

Using pictures in training

The impact of pictorial OSH training on migrant worker behaviour and competence



Our research and development programme

IOSH, the Chartered body for safety and health professionals, is committed to evidence-based practice in workplace safety and health. We maintain a Research and Development Fund to support research, lead debate and inspire innovation as part of our work as a thought leader in safety and health.

In this document, you'll find a summary of the independent study we commissioned from Glasgow Caledonian University: 'Using pictures in training – the impact of pictorial OSH training on migrant worker behaviour and competence'.

The researchers would like to thank all those organisations and individuals that took part in the research, as well as those who facilitated their contact with organisations and individuals.



www.iosh.co.uk/getfunding

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Using pictures in training

What's the problem?

The UK construction industry employs many workers from overseas. This can create communication problems when English is not their first language. One such problem is making sure they understand critical occupational health and safety information and instructions. Guidance from the Health and Safety Executive on managing this issue includes using images, signs and pictures to help, but there's a lack of evidence to prove how well this strategy actually works.

We commissioned researchers from Glasgow Caledonian University to investigate this problem and see whether there was any evidence that using pictorial aids during routine training had any impact on migrant worker competence and behaviour. The objectives of the research were to:

- develop measurable factors for assessing specific health and safety competence and behaviour
- record baseline measures for specific worker competences and behaviours on a number of construction sites (ie before the pictorial aid training interventions)
- use pictorial aids for communicating hazard information and instruction (ie the training interventions)
- record post-intervention measures of worker competences and behaviours (ie after the training interventions).

What did our researchers do?

The researchers conducted the study across four construction sites of the same firm, where there were over 30 migrant* workers of similar national origin on each site. The training interventions were delivered to 20 migrant workers on each site.

The interventions focused on four targeted themes:

- A exclusion zones
- B materials storage
- C use of hand tools
- D personal protective equipment (PPE).

These were chosen in collaboration with site management teams and with the aid of safety audit data. The workers' competence was measured using a knowledge test, while behaviour was measured by observation and scored as 'percentage safe'.

The knowledge test was a 24-question, multi-choice pictorial test with six questions per theme. For behaviour there were eight observational criteria, two per theme.

The researchers began by taking 'before' intervention performance measures of the workers' competence and behaviour (using the knowledge test and observation). The interventions were then carried out, consisting of pictorial toolbox talks on themes A and B conducted on two of the sites (sites 1 and 3, collectively known as group 1), while talks on themes C and D featured on the other two (sites 2 and 4, or group 2).

* For the purposes of this study, 'migrant workers' are those domiciled outside the UK and who do not speak English as their first language.

Each group acted as the control for the other by using text-only versions of the corresponding toolbox talk. Using control sites, where the same training was delivered without pictorial aids, allowed comparisons to be made and any differences in worker competence and/or behaviour to be identified.

'After' measures were then taken using the same knowledge test and observations on the same criteria.

Sites 1 and 2 were revisited one month later to be tested again, before a second round of training was delivered and data collected. Only these sites were revisited as it was not the main objective of the research to explore the effect of long term improvements.

The project structure is summarised in Table 1.

Sites	Intervention group	Control group
1 and 3	Themes A and B Pictorial	Themes C and D Text only
2 and 4	Themes C and D Pictorial	Themes A and B Text only

Table 1
Summary of the project interventions

What did our researchers find out?

The average knowledge test scores in relation to the themes where pictorial aids were used increased in all cases, whereas the average scores in relation to text-only themes showed only random variation (see Table 2). These differences in knowledge test scores were statistically significant, meaning that it's very unlikely that the improvements associated with the pictorial aids occurred by chance.

One month later, knowledge test scores remained high. In many cases the scores were 100 per cent, leaving no room for further improvement. Therefore no further testing was undertaken after the second intervention (although further observation data were collected for behaviour measures).

In addition to this, the average pre-intervention knowledge score was 10 per cent higher than that reported in previous research.¹ Further investigation found that this was probably due to a combination of two factors:

- the workers involved in this research were all European; the treatment of health and safety tends to be more similar to the UK in European countries than among other non-English-speaking nationalities
- all the workers had attained the Construction Skills Certification Scheme (CSCS) competence levels; not all sites in the previous research had required this.

The pre-intervention scores also agreed with previous findings showing that more experienced workers generally scored higher overall on the knowledge test than less experienced ones:

- under five years' experience = 21.89
- 5–10 years' experience = 22.13
- over 10 years' experience = 22.58.

