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Hidden effectiveness? Results of hand-searching Italian language journals for occupational health interventions

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ABSTRACT

Objective To compare the yield of hand-searching with optimised electronic search strategies in retrieving occupational health (OH) intervention studies published in a language other than English.

Methods The authors systematically hand-searched and screened reports of OH intervention studies published in Italian in peer-reviewed scientific journals between 1990 and 2008. The authors evaluated how many of them met the Cochrane Occupational Safety and Health Review Groups (OSHRG) definition of being an OH intervention study and how many potentially relevant studies retrieved by hand-searching would not be found by PubMed alone using the OSHRG's most specific and most sensitive search strings.

Results Hand-searching retrieved 25 articles (reporting 27 studies), including nine not indexed in MEDLINE. Most studies (81%, 22/27) had a before–after design and only one was a randomised trial. The OSHRG's most sensitive search string retrieved all 16 articles published in the Italian language journals that were indexed in MEDLINE, while the most specific search strategy retrieved nine articles (56%, 9/16). The most specific search string showed a lower 'number needed to read' value than the most sensitive one (60 vs 132).

Conclusions These findings suggest that a sensitive electronic search strategy may be able to find most of the OH interventions published in languages other than English that are indexed in MEDLINE. Hand-searching of important national journals not indexed in MEDLINE should be considered when conducting particularly in-depth research.

INTRODUCTION

As the culture of evidence-based medicine has led to widespread support for an evidence-based approach to occupational health (OH), the evaluation of the effectiveness of OH interventions has become a fundamental step towards evidence-based OH practice.^{1 2} One key aspect of evidence-based practice is the ability to conduct effective and efficient literature searches. In the OH field, this challenge has been addressed in at least two ways: with the development of systematic search strategies to optimise the yield of electronic databases,^{3–5} and by trying to identify a set of core OH journals.^{6 7} Both approaches can help occupational physicians and other stakeholders in OH to trace results

What this paper adds

- The evaluation of the effectiveness of occupational health (OH) interventions has become a fundamental step towards evidence-based OH practice.
- The number of intervention studies available in the field of OH is relatively modest.
- For journals indexed in MEDLINE, searching PubMed with a sensitive and optimised search strategy will locate most of the OH intervention studies, even if published in a language other than English.
- When conducting particularly in-depth research (eg, a systematic review on a little studied intervention), hand-searching of important national journals not indexed in MEDLINE should be considered to maximise coverage of the search.

published in the English language on which interventions work and which do not. However, some peculiar aspects of OH limit the completeness of the results provided by literature searches based solely on a restricted set of core journals or on electronic resources. Many OH interventions are implemented by local health authorities or administrations rather than by research centres such as universities, national institutes or private enterprises. In such cases, the appropriateness of the research methodology and scientific reporting may lag behind the quality of the interventions themselves. Therefore, evaluations of well-designed and conducted interventions are sometimes reported in secondary scientific journals not covered by MEDLINE, where they become difficult to locate. Moreover, the fact that many reports are intended for national journals published in languages other than English creates an additional language barrier for many researchers. For these reasons, hand-searching of national peer-reviewed journals may be necessary in order to maximise the comprehensiveness of a literature search of OH interventions.

To evaluate the role of hand-searching, we systematically screened reports published in Italian language peer-reviewed scientific journals to find evaluations of OH interventions. Then we

calculated how many of the potentially relevant studies retrieved by hand-searching could not be found by searching PubMed with optimised search strategies.^{3 8}

