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Manual handling training

Investigation of current practices and development of guidelines

Prepared by the **Work and Health Research Centre** for the Health and Safety Executive 2007

RR583
Research Report

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Investigation of current practices and development of guidelines

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This report presents findings of a systematic literature review, telephone survey and expert panels undertaken to determine what constitutes effective manual handling training. The results of the systematic review indicate there is very little evidence supporting the effectiveness of both technique and educational based manual handling training. There was evidence that principles learnt during training are not applied in the workplace. Strength and flexibility training appears potentially beneficial, however further research is needed to determine whether it has long term benefits in terms of injury reduction. There was no evidence for the effectiveness of back schools in preventing low back pain. Ergonomics interventions that include risk assessment, observation of workers, tailored training and task/equipment redesign have been shown to be beneficial in the literature. The telephone survey indicated that induction of new staff and statutory requirements are the main drivers for manual handling training. More than 75% of companies surveyed conduct in-house manual handling training rather than out sourcing training to consultants. Most organisations and consultancies record participant feedback on training courses and sickness absence is regarded as the main outcome measure of effectiveness. Survey respondents felt that manual handling training is more effective if it is tailored to specific industry and task demands. Practical elements in training were believed to reinforce learning, particularly if tailored to individual job demands. To be effective, manual handling training needs to be embedded as an on-going process in organisations and reinforced with regular refresher courses. Training should encourage the workforce to assess risk and there needs to be careful monitoring of working practices. The expert panels reviewed the findings and the discussions were used to generate and refine a set of guiding principles for effective manual handling training.

This report and the work it describes were funded by the Health and Safety Executive (HSE). Its contents, including any opinions and/or conclusions expressed, are those of the authors alone and do not necessarily reflect HSE policy.

HSE Books

First published 2007

EXECUTIVE SUMMARY

PROJECT AIMS

This project aimed to establish what constitutes effective manual handling training by reviewing the literature and by conducting a survey of current manual handling training practices in organisations. The results were presented to expert panels to validate the findings and to generate guiding principles for effective manual handling training.

METHOD

A systematic review was undertaken to examine the evidence for and against the effectiveness and appropriateness of different approaches to training in manual handling. A search strategy was devised to find research relevant to the review aims. Peer reviewed publications, published conference proceedings and reports from health and safety agencies (published between 1980 to 2006) on the topic of manual handling training were reviewed. A published checklist for reviewing papers was used as a basis for assessing the quality of the papers reviewed.

A telephone survey was also conducted to investigate current practice with regard to manual handling training in the UK. Interviews were conducted with representatives from 120 organisations across a broad range of industrial sectors. Thirty interviews were conducted with representatives from consultancies offering manual handling training.

Finally, two expert panels were conducted to validate the findings from this research and to generate guiding principles for effective manual handling training.

FINDINGS

The systematic review covered: manual handling interventions and the effectiveness of training in healthcare workers; the effectiveness of manual handling training and interventions in non healthcare workers; the effectiveness of exercise/physical training on manual handling capability; the effectiveness of the back school approach for treating and preventing manual handling injuries; and the effectiveness of ergonomics training and ergonomics interventions on manual handling. The literature review identified 84 papers, comprising 50 intervention studies; 22 papers describing questionnaire based surveys or audits assessing the effectiveness of prior manual handling training and 12 reviews or reports detailing the views of expert groups on manual handling training. The results of the systematic review indicate that there is little evidence supporting the effectiveness of technique and educational based manual handling training. There was considerable evidence that principles learnt during training are not applied in the working environment, i.e. there is little transfer of training from the learning environment to the working environment. Strength and flexibility training appear to offer benefits, although further research is needed to ascertain whether such interventions are sustainable over the long term, and whether there are long term benefits in terms of injury reduction in an occupational setting. There was no evidence of the effectiveness of back schools for preventing low back pain. Evidence does exist that multi-element ergonomics interventions, particularly those that include risk assessments, the observation of workers in their working environment, the tailoring of training to suit individual needs, and the redesign of equipment and handling tasks can be effective in reducing the risk of manual handling injuries.

