Effectiveness of measures and implementation strategies in reducing physical work demands due to manual handling at work
due to manual handling at work

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CRD summary
This review assessed ways to reduce the physical demands of manual handling at work in health care settings and various other industries. The authors concluded that physical work demands and symptoms like back pain were reduced when lifting devices were part of the intervention. Limitations in the review methods cast doubt on the reliability of the conclusions.

Authors' objectives
To determine the effectiveness of measures and implementation strategies to reduce the physical work demands associated with manual handling in work situations.

Searching
MEDLINE, EMBASE, HSELINE, NIOSHTIC and NIOSHTIC-2 were searched from 1990 to 2003; the search terms were reported. The references in retrieved articles and reviews were checked for additional studies. Studies published in the English language were eligible for inclusion.

Study selection
Study designs of evaluations included in the review
No inclusion criteria for the study design were stated.

Specific interventions included in the review
Studies of ergonomic measures or implementation strategies intended to reduce physical work demands were eligible for inclusion. The ergonomic interventions in the included studies were categorised as technical (engineering controls), organisational (administrative controls) or individual (training or education) measures. The implementation strategies were categorised as informational, compulsory, educational, persuasive or facilitative.

Participants included in the review
No inclusion criteria for the participants were stated. The included studies were conducted in a range of health care and industrial field settings, or under laboratory conditions. The participants were nurses and other health care workers, bricklayers, scaffolders, process plant workers, assembly workers, refuse collectors, warehouse personnel, abattoir workers, store workers and workers in various other industrial roles.

Outcomes assessed in the review
Studies that measured physical work demands, musculoskeletal symptoms, or effects of implementation strategies on process were eligible for inclusion. Physical work demands were defined as lifting, carrying, pushing or pulling materials or persons. Measurement of work demands in the included studies was classified as direct, observation or self-report. All reported measurements of musculoskeletal symptoms were included, from self-reported discomfort in the short term to injury records over the longer term. Methods of assessing process variables were classified as questionnaire, observation, checklist, interview or direct measurement. Process variables were classified as awareness, attitude, ability (to change behaviour) and behaviour (changing and maintaining).

How were decisions on the relevance of primary studies made?
One reviewer selected studies for inclusion; in the event of uncertainty, a second reviewer assessed the study and a decision was reached by consensus.
Assessment of study quality
Experimental and quasi-experimental studies were designated as 'high quality' and pre-test post-test and post only designs as 'low quality', without any further assessment. One reviewer assessed the studies; in the event of any uncertainty, a second reviewer assessed the study and a decision was reached by consensus.

Data extraction
The authors did not state how the data were extracted for the review, or how many reviewers performed the data extraction. Tests of statistical significance reported in the original studies were symbolised in the review to indicate a significant increase, significant decrease or no significant change.

Methods of synthesis
How were the studies combined?
The studies were grouped into those reporting effects of ergonomic measures on physical work demands and musculoskeletal symptoms, those reporting effects of implementation strategies on process measures, and those reporting effects of implementation strategies on physical work demands and subsequently on musculoskeletal symptoms. Some studies were included in more than one group. The study characteristics were tabulated together with a narrative summary that focused on the number of studies that measured improvements in outcomes.

How were differences between studies investigated?
Differences in the population, intervention, methods of outcome assessment, study design type and quality designation were illustrated in the tables and highlighted in the narrative summary of the results.

Results of the review
Forty-four studies were included. The review analysed three experimental field studies (including one randomised controlled trial) and four experimental laboratory studies; five quasi-experimental field studies and two quasi-experimental laboratory studies; 19 uncontrolled pre-post field studies; one pre-test post-test field/laboratory study; and 12 post-only field studies. (Two studies appeared to contain two design elements that were analysed separately, hence the discrepancy in the numbers of studies). The number of participants was not given for every study; where reported it ranged from 2 to over 7,000.

Eighteen studies reported the effects of ergonomic measures on physical work demands and musculoskeletal symptoms. Seven of the eight studies of technical interventions (engineering controls) reported reductions in physical work demands. Three of these were 'high quality' laboratory studies of industrial manual handling or patient handling. Four of the six studies of combined technical and organisational measures reported reductions in physical work demands, one of which was a 'high quality' field study. Four studies that tested individual or combined individual and technical measures also reported decreases in work demands. Two of these studies were 'high quality', one of patient handling and one of manual materials handling.

Ten studies reported inconsistent effects on musculoskeletal symptoms. Four studies overall reported a decrease in symptoms, including one of the two 'high quality' field studies.

Twenty-six field studies reported the effects of various implementation strategies on a variety of process measures. Twenty-one implementation strategies that measured improvements in process used a participatory ergonomic approach, an education and/or training programme, with direct involvement of the workers.

Eight studies reported the effects of implementation strategies on physical work demands and subsequent effects on musculoskeletal symptoms. The studies showed mixed results. Three studies involved patient handling. The two 'high quality' studies reported that interventions were associated with significant reductions in physical work demands and musculoskeletal symptoms; the third low-quality study reported a significant increase in back and hip pain following an educational intervention for patient handling. Five 'low quality' studies in other industrial settings showed mixed effects of various combination strategies on various work demands outcomes; the only study that reported musculoskeletal symptoms showed no significant difference in low back pain at 12 months.
Authors’ conclusions
Reductions in physical work demands and musculoskeletal symptoms were found when lifting devices were part of the intervention. Educational and facilitative implementation strategies involving worker participation seem to be important to achieve improvements in process.

CRD commentary
The review addressed a broad question of which only two components (intervention and outcomes) were defined in general terms in the inclusion criteria. The search covered several sources likely to contain relevant studies, although the restriction to studies published in English raises concern about the potential for both publication and language bias, which could favour studies with positive findings. The study selection procedure might not have sufficiently protected against reviewer error and bias. A lot of data were evidently extracted but it was not explicit that a systematic procedure was followed to minimise errors or bias. The method used to define study quality was unreliable and inadequate to assess the potential for bias and the reliability of the results in the individual studies.

Tables of characteristics of the included studies usefully summarised a large number of very diverse studies. However, the reduction of individual study results to symbols concealed the effect size. The narrative synthesis was appropriate given the many differences between the studies, but it tended to focus on the positive results. The greater attention given to those studies perceived to be of higher quality was appropriate but of limited value given the dubious method used to define quality. The authors’ conclusion did not adequately take into account the non-intervention-related differences between the studies and the lack of direct comparisons between interventions with different components.

Implications of the review for practice and research
Practice: The authors stated that the best intervention to reduce physical work demands and related musculoskeletal disorders in the long term seemed to be a minimum combination of engineering ergonomic controls and an implementation strategy of facilitation (participatory, educational or both) that directly involved the workers.

Research: The authors stated that more experimental or quasi-experimental studies are needed to determine the effectiveness of ergonomic measures and implementation strategies.

Bibliographic details

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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.