METHODS

We set out to identify full original articles published in Italian language peer-reviewed journals between 1990 and 2008 that met the Cochrane Occupational Safety and Health Review Group's (OSHRG) classification criteria for OH intervention studies.⁹ We excluded reports that were published only in ad hoc collections of conference proceedings and other theme-based supplements. We additionally decided to exclude studies that went on to be reported in English language journals. However, we did consider articles from an Italian language journal, *Prevenzione Oggi*, which since 2005 has provided parallel English language versions, based on the rationale that these publications cannot be traced via PubMed. Identification of eligible reports was accomplished in two phases. In an initial screening phase, we retrieved all potentially eligible articles. Four of us (DP, MF, GM, AF) first hand-searched all articles published in the Italian language peer-reviewed scientific journals whose scope directly concerns the OH sector or preventive medicine. These include: *Annali dell'Istituto Superiore di Sanità*, *Archivio di Scienze del Lavoro* (extant until 1995), *Epidemiologia e Prevenzione*, *Giornale degli Igienisti Industriali*, *Giornale Italiano di Medicina del Lavoro ed Ergonomia* (until 1997, *Giornale Italiano di Medicina del Lavoro*), *La Medicina del Lavoro*, *L'Igiene Moderna*, *Prevenzione Oggi*, and *Rivista degli Infortuni e delle Malattie Professionali*. All articles published in these journals were considered, even those exceptionally published in languages other than Italian. For each article, we scanned title, aims, tables and figures and earmarked all potentially relevant reports.

Each potentially eligible article was then submitted to a detailed independent reading by three of us (AB, SM, FZ) to evaluate whether any portion of the study fully met the OSHRG criteria for classification as an OH intervention study.⁹ To exclude studies subsequently reported in the English language, one of us (AF) scanned titles and abstracts of articles published in the English language that were written by either the first author or the last author of the studies published in Italian.

Adopting the OSHRG criteria,⁹ two of the authors (AF, RMTC) classified the study design (A codes) of eligible studies as randomised controlled trial (RCT) or cluster RCT (A1), controlled trial or prospective cohort study (A2), time-series (A3), before–after comparison without a concurrent control group, quality of care study or comparison with arbitrary controls (A4).

Studies were also categorised according to the OH outcomes (B codes,⁹ data not shown).

To explore differences between hand-searching and PubMed, we compared numbers of relevant articles identified by hand-searching with those obtained by applying OSHRG's most sensitive and most specific PubMed search strings.^{3 8} The comparison considered only the three hand-searched Italian journals that were indexed in MEDLINE: *Epidemiologia e Prevenzione*; *Giornale Italiano di Medicina del Lavoro ed Ergonomia*; *La Medicina del Lavoro*.

For the indexed articles, we calculated the number needed to read (NNR) as the number of articles identified by hand-searching or by the OSHRG's strings^{3 8} that on average was necessary to read to identify one OH intervention study.

RESULTS

After hand-searching all the Italian language journals dedicated to OH or preventive medicine, we traced and retrieved 25 articles published only in the Italian language between 1990 and 2008 that met the OSHRG classification criteria for OH intervention studies. Since two articles reported results from more than one study design, we considered a total of 27 studies. The majority (52%, 13/25) of the articles were published in *La Medicina del Lavoro* (the other journals represented were: *Archivio di Scienze del Lavoro*, n=4; *Giornale degli Igienisti Industriali*, n=3; *Epidemiologia e Prevenzione*, n=2; *Giornale Italiano di Medicina del Lavoro ed Ergonomia*, n=1; *L'Igiene Moderna*, n=1; *Prevenzione Oggi*, n=1). The total number of articles published in the three Italian journals that were also indexed in MEDLINE during the study period was 4035. As expected, all the 16 articles on OH intervention studies retrieved by hand-searching among these three journals were indexed in MEDLINE. Hence, we could calculate a NNR for hand-searching of 252 (4035/16). Table 1 reports the numbers of studies retrieved by hand-searching and by applying the OSHRG's electronic search strategies.^{3 8} Applying the most sensitive search strategy in PubMed we retrieved all 16 relevant articles among the total yield of 2112 references, thus giving a NNR of 132 (2112/16). The most specific search strategy on the other hand identified 9 (56%) articles among 537 references, resulting in a NNR of 60 (537/9). A brief description of all retrieved OH intervention studies is provided in Web Appendix 1.