The telephone survey indicated that induction of new staff members and statutory requirements are the main drivers for manual handling training. Most training is conducted on an annual basis and comprises half a day in duration. More than 75% of companies surveyed conduct in-house manual handling training. Of the training consultants interviewed, only 2/3 reported that they conduct a site visit prior to conducting manual handling training. The majority of manual handling training programmes incorporate some practical elements. Most organisations and consultancies record participant feedback on training but only 2/3 of consultants follow-up organisations to establish the effectiveness of their training. In terms of organisations monitoring the effect of training, sickness absence records are regarded as the main outcome measure. Respondents in the telephone survey considered that manual handling training is more effective if it is tailored to specific industry and task demands. It was felt that a practical element to the training can help to reinforce learning, particularly if it is tailored to individual job demands and uses familiar equipment relevant to their work. Manual handling training was thought to be effective only if adequately reinforced with suitable materials and ongoing support within the organisation itself. Trainers with experience and knowledge of a particular industry may have a greater understanding of specific risks within an organisation and this may lead to more effective training. Respondents believed that manual handling training would be more effective if refresher courses were offered to employees on a regular basis to update and reinforce their learning.

The expert panels stressed the need to promote the right culture to achieve safer working practices. They cautioned against treating manual handling training as an 'annual chore' and stated that manual handling training needs to be an integral component of organisational practices with regular refresher components, as part of an overall manual handling risk assessment strategy. The panel experts felt that the emphasis in training should be on increasing understanding and helping workers to risk assess their tasks as opposed to specific technique training. Management commitment was believed to be crucial to successful training. The panel experts favoured industry and task specific training rather than generic programmes. They highlighted the need for evaluation of training and development of training methods in line with the evaluation.

IMPLICATIONS

There is little evidence that manual handling training, focusing on handling techniques, is effective in promoting safer working practices and reducing manual handling injuries in the workplace. Techniques taught in manual handling training programmes often fail to translate to the workplace. There is evidence that training workers and managers to assess risk and report problems, is effective in reducing manual handling injuries. There is strong evidence that ergonomics interventions adopting a multidimensional approach, involving participation of workers and managers, the tailoring of training to suit the person and specific task requirements, along with equipment or task design/redesign, are effective in reducing manual handling injuries. The emphasis in training should be on changing attitudes and behaviour and promoting risk awareness among workers and managers. This is most likely to be achieved through industry and task specific training that is tailored to recipients' level of knowledge and understanding of the risks.

LIST OF CONTENTS

1. SCOPE OF RESEARCH AND FORMAT OF REPORT

1.1 RESEARCH CONDUCTED

A systematic literature review was conducted to establish the effectiveness of manual handling training. A total of 215 papers were reviewed, 84 of which met the criteria for inclusion in the review.

A telephone survey was conducted across a broad spectrum of UK employers to determine the range and effectiveness of current manual handling training. Telephone interviews were conducted with representatives from 150 organisations and training consultancies to provide a insight into current manual handling training practice and to investigate what methods and approaches organisations and training agencies consider to be the most effective.

Candidate principles for effective manual handling training were generated on the basis of the systematic review, the telephone interview survey and expert opinion. These candidate principles were presented to two panels of invited experts from which a set of guiding principles for manual handling training were determined.

1.2 FORMAT OF THE REPORT

The findings from each stage of investigation are presented sequentially within the following sections:

Section 2 presents the background for the systematic review and provides detailed information on the methods and selection criteria used within this review.

Section 3 presents the findings from the systematic review.

Section 4 details the aims and methods of the telephone interview survey.

Section 5 presents the quantitative findings from the telephone interview survey.

Section 6 comprises the qualitative findings from the telephone interview survey.

Section 7 summarises the findings from the first expert panel.

Section 8 outlines the findings from the second expert panel.

Section 9 summarises the main findings of this project, considers the implications for manual handling training policy and practice and presents the manual handling guidelines refined in the light of the expert panels.

2. SYSTEMATIC LITERATURE REVIEW BACKGROUND AND METHODS

2.1 BACKGROUND

Musculoskeletal disorders (MSDs) have consistently been the most commonly reported type of work-related ill health in Great Britain according to national surveys of self-reported work-related illness (Health & Safety Commission - HSC, 2000; 2001; 2004; 2005). Latest figures show that in 2005/2006 over a million people experienced ill-health that they felt was caused or made worse by their work, and approximately three quarters of these cases were musculoskeletal problems. Of the estimated number of individuals suffering from a work-related MSD, just over two fifths suffer from a disorder mainly affecting their back. Back pain can arise in many work situations, but is more common in tasks that involve: heavy manual labour, handling tasks in heavy industry, manual handling in awkward places (such as delivery work and aircraft luggage handling) and repetitive tasks.

