

## Effectiveness of OHS education and training

Each year workplaces provide many hours of training for employees, including occupational health and safety (OHS) training. Training is widely acknowledged as an important component of occupational hazard control and risk management programs. Increasingly, business owners want to know whether training can meet its goals of decreasing injury and illness, and whether the cost of training programs can be justified. This is important in view of the millions of injuries and illnesses, and thousands of deaths, that are reported annually in workplaces throughout North America and globally.

OHS training often consists of instruction in hazard recognition and control, safe work practices, proper use of personal protective equipment, and emergency procedures and preventive actions. Training can also guide workers on how to find additional information about potential hazards. It can empower workers and managers to become more active in implementing hazard control programs or effecting organizational changes that enhance workplace protection. It is critical to gain a better understanding of the factors contributing to successful training outcomes. To this effect, a systematic review was conducted.

The primary research questions in this systematic review were:

1. *Does OHS training have a beneficial effect on workers and firms?*
2. *Does higher engagement OHS training have a greater beneficial effect on workers and firms than lower engagement OHS training?*

### Key messages

We **recommend** the use of workplace education and training programs. They have a positive impact on the occupational health and safety (OHS) behaviours of workers. However, OHS training **on its own** was not shown, in this review, to have an impact on health, by reducing injuries or symptoms, for example.

There are not enough high quality studies to make recommendations about the nature or type of training, such as the level of engagement, computer versus lecture training or the number of sessions.

One secondary question was also considered:

3. *What is the methodological quality of the research literature concerned with the effectiveness of OHS training?*

### How was the review conducted?

The systematic review team consisted of 16 researchers from the United States and Canada. The review team searched 10 electronic databases for studies of randomized controlled trials published on OHS education or training between 1996-2007. An initial 6,469 articles were identified and reviewed for relevance. After relevant studies were assessed for quality,

20 unique randomized controlled trial studies remained, from which information was extracted. The levels of evidence were based on the criteria presented in Table 1.

During extensive topic consultations, stakeholders were involved in selecting the three research questions. Near the end of the review, they were consulted to provide feedback on research findings and to assist with the extraction of key messages.

**Categories of change:** The systematic review team focused on four categories of changes that could result from education and training: knowledge, attitudes & beliefs, behaviours, and health. In the **knowledge** category, changes consisted of gaining knowledge of the training topic. **Attitudes and beliefs** included changes in workers' intended actions, in workers' confidence in their ability to achieve targeted OHS behaviours (self-efficacy) and in their beliefs about the

beneficial effects of OHS behaviours. The **behaviours** category included changes in behaviour as well as hazards and exposures that could reasonably be under the control of a worker's behaviours. Changes in **health** included occupational illnesses and injuries, as well as early symptoms of these conditions.

**Levels of engagement:** The review team classified the training interventions according to three levels of engagement. With **low engagement training**, the trainee was presented with oral, written or multi-media presentations of information by an expert source, but did not have much interaction in the learning process. In **medium engagement training**, a trainee had some interaction through guided discussions within a group or other such approaches. With **high engagement training**, the trainee was highly involved in the learning process through a hands-on practice component in a realistic work environment.

**Table 1**

| Level of evidence | Methodological quality   | Minimum quantity | Consistency of effects                        | Size of effect* |
|-------------------|--|------------------|---|-----------------|
| Strong            | Good   | ≥2 studies       | Effects are consistently positive or negative | Sufficient      |
|                   | Good or fair   | ≥5 studies       | Effects are consistently positive or negative | Sufficient      |
|                   | Meet execution, quantity and consistency criteria for Sufficient but not Strong evidence |                  |   | Large           |
| Sufficient        | Good   | 1 study          | Not applicable                                | Sufficient      |
|                   | Good or fair   | ≥3 studies       | Effects are consistently positive or negative | Sufficient      |
| Insufficient      | The above criteria not met   |                  |   |                 |

\* This measure is based on a statistical approach called a standardized mean difference (SMD). For more details on how this was calculated, please see the full report.

## What were the main findings?

The most frequent topic addressed in training was ergonomics, followed by safety/injury hazards and, less often, chemical, biological or physical hazards. The four most common delivery methods were lectures, printed materials, hands-on practice in a realistic work environment, and giving feedback to the learner. The majority of interventions studied (20 out of 36) were classified as having “high engagement” delivery methods. However, the number of training sessions was usually modest. Two-thirds of the interventions involved only one session of training, and the session length was typically two hours or less.