DISCUSSION

To explore the need for hand-searching when looking for OH intervention studies published in languages other than English, we hand-searched the full reports of effectiveness studies published in Italian language scientific journals between 1990 and 2008. Our findings suggest that a sensitive electronic search

Table 1 Distribution of Italian occupational health intervention articles according to study designs

Study designs*	Hand-searching N (%)	Articles retrieved by specific search strategy for PubMed ^{3 8} N (%)	Articles retrieved by sensitive search strategy for PubMed ^{3 8} N (%)
A1 RCT	1 (4)	1 (9)	1 (6)
A2 CT	3 (11)	1 (9)	3 (17)
A3 time-series	1 (4)	1 (9)	1 (6)
A4 before-after	22 (81)	8 (73)	13 (72)
Total number of studies*	27	11	18
Total number of articles	25	9	16

*Total number of studies is 27 since two articles reported results from two different study designs.
CT, controlled trial; RCT, randomised controlled trial.

strategy applied to PubMed should be able to identify the vast majority of the Italian articles on OH intervention studies indexed in MEDLINE. Furthermore, when applying OSHRG's most sensitive search strategy without any further limitation, the NNR almost halved compared with hand-searching, permitting a consistent saving of time.

When we applied the OSHRG's most specific search strategy,^{3,8} we were unable to retrieve a considerable proportion (>40%) of the OH intervention studies identified by hand-searching. However, the performance of the most specific search strategy in terms of NNR confirms that this strategy should be considered as a valuable tool for first-line bibliographic searches.

The vast majority (81%) of the identified OH intervention studies had a before–after design, whereas the proportion of before–after studies in English language OH journals is only 44%.¹⁰

Table 1 shows that all the effectiveness evaluations performed with a study design other than before–after (ie, RCT, non-randomised controlled trials and interrupted time-series) were described in articles indexed in MEDLINE. This observation could suggest that the coverage of electronic search strategies is greater when looking only for high quality intervention studies. Our results are in line with those of Rollin *et al*,¹¹ who estimated that MEDLINE allows access to about 90% of the high-quality OH intervention studies included in the reviews of the Cochrane Library indexed under the topic 'occupational health field' in December 2009.

The evaluation of grey literature was outside the scope of this overview. The OH intervention studies reported in the proceedings of the Italian Society of Occupational Medicine and Industrial Hygiene congresses between 1988 and 2003 have been reviewed elsewhere:¹² of the 108 studies retrieved only six were controlled trials, none of which was randomised (no interrupted time-series analysis was found). Only five of the 108 studies presented in the proceedings were subsequently reported in a peer-reviewed journal indexed in MEDLINE.¹²

CONCLUSIONS

For journals indexed in MEDLINE, searching PubMed with a sensitive and optimised search strategy³ will locate most of the

OH intervention studies, even if published in a language other than English. However, when conducting particularly in-depth research (eg, a systematic review on a little studied intervention), hand-searching of important national journals not indexed in MEDLINE should be considered to maximise coverage of the search.

Contributors SM drafted the article. AF, RMT, SC, GM and FZ made substantial contributions to acquisition, analysis and interpretation of data and drafting the article. AB made substantial contributions to the conception, design, analysis and interpretation of data. JHR, DP, MF, GC and FSV revised the article critically for important intellectual content. FSV approved the final version to be published.

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Web Appendix 1. Occupational health intervention studies published in the Italian language between 1990 and 2008. Classification according to the criteria proposed by the Cochrane Occupational Safety and Health Review Group (A codes and B codes) and brief description of the studies.

Authors (journal, year)	Study design and setting (period)	Study population	Intervention	Main outcome measures	Main findings	Comments	OSHRG class (design, outcome)
Arduini and Della Foglia [1]	Before-after study of leather, footwear and accessories sector (1986-1989)	n.a.	Administrational: workplace inspections (incompletely described)	Adherence of workstations to current legal and professional/technical standards	Apparent reduction of number of workstations not adhering to current legal and professional/technical standards (no statistical analysis)	- Exposure assessment methods not described or validated	A4 / B1
Capodaglio et al [2]	Before-after study of biomechanical overload and low back pain in a large industrial wool processing factory (period?)	Unspecified number of workers (3 job tasks)	Ergonomic: platforms (detailed description)	Five exposure indices (OCRA, ESI, SI, TLV and ad hoc) before/after intervention	Unclear (no statistical analysis)	- Main study aim was risk evaluation	A4 / B1
Carrer et al [3]	Before-after study of welders in a power station following raised urinary values for metals at biological monitoring (period?)	7 welders (all men)	Educational [technological] (incompletely described)	Urinary Ni values before the intervention and at 12 and 18 months (defined)	>20-fold reduction in urinary Ni values at 18 months (no statistical analysis of main outcome)	- Study period and exact intervention unclear - Urinary values of Ni used as proxy for Pb and Al	A4 / B1
Castagnoli	Before-after	n.a.	Technological:	Environmental	Noise levels appeared	- Numbers of	A4 / B1