However, the correlation was not statistically significant.

Themes		Average test scores (before)	Average test scores (after)
A and B	Pictorial	11.35	11.95
	Text only	11.75	11.55
C and D	Pictorial	11.03	11.95
	Text only	10.07	10.20

Table 2
Average knowledge test scores

¹ Hare B and Cameron I. *Pictorial aids for communicating health and safety*. Presented at the CIB W099 Health and Safety in Construction Conference, Melbourne, 21–23 October 1999.

The observation scores were not as conclusive. In general, the results were similar, as improvements in safe behaviours (percentage safe) were greater on intervention sites. Individual scores were not statistically significant, ie there was not enough change to rule out random variation. But the overall combined scores were significant or very nearly significant.

The improved scores remained high one month later for the intervention on themes A and B, whereas the scores dipped for C and D, before rising again after the second intervention. Further investigation into this showed that the management on site 1 had reproduced posters of the training images and placed them beside work areas. This 'poster effect' may have been the reason for the behaviour scores remaining high one month later for themes A and B.

Themes		Average observation scores (% safe)			
		Before first intervention	After first intervention	One month later	After second intervention
A and B	Pictorial	73.13	91.58	90.36	94.38
	Text only	77.39	81.50	75.76	77.49
C and D	Pictorial	84.53	93.62	79.53	90.26
	Text only	66.18	71.34	70.57	73.14

Table 3
Average observation scores

What does the research mean?

The test scores show that training with picture-based materials improve knowledge and understanding among migrant workers (whose first language isn't English) better than text-only training. Further, these knowledge test scores remained high one month later, indicating that the knowledge had been retained and that the test was not just a 'memory test'. The pictorial aids used were a combination of sketch drawings, pictograms and photographs. All followed a consistent format of hazard, consequences and controls, which is commonly used on warning labels. These findings show that this is an effective format and should be used for communicating basic health and safety information to migrant construction workers.

The behaviour scores show that measuring the impact of the images on behaviour is both challenging and unpredictable. Pictorial aids are obviously limited by the fact that they are merely a method of communication and do not ensure compliance. However, the sustained improvement in behaviour seen on site 1, probably caused by the 'poster effect', opens up the possibility of a co-ordinated approach involving training with poster reinforcement using the same images. This finding reinforces those of the Health and Safety Executive's 'Trojan horse' research.²

Sketch drawings, pictograms and photos all have different strengths. More research is needed to establish, in detail, how each of them can be used more efficiently by comparing them in different situations. Using pictorial toolbox talks alongside a synchronised poster campaign may help improve the overall impact and effectiveness of pictorial aids to communicate health and safety information. But their long term efficacy needs to be investigated. Finally, more research on the interaction of communication method, motivation, capability and other relevant factors would help understand more fully how pictorial aids affect workers' behaviour in general.

² Steel Construction Institute. *Trojan horse construction site safety messages* (RR336). HSE Books, 2005. www.hse.gov.uk/research/rrpdf/rr336.pdf.

Don't forget

The research described in this study has been as robust as possible, bearing in mind that the interventions took place on 'real world' sites. The mere fact that they weren't in 'laboratory conditions' creates obvious limitations of control. For example, the decision by the management of site 1 to reproduce the images in poster form was outside the control of the research design. However, ethically it was difficult to prevent this from occurring. Besides, the implications of this initiative for the longevity of the intervention proved to be very interesting and useful.

Some behaviour baseline scores were excessively different. This may have been due to some target criteria being too site-specific, so that they didn't correspond with the control site. However, this problem only occurred with a few of the criteria. The results one month later were not as robust, since there was some drop-out of participants by this time. This may have caused some contamination of the follow-up observation data. However, *prima facie* improvements were still detected.

Our research

This project is one of a series of projects commissioned by IOSH to look at the challenges of securing healthy and safe work for all members of a diverse working population and enabling them to work while minimising risk of harm. The first report, by the Institute of Occupational Medicine, looks at the evidence base for the health, safety and health promotion needs of older workers (www.iosh.co.uk/olderworkers). The second, by Brunel University, focuses on post-retirement age workers and health and safety (www.iosh.co.uk/postretirement).

Our summary gives you all the major findings of the independent project report by Glasgow Caledonian University. If you want to read about the study in more depth and see the actual images used in the toolbox talks, you can download the full report from www.iosh.co.uk/pictraining.

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