



Systematic literature review on the effectiveness of training and education for the protection of workers

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Presentation based on recent IWH-NIOSH report

- Robson et al. A systematic review of the effectiveness of training & education for the protection of workers. Toronto: IWH; Cincinnati, OH: NIOSH; 2010
- Technical report and lay summary available from <http://www.iwh.on.ca/sys-reviews/training-and-education-programs>
- Journal manuscript submitted to American Journal Preventive Medicine



IWH-NIOSH review starts where the earlier review by NIOSH ended

- **Traditional narrative literature review: NIOSH report**
 - 80 intervention studies, from 1980-1996
 - Found training is effective in changing:
 - Knowledge
 - Behaviours
 - Health (i.e. illness & injury)
 - BUT authors said more rigorous research evidence needed in future
 - Stronger study designs
 - Lack of confidence about the findings on health outcomes

Cohen A et al. Assessing occupational safety and health training: a literature review. Cincinnati, OH: NIOSH, 1998



Research question 1

- Does OHS training have a beneficial effect on workers?



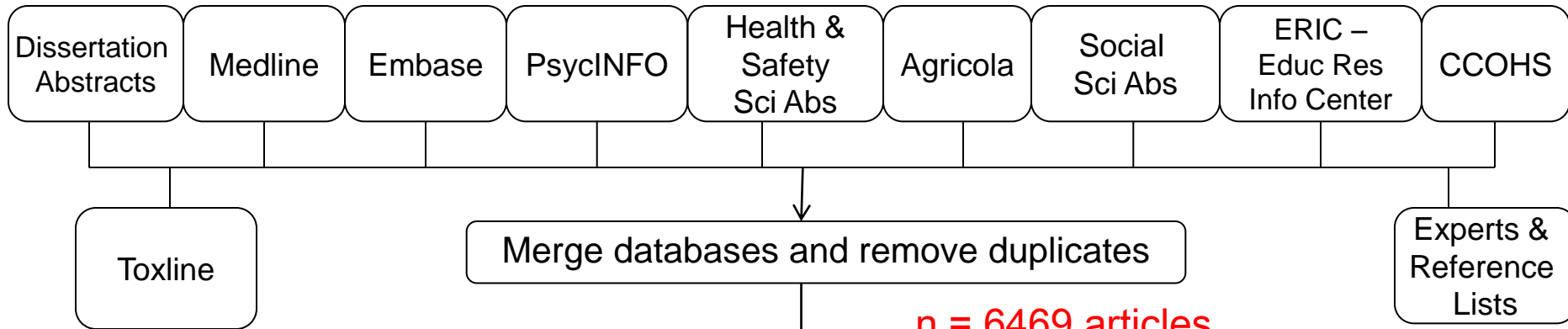
Criteria for articles we reviewed

- Randomized controlled trials
- Worker or worker-in-training
- Education or training for primary prevention of illness or injury
- OHS outcomes
 - Knowledge
 - Attitudes & beliefs
 - Behaviours (also hazards, exposures)
 - Health (illnesses, injuries, symptoms)
- French or English language
- Published between 1996-2007 in peer-reviewed journal

Overview of the review process

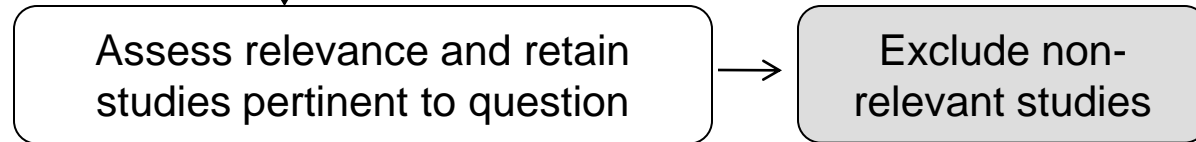
Step 1: Research Question

Step 2: Literature Search



n = 6469 articles

Step 3: Relevance Assessment

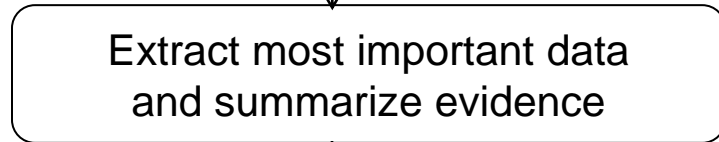


k = 22 studies

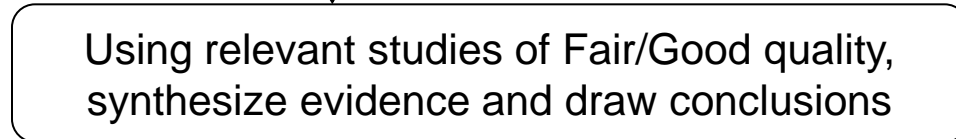
Step 4: Quality Assessment



Step 5: Data Extraction



Step 6: Evidence Synthesis and Conclusions



k = 12



Use of evidence synthesis algorithm

Body of evidence: results from multiple studies of training effectiveness



Assess body of evidence using algorithm

Level of evidence	Method. quality	Quantity (min.)	Consistency in directions of effects	Effect size
Strong	Good	2	Yes	Sufficient
	Fair/Good	5	Yes	Sufficient
	Meet criteria for Sufficient level of evidence			Large
Sufficient	Good	1	n/a	Sufficient
	Fair/Good	3	Yes	Sufficient
Insufficient	Any of the above 4 criteria not met			