and Attaccalite [4]	study of noise exposure in a gas cylinder branding department (period?)		sound absorbing materials (detailed description)	noise exposure levels at two work stations, expressed as Leq Db(A)	to be reduced in both work stations (no statistical analysis)	noise exposure levels for each different operation not always specified	
Cella et al [5]	Quasi-experimental study of effectiveness of flu vaccination for workers in a large hospital (2002-2003)	423 vaccinated workers and 423 controls matched by sex and working area	Health care: workers vaccinated in a voluntary vaccination campaign vs. sample of workers who did not respond to the appeal (vaccination described, campaign scantily described)	Numbers of influenza-like cases and numbers of working days lost; Cost benefit analysis	Significant reductions in cases and working days lost; Cost-benefit analysis, 4.5. (calculated according to Postma)	- Study design targeted effectiveness of the vaccine rather than the vaccination campaign, as claimed - Includes subanalysis stratified by age and job title	A2 / B3, B8
Cornaggia et al [6]	Before–after study of noise in a “shaking out bay” in a metallurgic plant (no earlier than 1991)	n.a.	Technological: multiple changes to machine (detailed description)	Daily personal noise exposure level expressed as Lep,d Db(A)	“Exposure reduction from 102 to 86 Lep,d Db(A)” (no statistical analysis)	- Outcome measurements not clearly reported	A4 / B1
Crippa et al [7]	Before–after study of latex allergy in a single large hospital (2001-2002)	All 20 subjects found to be allergic to latex in a population of 1962 workers exposed for	Secondary prevention: Alternative individual/ working group materials, or change of job task, as appropriate	Absence of symptoms at 12 months (defined)	Intervention effective for 11/14; 6 lost to follow-up (no statistical analysis)	- Study of prevalence which also reported a highly selective intervention	A4 / B2

		≥1 year					
Crippa et al [8]	Before–after study of trainees attending 3 different private/public hairdressing schools (2001-2004)	All 83 trainees [women, n=77] who completed the entire course; out of 154 who started	Educational: Two 3-hour sessions (not described) conducted during the 1 st and 3 rd years of a 3-year course	Self-reported: 1) use of protective strategies; 2) work-related diseases (choice of measures unclear explained)	Increased use of appropriate gloves; Reduced prevalence of dermatitis (accompanied by increased prevalence of back pain)	- Many aspects of study design/measures unclear - Main specified aim was to evaluate acquisition of “knowledge” of risk factors and preventive strategies	A4 / B2, B3
Donghi et al [9]	Before–after study of noise exposure in a cement factory with noise levels above action level (1992-1993)	n.a.	Technological: Replacement/modification of machines and introduction of sound-absorbing materials (partially described)	Daily personal noise exposure levels in 5 different job tasks in 4 work stations; expressed as Lep,d Db(A)	Reductions of Lep,d in all 5 job tasks; 3 of 5 tasks below action level after intervention (no statistical analysis)	- Numbers of measurements and sampling times not specified	A4 / B1
Duca et al [10]	Randomized controlled trial for prevention of dermatitis in 13 printing factories (1991-1993)	868 [of 942] workers who satisfied eligibility criteria were randomized (individually matched by task, sex, age and	Educational: Individual advice to use freely available barrier cream at start of work and mid-shift vs. no advice (described)	Workers with dermatological symptoms at least one follow-up examination [at 4, 8 and 12 months]	2% to 17% [95% confidence intervals] reduction in the proportion of symptomatic workers	- Workers with “severe” dermatological diseases were excluded - Creams chosen at company level and financed by researchers; unclear whether availability was boosted during	A1 / B3

