463
Lack of opportunities for using my skills	2.9	2.4	-0.5	0.021
Lack of feedback on performance	2.9	2.6	-0.3	0.310
Work at fast pace for whole shift	2.8	2.5	-0.3	0.244
Often work standing still, no moving around	2.8	2.9	0.1	0.728
People here are not treated fairly	2.8	2.6	-0.1	0.736
Often lift or carry moderately (or very) heavy things	2.8	3.2	0.4	0.198
Problems with facilities for taking breaks	2.8	2.2	-0.5	0.031
Poor communication with supervisor	2.8	2.3	-0.5	0.110
To get things done, people don't always use 'correct' procedure	2.7	2.7	0.1	0.842
Low Job Satisfaction	2.7	2.2	-0.5	0.042
Get behind with work	2.6	2.9	0.3	0.319
Work goals and responsibilities are not clear	2.6	2.5	-0.1	0.783
Lack of support from supervisor	2.6	2.2	-0.4	0.192
How people get on personally or socially	2.6	2.2	-0.4	0.127
Poor balance between work and home life	2.5	2.5	0.0	0.954
Have to do some things that seem unnecessary	2.5	2.2	-0.3	0.304
The work I do is not important	2.5	2.5	0.0	0.996
Not enough time to get all work done	2.4	2.1	-0.3	0.301
How people work as a team	2.4	2.2	-0.2	0.382
Often work sitting still with little or no moving	2.3	2.4	0.1	0.844
Have to cope with upset/unhappy people	2.3	2.1	-0.2	0.643
Unpleasant arguments or conflicts	2.2	1.7	-0.5	0.072
Don't know what is expected of me	2.2	2.0	-0.1	0.685
Often work hard/fast enough to get a bit breathless	2.2	2.1	-0.1	0.793
Work can be emotionally disturbing or upsetting	1.9	2.0	0.1	0.824

Workplace aggression / violence	1.3	1.4	0.1	0.397
Workplace bullying	1.2	1.1	-0.1	0.162
Workplace sexual harassment	1.2	1.0	-0.2	0.225