There were few high quality randomized trials looking at the effectiveness of OHS training. Only 14 of the 20 relevant trials were of high enough quality to be included in the final evidence synthesis. There were only enough higher quality studies to meaningfully examine the size and consistency of the effects of OHS training on behaviours and health.

The review team found the following results, by level of evidence:

### **Strong evidence:**

#### **Behaviours**

The review found strong evidence that OHS training was effective in changing targeted OHS behaviours.

Of the 10 studies that looked at changes in behaviour, six studies supported this conclusion. All were of fair or good quality and had positive effects, some of which were quite large. The types of behaviours that were targeted depended on the training topic. Three studies involved multi-component office ergonomics training, and looked at changes in postural behaviours, workstation hazards or ergonomic modifications. The other studies dealt with farm safety behaviours (such as personal protective equipment use), universal precautions behaviours among nurses, and wet work behaviours among nurses, cleaners and kitchen staff.

### *What is a systematic review?*

A systematic review is a type of research study. It aims to find an answer to a specific research question using existing scientific studies. Reviewers assess many studies, select relevant, quality studies, and analyze the results. The review normally includes the following steps:

- determine the review question
- develop a search strategy and search the research literature
- select studies that are relevant to the review question
- assess the quality of the methods in these studies and select studies of sufficient quality
- systematically extract and summarize key elements of the studies
- describe results from individual studies
- combine results and report on the evidence.

The Institute for Work & Health has established a dedicated group to conduct systematic reviews in workplace injury and illness prevention. Our team monitors developments in the international research literature in this field. We rely on feedback from non-research audiences to select timely, relevant topics for review, to help shape the research question and to frame our findings.

We appreciate the support of the Ontario Workplace Safety and Insurance Board (WSIB) in funding this four-year Prevention Systematic Reviews initiative.

### **Insufficient evidence:**

#### **Health**

There were small and inconsistent effects of OHS training on health. As a result, the review team was not able to conclude that OHS training has an effect on health.

This conclusion was based on five studies. Two focused on workers’ musculoskeletal symptoms after multi-component office ergonomics training in offices and universities. The other three studies measured cutter-related injury rates among super-market workers, the severity of skin symptoms among nurses, cleaners and kitchen staff at a geriatric care facility, and work-related injury rates among farmers.

## Knowledge; Attitudes and beliefs

Only two studies of fair or good quality considered the effect of OHS training on knowledge. Similarly, there was only one study of fair quality looking at changes in attitudes and beliefs. These small numbers led to a conclusion of insufficient evidence. However, the findings in these categories were consistent with the evidence on behaviours: for both categories, the effect sizes were positive and large.

## High engagement vs. low/medium engagement training

There were too few studies comparing the effect of high engagement versus low/medium engagement OHS training on knowledge, attitudes and beliefs or health. Although there were three studies of fair or good quality that considered effects on behaviours, the effect sizes were consistently small. As a result, there was insufficient evidence that a single session of high engagement training had a greater impact on OHS-related behaviours compared to a single session of low/medium engagement training.

## Conclusions

- There is strong evidence supporting the effectiveness of OHS training on targeted OHS behaviours of workers.
- The size and positive direction of the effects observed to date for knowledge and attitudes and beliefs are consistent with the evidence on behaviours. There is still insufficient evidence on the effectiveness of training on knowledge and attitudes and beliefs, because there are too few studies of sufficient quality meeting the review's relevance criteria.
- There is insufficient evidence of the effectiveness of OHS training on health (such as injuries or symptoms), because there are inconsistent and small effects.
- There is insufficient evidence that high engagement OHS training is more effective than medium/low engagement training on OHS

knowledge, attitudes or health, because there are too few studies of sufficient quality meeting the review's relevance criteria.

- There is insufficient evidence that a single session of high engagement OHS training has a greater effect than a single session of low or medium engagement training on targeted OHS behaviours, since the observed effects to date are very small.

There is a lack of high quality randomized trial research on OHS training effectiveness. This lack of useable evidence is a barrier to drawing conclusions in some areas.

These findings are based on the report *A systematic review of the effectiveness of training & education programs for the protection of workers* by Lynda Robson, Carol Stephenson, Paul Schulte, Benjamin C. Amick III, Stella Chan, Amber Bielecky, Anna Wang, Terri Heidotting, Emma Irvin, Don Eggerth, Robert Peters, Judy Clarke, Kimberley Cullen, Lani Boldt, Cathy Rotunda and Paula Grubb.

The full report is available at:  
[www.iwh.on.ca/systematic-reviews](http://www.iwh.on.ca/systematic-reviews).

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