		length of service)				study - Contamination possible	
Gasparri et al [11]	Before–after study of environmental tobacco smoke in public offices [n=10], “industrial buildings” [n=10], ‘pubs’ [n=7] and discos [n=4] (2004-2005)	n.a	Legislative: National law introduced in January 2005 prohibiting smoking in enclosed public spaces and workplaces	Breathing space concentrations vapor-phase nicotine [as marker of tobacco smoke] (defined)	Reductions in pubs and discos, ~95%; public offices, 77%; manufacturing companies, 43%	- “Industrial buildings” not described - Researchers conclude intervention was especially effective in places where concentration was initially high (pubs/discos)	A4 / B1
Marchi et al [12]	Quasi-experimental study of smoking prevention among “trainees” attending official industrial hygiene course (1999-2001)	Intervention: 552 men, 531 women. Controls: 458 men; 312 women.	Educational: Personally consigned pamphlets plus individual access to informal counseling vs. no intervention (described)	At ~1 year, proportions of men/women smokers who ‘quit’; men/women non-smokers who ‘started’. Additionally, before-after analysis of intervention group with multiple outcome measures. (defined)	In treatment arm, RR (95%CI) of quitting: women, 2.7 (1.2-5.9); men 1.9 (1.0-3.6); of starting: women, 0.3 (0.2-0.7); men 0.4 (0.2-0.6)	- Controls were historical [follow-up closed in 1999] - Type of “trainees” not specified - Counselor’s profession unspecified - Quitting (and starting) smoking undefined	1) A2/B7; 2) A4 / B7
Marconi et al [13]	Quasi-experimental study of	n.a.	Technological: changes to composition and way	Environmental and personal monitoring of	Personal monitoring: 3-fold reduction during preparation of	- 12 environmental and 16 personal	A2 / B1

	exposure to ceramic fibres during turbine insulation work at a thermoelectric power plant (no later than 1997)		materials are presented to workers responsible for fitting them vs. no change (described)	breathing space exposure to ceramic fibers during on site preparation of materials and during fitting (defined)	materials and 15-fold reduction during fitting Environmental monitoring: no reduction during preparation of materials but 10-fold reduction during fitting (no statistical analysis)	measurements	
Miscetti and Bodo [14]	Time series analysis of injuries in all building sites in the Assisi district from 1992 to 2006	Dynamic	Intensification of routine 'OSHA inspections' (described) following a disastrous earthquake	Variations in annual injury incidence rates ('injuries' not defined)	Effectiveness claimed but without analysis of trend (no statistical analysis)	- Primarily a monitoring study (no clearly specified research question)	A3 / B5
Nicoletti et al [15]	Attempted time-series analysis of upper limb musculoskeletal disorders in a large manufacturer of upholstered furniture, broadly classifiable as before-after study (2000-2005)	All manual workers (~3,500 at close of study)	Multicomponent. Educational [manual handling tutorials with cautionary tales from affected workers]; Organizational/Ergonomic/Technological [from 2002, some automation, task reorganization, improved equipment, including new mechanized equipment allowing	Incidence rates of work-related musculoskeletal disorders	Findings unclear; trends claimed for reductions in both work-related musculoskeletal disorders (graphical presentation without statistical analysis)	- Narrative article - Sketchy application of multiple analytical approaches - External comparison groups considered in results - Monetary estimate of benefits but not of costs - Timing of some	A4 / B3