Manual handling has been defined as any activity requiring the use of force exerted by a person to lift, lower, push, pull, carry, move, hold, or restrain a person, animal or object (Carrivick et al., 2001). If these tasks are not carried out safely, there is a risk of injury and research shows a significant linkage between musculoskeletal injuries and manual handling (Edlich et al., 2005; Hoozemans et al., 1998). With regard to manual handling, the primary area of physiological and biomechanical concern has been the lower back, particularly the discs of the lumber spine (Kroemer, 1992). Over a third of reported injuries resulting in 3 days or more absence are caused by manual handling incidents (http://www.hse.gov.uk/msd/hsemsd.htm). Manual handling injuries are a major burden to society, organisations and the sufferers themselves and the financial costs are estimated to be in the region of £2 billion a year (Tudor, 1998).

The 1992 Manual Handling Operations Regulations (Health and Safety Executive, 1992) set out a hierarchy of control measures to reduce risk of injury, starting with the requirement to avoid hazardous manual handling wherever reasonably practicable. Where this is not possible, attention should be given to the provision of lifting aids, task, workplace design and work organisation. Training then has a role to play in supplementing these approaches (Kaye, 2004).

There are 3 solutions for safer and more efficient manual material handling outlined by a number of authors, these are: personnel training, personnel selection and job design (Chaffin et al., 1986; Kroemer, 1992; Straker, 2000). The first two approaches fit the worker to the job, while the third approach fits the job to the person (Kroemer, 1992).

Section 2 of the Health and Safety at Work Act 1974 and regulations 10 and 13 of the Management of Health and Safety at Work Regulations 1999 require employers to provide their employees with health and safety information and training. This should be supplemented as necessary with more specific information and training on manual handling injury risks and prevention, as part of the steps to reduce risk required by regulation 4(1)(b)(ii) of the Regulations. Compliance with manual handling policy can be varied among organisations (Addison & Burgess, 2002) and non compliance can result in adverse acute and chronic health outcomes (Dempsey & Mathiassen, 2006; Garg et al., 1992; Knibbe & Friele, 1996). Moreover, the efficacy of current manual handling training methods have been questioned by several authors (Dean, 2001; Edlich et al., 2004; Graveling, 1991; Hellsing et al., 1993; Hignett, 1996; 2003; Hollingdale & Warin, 1997; Kroemer, 1992; Pheasant & Stubbs, 1992; Snook et al., 1978; St-Vincent et al., 1989; Straker, 1989; Stubbs et al., 1983; Tang, 1987; Videman et al., 1989).

Manual handling training programs are designed to make workers aware of the risks associated with manual handling as well as provide training in how to reduce the likelihood of becoming injured. The type of training offered and its effectiveness often depends on a multitude of factors such as method of teaching, organisation setting and type of training technique that is used (van der Molen et al., 2005).

2.1.1 Principles of training

Training refers to *"…instruction and practice for acquiring skills and knowledge of rules, concepts, or attitudes necessary to function effectively in specified task situations"* (Cohen & Colligan, 1998) (pp 11). Understanding the processes involved in the transfer of knowledge and training will improve the efficacy of manual handling training. Manual handling training aims to develop new skills in workers that modify their behaviour and increase their competence in performing manual handling tasks. This type of training is normally short in duration so as to be efficiently implemented within the organisational context.

Two key concepts involved in the process of training are performance and motivation. Performance is normally used as an outcome variable to determine if training is successful. In the context of manual handling training, performance relates to how effectively manual handling tasks are carried out with the long term result being a reduction in injuries. Motivation is an important factor in determining the trainees' resolve to acquire and use the new skills (Quinones, 1995). When manual handling training programs are designed and implemented, these concepts need to be factored into the training.

Authorities in the field of training in general (Goldstein & Buxton, 1982; Salas & Cannon-Bowers, 2001; Yamnill & McLean, 2001) highlight 6 key factors in the process of training:

1) Needs assessment

2) Training objectives

3) Training content

4) Accounting and specifying of individual differences

5) Evaluation of training

6) Follow up

These factors will be taken into consideration in later sections of this report which outlines the effective components of manual handling training as determined by an examination of the available literature.

2.2 METHOD

2.2.1 Databases searched

The following electronic databases were searched: ANTE (CSA Illumina), ArticleFirst (OCLC), ASSIA (CSA Illumina), Biological Sciences (CSA Illumina), Biotechnology and Bioengineering Abstracts (CSA Illumina), Computer and Information Systems (CSA Illumina), Health and Safety Science Abstracts (CSA Illumina), HSELINE, HSE website, Intute: Social Sciences, IOSH website, Loughborough University Institutional Repository, Loughborough University Library Catalogue, NIOSH website, NIOSHTIC-2, PsycINFO (CSA Illumina), PubMed, Science Direct, SPORTDiscuss, TOXLINE (CSA Illumina), and Zetoc.

