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Musculoskeletal risk reduction

May 2018

Construction Work Health and Safety Research @ RMIT

The Australian Work Health and Safety Strategy targets a reduction of a 30% in the incidence rate of claims for musculoskeletal disorders resulting in one or more weeks off work by 2022.**

** Safe Work Australia, Australian Work Health and Safety Strategy 2012-2022

1. The prevalence of musculoskeletal injury in construction

Construction workers are a high risk group for work-related musculoskeletal injury. These injuries often involve extended periods of time off work and incur significant workers' compensation costs (FIGURE 1).

Workers who experience musculoskeletal injury can suffer chronic pain and work disability, significantly impacting their financial security and quality of life.

In some cases workers who experience a musculoskeletal injury are unable to return to the jobs they performed before they were injured.

Understanding the risk factors for work-related musculoskeletal injury is important in order to be able to make improvements to the work environment and methods of work, including the equipment and tools to be used.

Lightweight, wearable sensors are now available, enabling trained technicians to reliably measure human movement to provide a more detailed understanding of the risk factors for musculoskeletal injury.

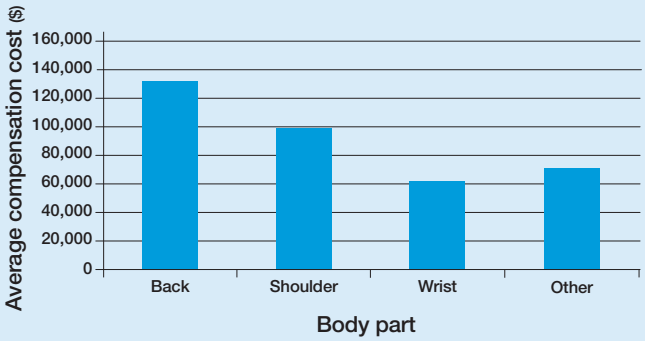


FIGURE 1: Average cost of compensation claims for work-related musculoskeletal injuries in construction[1]

2. The research

A team of researchers from RMIT used a whole body system of wearable sensors to capture information about risk factors for work-related musculoskeletal injury in manual tasks frequently undertaken in the construction industry.

These tasks were:

- steel-fixing
- jackhammering
- cable-pulling
- shotcreting, and
- shovelling.

Researchers visited rail construction sites within the Victorian Government's Major Transport Infrastructure Program.

Construction workers participated in the study by wearing a whole body system of lightweight sensors to objectively measure movement of the muscles and joints while workers were performing their daily work tasks (FIGURE 2). Workers also provided feedback on work methods, tools and equipment (FIGURE 3).

FIGURE 2: The wearable sensor system. REFERENCE(S): 3.0, p. 61.

FIGURE 3: Field-based data collection*

1 Source: WorkSafe Victoria reported MSD claims in the construction industry between 01 July 2007 to 30 June 2017, excluding self-insured employers. Stated costs reflect the anticipated lifetime cost of a reported claim paid by WorkSafe to an injured worker.

* This footage was filmed or photographed in a controlled environment and should not be taken as an example of acceptable work practices in the field. Site and task specific risk assessments should always be undertaken before commencing work.

The research was conducted on-site, rather than in a laboratory, which ensured that tasks were realistic and measurement accurately reflects the way work is actually performed in the construction site context (FIGURE 3).

The site-based research also allowed observation of environmental risk factors associated with the increased risk of work-related musculoskeletal injury, such as working in small space or on uneven ground (FIGURE 4).

The data collected provides a detailed understanding of the way that work is performed and the potential impacts of this work on the musculoskeletal system (FIGURE 5).

FIGURE 4: Data collection on-site*

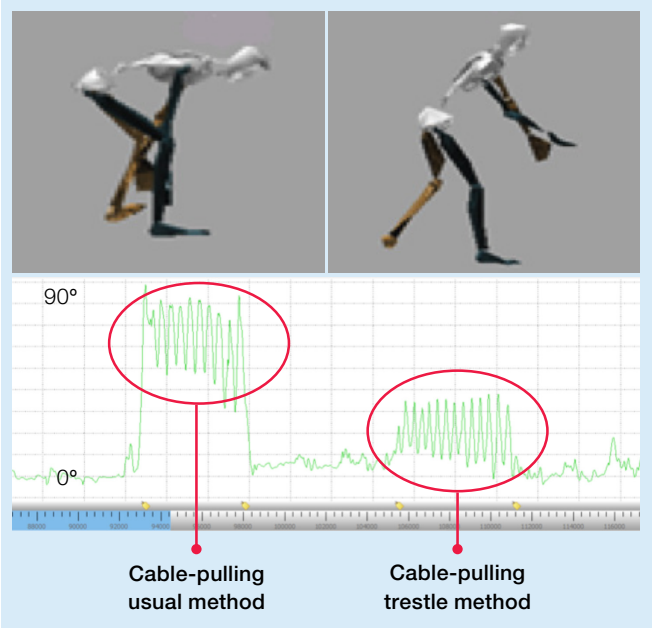


FIGURE 5: Measurement of trunk (back) inclination. REFERENCE(S): 6.1, p. 146.

3. The findings

The detailed measurement of workers' movements allowed the research team to identify those task elements that contribute significantly to the risk of work-related musculoskeletal injury.

Analysis of the data allowed the research team, in consultation with workers and employers, to identify opportunities to reduce the risk of work-related musculoskeletal injury. These focused on making improvements to the work environment and methods of work, including the equipment and tools to be used.

For some tasks a novel approach was used to understand how risk factors change depending on the height at which work is carried out.