			the most demanding tasks to be allocated to affected workers] (detailed but incomplete description)			components of the intervention unclear - Subsidiary aim: reduction of disabilities	
Pasquini et al [16]	Before-after study of exposure to NO ₂ and halogenated anesthetics in the surgery department of a large hospital (1984-1992)	n.a.	Technological [forced ventilation] (not described)	Environmental exposure levels, expressed in ppm and categorized (4 classes)	Apparent reduction of environmental exposure levels (no statistical analysis)	- Main study aim was risk evaluation	A4 / B1
Paternoster et al [17]	Before-after study within departments of a single hospital (1996-1997)	Hospital auxiliary workers [n=201] (recruitment unclear)	Behavioral: Physiatriac education for patient lifting (described)	Four postural evaluations; score for overall lifting technique (described) evaluated on workers [n=40] on morning shifts at 6 months pre/post-intervention	No evidence of effectiveness	- Outcomes measured in different groups of individuals working on a particular shift	A4 / B2
Perico and Pagni [18]	Before-after study of airborne pharmacological contamination in a ward for treatment of	n.a. [5 nurses]	Multicomponent. Organizational: Separate room or aerosol treatments. Technological: air exchange apparatus potentiated	Personal monitoring; environmental monitoring of pentamidine concentrations in treatment room	>6-fold reduction at personal monitoring; ~50% reduction at environmental monitoring of treatment room (no statistical analysis)	- Urinary pentamidine concentrations were below level of detection when measured at baseline	A4 / B1

	infectious diseases (period?)		(described)	(described)			
Rivolta et al [19]	Before-after study of a health promotion program conducted in OH clinic/workplaces (2000-?)	About 800 smokers, of whom 472 agreed to participate	Multicomponent: Educational/Psychological and Pharmacological (nicotine substitute and antidepressants) (incompletely described)	Non-smokers (tested with cotinine) at 1 year	At 1 year 243/472 (51%) active participants had quit (no statistical analysis)	- No description of workers - On treatment analysis	A4 / B7
Sebben et al [20]	Before-after study of noise exposure and hearing loss in the bottling department of a brewery (1980-1986)	88 workers with pre/post audiometric test data	Technological: Soundproofing of machines (1983) (not described)	Environmental noise exposure levels (28 measures) expressed as Leq Db(A); Audiometric results	Claimed reduction of Leq Db; audiometric results unclear (no statistical analysis)		A4 / B1, B3
Scinardo et al [21]	Before-after study in a factory producing diamond grindstones with cobalt exposure concerns (period not specified)	Workers (number unspecified) in exposed sector of factory	Multicomponent. Technological: Increased efficiency of laboratory fume hoods extractor fans (described); Educational: optimize exposure-related behavior (incompletely described)	Personal and environmental monitoring of cobalt and total dust (techniques described but timing not specified)	Apparent reduction of personal/environmental cobalt concentrations only (no statistical analysis)	- Educational part of intervention describes desired behavior but not training methods/duration - No behavioral outcome measure	A4 / B1
Terzi et al [22]	Before-after study of a wool mill insulated with asbestos	n.a.	Building reclamation: Removal of asbestos (described)	Environmental monitoring of breathing space: amosite	11–20-fold reductions in amosite concentrations (no statistical analysis)	(Exact study period unclear)	A4 / B1

	(1990-1991?)			concentrations before/after intervention and at 5 months (defined)			
Tominz et al [23]	Before–after study of exposure to tobacco smoke in a Local Health Agency in Trieste: 1) workers (2004-2005); 2) internal environment (2004-2006)	1) Before: 746 replies from all 1067 workers; After: 186 replies from a “sample” of 200 workers 2) n.a.	Legislative [National law introduced in January 2005 prohibiting smoking in enclosed public spaces and workplaces]	1) Prevalence of: smokers; self-reported exposure to first/second-hand smoke (incompletely defined) 2) Breathing-space concentrations of PM _{2.5} and PM ₁₀ (described)	1) Prevalence of smokers unchanged; reduced self-reported exposure to second-hand smoke [from 58% to 47%] 2) Apparent reduction of PM _{2.5} and PM ₁₀ environmental exposure	- Can be considered as two independent studies - Sampling procedure for follow-up interviews not stated	1) A4 / B1, B7 2) A4 / B1
Torri et al [24]	Before–after study of staff exposed to manual handling of patients in 2 hospitals (1995-1997)	Exposed workers [n=603; n=271]	Multicomponent: Technological [lifting appliances]; Ergonomic [new fittings]; Educational [OH physician course]	Before intervention and at 18 months: number/cost of working days lost due to low back pain in previous year	Reductions of both days lost [39%] and costs [39%] (no statistical analysis)	- Intervention costs not specified - Complex intervention only partially described	A4 / B4
Zecchi [25]	Before-after study of biomechanical overload of the upper limbs in a Parmesan cheese production plant (2000-2005)	About 1000 workers	Multicomponent: Educational [via shop stewards], Organizational and Technological [mechanized lifting]	“Disabilities” (eg back injuries) related to biomechanical overload and numbers of working days lost	“Disabilities” and working days lost both reduced by ~40% (no statistical analysis)	- Initial report of an ongoing analysis of effectiveness - Outcome measure “disabilities” not defined	A4 / B3