2.2.2 Key words used to search electronic databases

The databases were searched for the following key text words in the title or the abstract: 'manual handling' with the Boolean 'AND' to the terms 'training' or 'manual handling training' or 'effectiveness' or 'efficacy' or 'reduction in injuries' or 'lifting' or 'literature review' and 'patient handling'. The electronic databases were searched for articles published between 1980 and 2006. The search strategy also involved examining the reference lists of the relevant articles found, to check for further studies. Although the review was confined to articles from 1980 to 2006, the checking of reference sections revealed some relevant articles from the 1970's. These were included if they added knowledge to the literature review.

2.2.3 Selection criteria

The literature reviewed encompassed published articles, available in English in the databases mentioned above. The review was confined to articles in peer reviewed journals, reports from health and safety agencies and published conference proceedings.

Articles were included if they described empirical research in the laboratory or workplace interventions providing that the focus of the study was the evaluation of manual handling training. Studies employing a broader approach to improving manual handling in the laboratory and workplace were also incorporated, in particular studies which evaluated the impact of exercise in improving manual handling performance. Questionnaire based surveys and audits of the effectiveness of prior training in manual handling were also included. In addition review papers on the effectiveness of manual handling training are also discussed.

Studies were excluded if they used the words 'manual handling training' in their abstract and title but when reviewed, were found not to encompass training. For example, a study would be excluded if it looked at musculoskeletal disorders and mentioned the link between poor manual handling and back pain.

2.2.4 Quality assessment of the intervention studies

To evaluate the quality of the intervention papers reviewed, the 27-item checklist developed by Downs and Black (1998) (as used by Hignett, 2003) to assess the methodological quality of both randomised and non-randomised studies of health care interventions, was applied. This checklist comprises four sections, each assessing specific aspects of the quality of the paper.

Section one consists of 10 questions and evaluates the general structure of the paper, questions in this section include the clarity of the study's aims, description of the interventions applied, participant characteristics, identification of confounding factors, and presentation of the main findings.

Section two comprises three questions assessing the external validity of the study, these questions cover the representativeness of the sample used and the context in which the study was conducted.

Section three contains seven questions assessing the internal validity (bias) of the research. Questions in this section include the blinding of participants and experimenters to the interventions/study groups, compliance with the intervention, choice of outcome measures and statistical tests.

Section four incorporates six questions assessing the internal validity (confounding, selection bias), questions in this section include the sampling strategy, with respect to the diversity within the population recruited and the allocation of participants to different study groups (intervention/control groups), the time period over which the study was conducted and consideration of participants lost to follow-up. A final question assessing whether the study has sufficient power is also included in the check list.

For the purpose of the current review, two additional questions were added to section three of the checklist. These questions were 1) 'Was a control group used?', and 2) 'Was there a follow-up period?' A full copy of the modified checklist is shown in Appendix 1. When scoring each paper, if a question was answered 'yes', one mark was entered alongside that question, if a question was answered as either 'no' or 'unable to determine', a mark of zero was given. For each paper therefore, questions 1 to 28 were either awarded a mark of one or a mark of zero. The marks for question 29 (which assesses statistical power) were given on a scale ranging from zero to four, with zero being 'insufficient power to detect meaningful differences at $p<0.05$', one being 'just sufficient power to detect differences at $p<0.05$' and four being a very large sample size ($n >1000$) capable of detecting meaningful differences at $p<0.001$'. The maximum marks available were 32, following the scoring of each paper, its percentage mark was calculated and this is shown in the review tables presented in the Results section.

To check the reliability of the assessment of the intervention studies, an inter-rater reliability study was conducted using three reviewers, and this resulted in an overall intra-class correlation of 0.97 demonstrating a very high agreement between reviewers.

3. SYSTEMATIC LITERATURE REVIEW RESULTS

Approximately 1824 papers were located. These were then checked to eliminate duplications (arising from the different search strategies) and papers which were inappropriate to the research topic, based on their title and details contained within their abstract, were eliminated. A total of 215 papers were collected and reviewed. Of these, 50 were intervention studies with the primary aim of investigating the effectiveness of manual handling training. A further 22 papers consisted of questionnaire based surveys or audits assessing the effectiveness of prior manual handling training, and 12 comprised either review papers or reports describing the views of expert groups on manual handling training. These 84 papers are summarised in the following sections of this review.