This provided a detailed understanding of the physical characteristics of the tasks as well as specific information about the best tool or work method to use when performing work at different heights (FIGURE 6).

The measurement also enabled a comparison of movement and risk factors when performing tasks using different tools, equipment or methods. In several cases, significant reductions in risk for musculoskeletal injury were measured when tasks were modified (FIGURE 7).

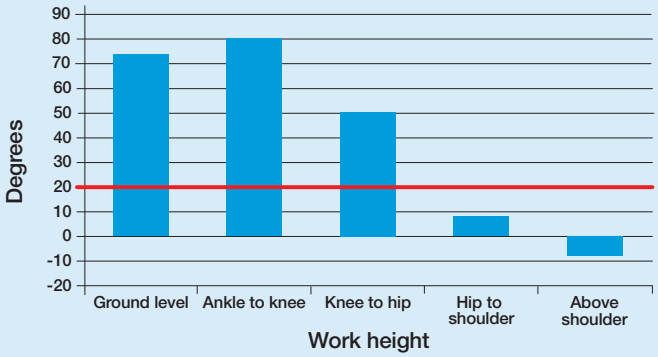


FIGURE 6: Average back (trunk) inclination (bending) when using pincer cutting tool to tie steel reinforcement bars by work height. REFERENCE(S): 4.1, p. 86.

The WorkSafe Victoria Code of Practice for Manual Handling identifies working with a trunk inclination greater than 20 degrees when undertaking a task for more than two hours over a whole shift, or continually for more than thirty minutes at a time, as a risk factor for musculoskeletal injury.

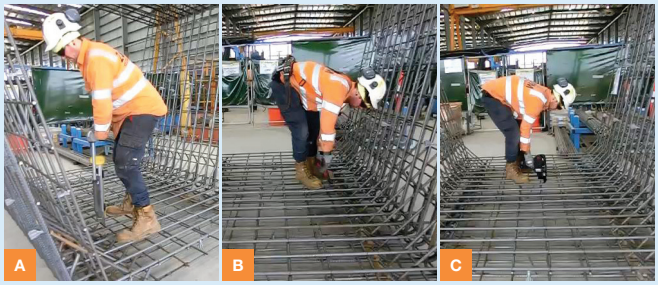


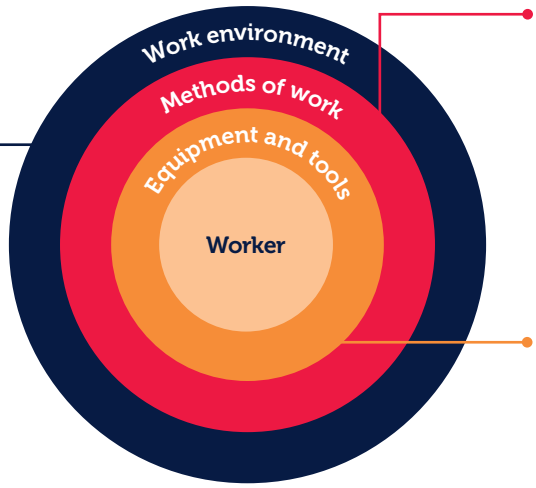
FIGURE 7: Steel-fixing at ground level with different tools. The long-handled stapler tool (A), conventional pincer-cutter tool (B) and the power tying tool (C).*

4. Work system design

The research showed that postures and movement in manual construction tasks are determined by the work environment and methods of work, including the equipment and tools to be used.

The research identified opportunities to intervene to reduce the risk of work-related musculoskeletal injury by redesigning the work environment, methods of work and equipment and tools.

Opportunities to redesign the work environment related to the identification of musculoskeletal injury risk in the planning and design stages of projects, consideration of mechanised ways of performing tasks and the coordination and planning of on-site activities.



Opportunities to redesign methods of work related to the integration of construction knowledge in the design, manufacture and supply of ergonomic tools.

Opportunities to redesign equipment and tools related to the selection of the best tools for a specific task, and the interaction between the worker, the task and the tools and equipment being used.

Using the wearable sensors, the researchers were able to assess alternative tools, equipment and work methods to see whether these can eliminate or significantly reduce the range, frequency or duration of potentially harmful postures and movements.

5. Considerations in understanding and reducing musculoskeletal injury risk in construction

Measuring human movement to understand risk factors for musculoskeletal injury provides important information that can be used to decide the best ways to control the risk of work-related musculoskeletal injury in the construction industry.

Wearable sensor technology can be used to measure and document improvements that can be made by making changes to the work environment and methods of work, including the equipment and tools to be used.

The challenge for the construction industry is to consult with workers to identify opportunities to reduce the risks of work-related musculoskeletal injury:

- when designing and planning the work environment, layout and flow.
- when designing methods of work, including the equipment and tools to be used, and
- when selecting and purchasing tools and equipment that will be used to perform a work task.

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Over the 14-year period between 2000–01 and 2013–14, the percentage of serious claims that involved musculoskeletal disorders remained stable at between 59 and 61 per cent.*

In the same period, the median time lost from work for serious musculoskeletal disorder claims increased by 35 per cent from 4.3 working weeks to 5.8*

Frequency rates of serious musculoskeletal disorder claims generally increase with age.*

* Safe Work Australia (2016) Statistics on Statistics on Work-Related Musculoskeletal Disorders, Canberra.

For related content such as the full report, videos and training material, please see:
rmit.edu.au/musculoskeletalriskreductionresearch

This research was jointly funded by WorkSafe Victoria and the Major Transport Infrastructure Program, Department of Economic Development, Jobs, Transport and Resources, Victorian Government.