Abbreviations:OSHRG, Occupational Safety and Health Review Group; n.a., not appropriate; OCRA, Occupational Repetitive Actions index; ESI, Ergonomic Stress Index; SI, Strain Index; TLV, Threshold Limit Values; Leq, Equivalent Continuous Sound Level; LEP,d, daily personal noise exposure; OSHA, occupational safety and health administration; PM₁₀, particulate matter of 10 micrometers or less; PM_{2.5}, particulate matter of 2.5 micrometers or less

Classification of study designs (A codes) [26]

A1 RCT or Cluster RCT

Criteria:

- Random assignment of the study participants to intervention(s).
- Randomisation procedure should be mentioned in the methods section.

A2 Controlled Before-After study or Prospective Cohort Study

Criteria:

- Intervention and control group outcomes measured both before and after the intervention
- No randomisation procedure but deliberate assignment of the intervention to one group

A3 Time-series

Criteria:

- Intervention group only
- Outcome measurements at least three times before and three times after the intervention

A4 Before After comparison without a concurrent control group, quality of care studies, comparison with arbitrary controls

Criteria:

- Outcome measurements before and after the intervention only
- For patients it can be an after measurement only

Classification of the occupational health outcomes (B codes) [26]

B1 Exposure Intervention to remove/eliminate exposure

Criteria:

- Exposure measured (e.g. on skin or inside a mask, metabolites from urine, etc.)
- Real life work situation involved

- Exposure due to holes in gloves in health care situations would mean real exposure to viruses and would be accepted

B2 Behaviour Intervention to influence working behaviour

Criteria:

- Behavioural features measured
- Not: measurement of knowledge, attitude, satisfaction, well-being, perception or compliance only (that might lead to a change in behaviour)

B3 Occupational disease Intervention to influence the course of occupational disease or work-related symptoms or signs

Criteria:

- Measurement of occupational disease symptoms or signs or measures of health (GHQ)
- Occupational as defined by the authors or otherwise clear from context

B4 Disability Intervention to: prevent the course of occupational disability, maintain working ability, reduce sickness absence or increase return to work

Criteria

- Measurement of time to return to work, time spent off work or being on sick leave, score on a work ability scale, rate of being disabled, number of compensation claims

B5 Injuries Intervention to reduce injuries and occupational accidents

Criteria:

- Measurement of the rate of accidents or injuries related to work

Not: back injuries (=occupational disease if stated by the authors) or intermediate outcomes that may eventually lead to less injuries like improved skills or awareness

B6 Quality of OHS Intervention to increase the quality of occupational health services or the qualifications of occupational health professionals

Criteria:

- Measurement of quality of care by means of observations
- Measurement of quality of occupational health professionals by means of tests

Not: measurement of the quality of instruments or health care workers' compliance to vaccination schemes etc.

B7 Health promotion program Intervention to change life style

Criteria:

- Studies have measured weight loss, physical exercise, use of stairs, food intake, smoking, alcohol or drugs intake or any other indicator of health improvement at the work place; OR

- Studies have measured the physiological change resulting from behaviour change: BMI, blood lipids, blood pressure, blood glucose or nicotine levels, etc.
 - No occupational outcomes have to be measured, but the studies have to be performed in workers or at the workplace.
- Not: satisfaction, knowledge or attitude towards lifestyle changes

B8 Cost effectiveness Intervention with an additional analysis of the costs

- Always together with other B-codes
- Measurement and analysis or even just the estimation of the costs, cost effectiveness, cost-benefit or cost-utility of intervention(s)
- Only for the added user-friendliness of the COHF databases

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