The 50 intervention-based papers have been grouped according to the type of intervention reported, or the population targeted, and the 22 questionnaire/audit papers have been grouped depending on the target group assessed. The summaries of the papers comprising each group are provided and discussed in separate tables and sections below. Within each table the summaries are presented in chronological order.

Section 3.2 of this report summarises and evaluates intervention studies conducted on health care workers. The findings of questionnaire-based surveys and audits on the effectiveness of prior manual handling training in health care workers are also summarised and discussed in this section.

Section 3.3 of this report summarises and evaluates workplace and laboratory based intervention studies conducted in all non-healthcare organisations. The findings of questionnaire-based surveys on the effectiveness of prior manual handling training in non-healthcare workers are also summarised and discussed in this section.

Section 3.4 of this report summarises and evaluates workplace and laboratory based studies assessing the effectiveness of an exercise intervention for improving manual handling capabilities.

Section 3.5 of this report summarises and evaluates the use of Back Schools (and the associated training in lifting technique included in a back school program) for preventing injures linked with manual handling.

Section 3.6 of this report summarises and evaluates workplace and laboratory based studies assessing the effectiveness of ergonomics interventions for improving manual handling tasks.

Section 3.7 of this report summarises the findings from review papers published examining the literature concerning the effectiveness of manual handling interventions. Papers and reports documenting the views of expert groups on manual handling training are also summarised in this section.

3.1 INTERPRETATION OF THE QUALITY RATING

The quality rating (QR) of all intervention studies reviewed ranged from 31 to 84%. For papers to be published in peer-reviewed journals it is expected that they all have certain key elements included, such as a statement of their aims/hypotheses for example. Therefore the minimum quality rating expected would be approximately 20% (based on certain criteria being fulfilled to be published in a peer reviewed journal, which automatically satisfies some questions on the checklist). With this in mind, the papers included in the current review with a QR between 0

and 49% are described as 'poor'. These papers typically had a small sample size, no control group, and no follow-up.

Papers with a QR between 50 and 59% are described as being of medium quality, those with a QR of 60 to 69% are described as being of good quality, and those with a QR above 70% are described as being of high quality. These papers typically contained large samples of participants, randomisation of participants into either an intervention or control group, a sufficient intervention period, and a follow-up assessment.

3.2 INTERVENTION STUDIES AND THE EFFECTIVENESS OF MANUAL HANDLING TRAINING REPORTED IN HEALTH CARE PERSONNEL

Health care personnel, particularly nurses, are exposed to high levels of patient handling as part of their daily work. According to Hellsing et al. (1993) one of the biggest environmental risks facing nurses is work-related back pain, and nurses are estimated to have the highest rate of back pain (in comparison with other health services personnel), with an annual prevalence of 40-50% and a lifetime prevalence of 35-80% (Edlich et al., 2004).

Unlike many manufacturing operations, the work of nursing (and other care workers) is quite varied, and includes many separate tasks. In addition, nursing practice involves human beings rather than inanimate objects and this poses special issues (such as maintaining the dignity of the patient). The lifting of patients is not only about simply overcoming a heavy weight, nurses must take into account the size, shape, and deformities of the patient, along with their conscious state and any physical impairments of the lower limb function, as well as balance and coordination. Some patients may also be uncooperative. Space limitation, equipment interference, and un-adjustable beds, chairs and commodes may also contribute to an increased risk of back injury in this group (Edlich et al., 2004).

While some general approaches used for manual handling may be applicable to nursing, there are many aspects of patient manual handling that are unique to healthcare workers (Harber et al., 1988) and a number of studies have been conducted in order to investigate suitable interventions in this specific work force.

Table 1 summarises intervention studies conducted using health care workers, with the goal of reducing injuries associated with manual handling. In addition, the findings of questionnaire-based surveys and audits on the effectiveness of prior manual handling training in health care workers are summarised in Table 2.