Strength of the body of evidence determined:

- Insufficient
- Sufficient
- Strong



Algorithm used for evidence synthesis

Level of evidence	Method. quality	Quantity (min.)	Consistency in directions of effects	Effect size
Strong	Good	2	Yes	Sufficient
	Fair/Good	5	Yes	Sufficient
	Meet criteria for Sufficient level of evidence			Large
Sufficient	Good	1	n/a	Sufficient
	Fair/Good	3	Yes	Sufficient
Insufficient	Any of the above 4 criteria not met			

Based on Briss et al. (2000) Developing an evidence-based *Guide to Community Preventive Services* – Methods. Am J Prev Med 18(1S):35. (The Guide can also be accessed at <http://www.thecommunityguide.org/index.html>.)

Effect size (d) criteria for evidence synthesis algorithm:

Outcome	Training versus control comparisons	
	Sufficient d	Large d
Knowledge	1.0	1.5
Attitudes & Beliefs	0.5	1.0
Behaviours	0.4	0.8
Health	0.15	0.30



Effect size criteria decrease as the outcome becomes more distant from training intervention




Six studies contributed to evidence synthesis on behaviours

Training intervention	Method of training delivery	1 st author, yr of publication
Office ergonomics	Multi-component, 1 session	Brisson 1999
Office ergonomics	Multi-component, 2 sessions	Eklöf 2004, 2006
Office ergonomics	Multi-component, 2 sessions	Greene 2005
Dermatitis prevention in “wet work” in health care organizations	Multi-component, 3 sessions	Held 2002
Farm safety, farmers	Multi-component, 2 sessions	Rasmussen 2003
Universal Precautions, health care workers	Computer-based, 2 sessions	Wright 2005



Effects on behaviours relative to evidence synthesis algorithm

Outcome	Status of body of evidence relative to evidence synthesis algorithm			Resulting level of evidence
	Number fair/good studies	Consistency in directions of effects	Median effect size	
Knowledge				
Attitudes				
 Behaviours	Enough (6)	Yes	Large (+1.09)	Strong
Health				



Five studies contributing to evidence synthesis on health (i.e. injury, illness, symptoms)



Intervention	Method of training delivery	1 st author, yr of publication
Box cutter use, retail workers	Multi-component, 1 session	Banco 1997
Office ergonomics	Multi-component, 2 sessions	Eklöf 2004, 2006
Office ergonomics	Multi-component, 2 sessions	Greene 2005
Dermatitis prevention in “wet work” in health care organizations	Multi-component, 3 sessions	Held 2002
Farm safety, farmers	Multi-component, 2 sessions	Rasmussen 2003



Effects on health and behaviours relative to evidence synthesis algorithm

Outcome	Status of body of evidence relative to evidence synthesis criteria			Resulting level of evidence
	Number fair/good studies	Consistency in directions of effects	Median effect size	
Knowledge				
Attitudes				
Behaviours	Enough (6)	Yes	Large (+1.09)	Strong
Health	Enough (5)	No	Not sufficient (-0.04)	Insufficient

Effects on all outcomes relative to evidence synthesis algorithm

Outcome	Status of body of evidence relative to evidence synthesis criteria			Resulting level of evidence
	Number Fair/Good studies	Consistency in directions of effects	Median effect size	
 Knowledge	Two few (2)	Yes	Large (+2.52)	Insufficient
 Attitudes	Two few (1)	n/a	Sufficient (+0.84)	Insufficient
Behaviours	Enough (6)	Yes	Large (+1.09)	Strong
Health	Enough (5)	No	Not sufficient (-0.04)	Insufficient

Results of sensitivity analysis

Outcome	Status of body of evidence relative to evidence synthesis criteria			Resulting level of evidence
	Number of studies	Consistency of directions of effects	Median effect size	
Knowledge	Enough (5)	Yes	Sufficient (+1.27)	Sufficient
Attitudes	Enough (3)	Yes	Sufficient (+0.85)	Sufficient
Behaviours	Enough (10)	Yes	Sufficient (+0.79)	Sufficient
Health	Enough (10)	Yes	Too small (+0.05)	Insufficient

➔ Conclusions about behaviours and health are robust 17



How does this fit with other research evidence on training and health outcomes?

Review	Type of OHS hazards	Type of evidence synthesis	Conclusion
Three IWH reviews from 2006-8	Ergonomics – various	qualitative	Not supportive: either mixed effects OR moderate evidence of no effect
Martimo et al. BMJ 2008	Ergonomics – lifting	quantitative	“No evidence to support use of advice or training”
Burke et al. AJP 2006	All types	quantitative	Small effect ($d = +0.25$) if training is highly engaging



Practical messages

After considering the evidence from the IWH-NIOSH review:

- The review team **recommends** that workplaces continue to conduct education and training programs, since they have a positive impact on worker practices. However, OHS training **as a lone intervention** has *not* been demonstrated to have an impact on health (e.g. injuries, symptoms).

After considering evidence from various sources:

- We strongly suggest that decision-makers consider more than just training when addressing a risk in the workplace, since **large impacts of training alone cannot be expected**



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