Table 1 A summary of the research investigating the efficacy of manual handling training in healthcare personnel

Author	Participants	Study design	Intervention	Outcome measure	Results	QR
Scholey (1983) (UK)	4 Nurses working on two wards	Within subjects design. Workplace intervention	6 patients agreed to have patient handling tasks practiced on them. Nurses were given feedback and shown improved techniques following a baseline assessment. They were encouraged to practice the new methods.	The patient handling tasks were repeated 3 weeks following training. Intra-abdominal pressure and observations of nurses posture and technique were compared pre and post training.	Training was effective in reducing the back stress for 3 of the 4 nurses. Intra-abdominal pressure actually rose however in the fourth nurse post training. It was noted that it was difficult to evaluate the effects of training due to many uncontrollable variables in the clinical situation. The nurses' tasks were not identical on repetition even with the same patients.	45%
Stubbs et al. (1983) (UK)	2 Nurses	Within subjects design. Workplace intervention.	At baseline both nurses performed 8 patient transfers, nurse 1 then received intensive training from an instructor. Nurse 1 later instructed Nurse 2, following this both nurses received further instructions.	The same lifting tasks were conducted 15 weeks following training. Intra-abdominal pressure was measured during each training session and comparison made.	Little improvement, as assessed by intra-abdominal pressure occurred throughout the training, or during the follow-up session, on some occasions a decrement in performance was actually observed.	41%

Table 1 continued

Author	Participants	Study design	Intervention	Outcome measure	Results	QR
Troup and Rauhala (1987) (Finland)	106 intervention participants, 93 controls. All participants were student nurses.	Between subjects design. Education intervention at a nursing school	The experimental group received a modified training program whereby they received 20 hours of theory and practical teaching on ergonomics and biomechanics regarding working postures and patient transfers. Follow-up lessons on ergonomics were also provided throughout their training. The control group received traditional training.	Participants were assessed on two standardised patient transfer tasks upon completion of their training.	The trained group scored significantly higher marks than the control group on the transfer tasks. The mean score however for the trained group was still in the 'poor' range according to the assessment criteria.	41%
Wood (1987) (Canada)	Nurses from two units within a hospital received the intervention, nurses from a third unit formed a control group. Participant numbers not given.	Within and between samples design. Workplace intervention.	Intervention nurses were followed by a physiotherapist and advice on safe lifting procedures was given. Nurses also attended a 1 hour classroom session on body mechanics and correct lifting techniques.	The number of wage-loss claims due to back injuries filed by nurses were compared, between the experimental and control groups, over a 1 year period following introduction of the intervention.	The number of wage-loss claims over a 1 year period post intervention was 5 for the intervention wards and 7 for the control ward. It was concluded that the intervention was not effective.	47%

Table 1 continued

Author	Participants	Study design	Intervention	Outcome measure	Results	QR
Videman et al. (1989) (Finland)	87 intervention participants, 113 controls. All participants were student nurses.	Educational intervention at a nursing school.	Nurses enrolled between 1981-82 received standard patient handling training, nurses enrolled between 1983-84 received adapted training based on principles of biomechanics and ergonomics.	Patient handling skills were assessed in a standardised environment upon completion of training. Prevalence of low back pain (LBP) 1 year after qualification was also assessed.	The experimental group scored significantly higher in the patient-handling skill assessment than the control group, however the skills were rated as comparatively low in both groups. Nurses whose patient handling skills were rated as poor or bad had a higher prevalence of injury during their first year as a qualified nurse. 54% of trained and 60% of controls reported LBP 1 year after qualification.	56%
Feldstein et al. (1993) (USA)	13 intervention participants from one medical centre, 15 controls from a different medical centre. Participants were nurses, nurses' aids and orderlies.	Within subjects design. Workplace intervention.	Educational programme. The intervention group received a 2 hour educational training session, which included instruction on proper body mechanics, specific techniques for patient transfer, one-to-one assistance, use of assistive equipment, identification of environmental hazards. Stretching and strengthening exercises were also taught. 8 hours of practical time were also given.	Reported back pain and back fatigue prior to the intervention and at one month post intervention. Patient transfers were also assessed pre and post intervention.	No significant differences in reported back pain and back fatigue were seen over the intervention in the intervention group. The intervention and control groups did not differ significantly on their questionnaire responses. The intervention group improved in their assessed quality of patient transfer, no change was seen in the control group.	59%

Table 1 continued

Author	Participants	Study design	Intervention	Outcome measure	Results	QR
Gundewall et al. (1993) (Sweden)	28 intervention participants and 32 controls. All participants were nurses and nurses' aids.	A normalised, randomised prospective design.	The intervention group performed a workout program for the back muscles designed to increase dynamic endurance, isometric strength and functional coordination, for 20 minutes 6 times/month for 13 months. No exercises were given to the control group.	Isometric back strength measured at the beginning and end of the study. The presence of low back pain, and the number of days off work because of LBP, recorded by participants throughout the study.	Training group participants increased their back strength by an average of 20% over the study; no change was seen in the control group. 1 training participant had been absent from work for 28 days due to LBP during the study, versus 12 participants from the control group who had been absent for 155 days in total. The training group also had significantly less LBP complaints and a lower pain intensity than the controls.	69%
Hellsing et al. (1993) (Sweden)	19 intervention participants, 33 controls. All were student nurses from two separate nursing schools.	Educational intervention at a nursing school.	The experimental group received extra education integrated into the 2 year programme, which comprised of an average of 2 hours of 'ergonomy' per week. The control group received the traditional training.	Students completed an assessment at the beginning, middle and upon completion of their education, and at 1 year follow-up. 5 nurses from each group were observed, conducting standardised work-tasks, during work on the ward at 4 months post course.	Observational assessment revealed that the experimental group knew how to 'work better' from an ergonomics point of view. The effect of the education on reported musculoskeletal pain was not obvious during the follow-up year.	73%

Table 1 continued

Author	Participants	Study design	Intervention	Outcome measure	Results	QR
Best (1997) (Australia)	16 intervention participants, 19 controls. All participants were nurses working within 3 similar geriatric nursing homes.	Within and between subjects design, randomised, workplace intervention.	Intervention participants from 1 nursing home received a 32 hour training course in Manutention. Control participants from two similar nursing homes both received in-house basic training.	Responses on a questionnaire assessing the occurrence of back injuries completed pre and at 3 and 12 months post training. Lifting behaviour was also observed and injury statistics collected.	There was a trend for a decline in the incidence of back pain occurring in the nurses trained in Manutention, and an increase in back pain in the controls. Differences were not statistically significant and injury statistics did not support the decrease in pain data reported from the intervention group. Manutention lifts (n=2) were rated significantly better, in terms of posture and effort, than the non-Manutention lifts (n=2).	56%
Daynard et al. (2001) (Canada)	12 participants in a 'safe lifting' group, 12 participants in a 'no-strenuous lifting' group and 12 controls. All participants were unit assistants on hospital wards.	Randomised control trail. Workplace intervention.	The intervention groups received intensive education in back care, lifting technique, and patient assessment. The 'safe lifting' group received instruction on the use of equipment already available on the wards, whereas the 'no-strenuous lifting' group were provided with new assistive patient handling equipment.	Compliance with proper transfer technique and biomechanical analysis assessed during 5 patient handling tasks conducted post intervention.	Results showed greater compliance with interventions that incorporated new assistive patient-handling equipment, as opposed to those consisting of education and technique training alone. Participants who were untrained or non-compliant with interventions experienced significantly higher peak spinal loading. However, patient-handling tasks conducted with the aid of assistive equipment took longer than those performed manually. This, along with variations in techniques, led to increases in cumulative spinal loading with the use of patient-handling equipment on some tasks.	59%

Table 1 continued

Author	Participants	Study design	Intervention	Outcome measure	Results	QR
Yassi et al. (2001) (Canada)	85 participants in a "safe lifting" group, 94 participants in a "no-strenuous lifting" group and 82 controls. All participants were nurses and unit assistants on hospital wards.	Randomised control trial.	The intervention groups received intensive education in back care, lifting technique, and patient assessment. The 'safe lifting' group received instruction on the use of equipment already available on the wards, whereas the 'no-strenuous lifting' group were provided with new assistive patient handling equipment.	Frequency of patient handling tasks, frequency and intensity of physical discomfort associated with handling tasks, and back and shoulder pain disability were compared at baseline and at 6 and 12 months post training. Injury and claim data were also collected.	The frequency of manual lifting tasks decreased significantly at 12 months follow-up in the " no strenuous lifting" group. No changes were seen in the control group or in the "safe lifting" group. Self perceived fatigue, back and shoulder pain, safety, and frequency and intensity of physical discomfort associated with handling tasks, improved in both intervention groups, with greater improvements seen in the "no strenuous lifting" group. Injury rates were not altered significantly in any group.	67%
Owen et al. (2002) (USA)	37 intervention participants, 20 controls. All participants were nursing personnel from two rural hospitals.	A quasi-experimental, independent samples design. Workplace intervention.	All participants reported their most stressful patient handling tasks, equipment to help with selected tasks was tested in a laboratory and implemented in the intervention hospital. Nurses were trained in its use.	Injury data collected 18 months prior to the intervention was compared with injury data collected 18 months post intervention.	In the experimental hospital injury rate decreased by 40% post intervention. Over a 5 year follow-up there were 26 injuries reported which occurred in relation to the specific tasks studied. It was estimated that if the number of injuries had continued at the same pace as found in the 18 month pre intervention period, the number would have accumulated to 67 by the end of the 5 year period. No changes were seen in the control hospital.	58%

Table 1 continued

Author	Participants	Study design	Intervention	Outcome measure	Results	QR
Ore (2003) (Australia)	351 intervention participants, 351 controls. Disability service workers.	Between subjects design. Workplace intervention.	The experimental group undertook a 35 hour training course, involving assessment of manual handling (MH) tasks, training on special techniques, and on the use of assistive devices. The control group consisted of workers who received no training.	The number of MH injuries reported between 1st July 1999-30th June 2000 per 100 full-time equivalents (FTEs) (training took place between 1st July 1998-30th June 1999) and compensation claims.	Training in MH significantly reduced the risk by 42% with an average injury rate of 49.6 per 100 FTEs among the intervention group compared with 84.8 per 100 FTEs among the controls. The control group had an average compensation claims cost of $11,354, while the intervention groups compensation claims cost was $2,658.	81%
Hartvigsen et al. (2005) (Denmark)	140 intervention participants, 115 controls. All participants were home care nurses and nurses' aids.	2-year, prospective controlled study.	The intervention group were divided into groups of 8-12, one member of each group was educated as an instructor. Instructors had a minimum of 1 hour/week during 2 years to educate, supervise, and enforce messages about lifting techniques and body mechanics to all members of their group. The control group attended a one-off lifting course.	Questionnaire completed post intervention assessing the number of days with self reported LBP during the last year, number of episodes of LBP, and care seeking for LBP during the past year.	At follow-up, no significant differences were found between the intervention and the control group in terms of the number of days with LBP during the past year, the number of episodes with LBP during the past year and seeking of examination or treatment due to LBP during the past year.	73%

Table 2 Questionnaire-based surveys and audits on the effectiveness of prior manual handling training in healthcare workers

Author	Participants	Type of survey/methods	Outcome measure	Quantity of training	Effectiveness of training/injury data
St-Vincent et al. (1989) (Canada)	39 hospital orderlies.	Observational. MH techniques used by orderlies were observed by 2 trained observers.	To determine whether orderlies used patient handling techniques taught during training.	Training consisted of 12 hours of courses given in the classroom. The classes consisted of theory and practical sessions. Training mainly focused on the teaching of basic principles which should be applied to all handling tasks, characteristic of the 'straight back/knees bent approach'.	The principles taught during training were seldom applied in the workplace. In horizontal handling, training is rarely applied whereas in vertical handling operations, some of the taught principles were more often used.
Wachs and Parker-Conrad (1989) (USA)	178 registered nurses.	Observational	Nurses employed in 4 community hospitals were observed whilst moving patients in bed. The proportion using the correct technique was the main measure.	No information provided.	Only 2% of the sample moved patients in the prescribed manner. It was hypothesised that over time nurses develop their own techniques for moving patients based on personal experience and unit or hospital norms, and that these techniques may not follow the principles of prescribed body mechanics taught in nursing schools.

Table 2 continued

Author	Participants	Type of survey/methods	Outcome measure	Quantity of training	Effectiveness of training/injury data
Ellis (1993) (UK)	85 physiotherapy students, from 11 physiotherapy schools.	Postal questionnaire	The number of hours reported undertaking MH theory and practical training.	On average students reported 1.9 hours of MH theory training and 1.8 hours of practical training.	64% felt that they had been taught the basic principles, but further instruction was needed. 27% had subsequently experienced LBP.
Gladman (1993) (UK)	46 nurses who received traditional training in patient handling (group A) and 41 nurses who received a more research based course (group B).	Questionnaire	The number of respondents from each group reporting back pain.	Training received by Group A consisted of a 3 hour classroom based session early on in their nursing education, it included principles of safe lifting. Training received by Group B consisted of a 6 hour introductory programme, followed up 1 year later by a 3 hour update. Additional items taught included: biomechanics of the spine and ergonomics.	At follow-up, (26 months post training for group A, and 16 months for group B) 73% of group A and 92% of group B reported suffering from back pain at some point. 81% of all nurses surveyed reported suffering from back pain at some time. Both groups identified problems with the attitudes of qualified staff, the availability of lifting aids and the shortage of skilled assistance.

Table 2 continued

Author	Participants	Type of survey/methods	Outcome measure	Quantity of training	Effectiveness of training/injury data
Kane and Parahoo (1994) (UK)	16 nursing students.	Questionnaire	A scenario was presented in the questionnaire to determine whether respondents would participate in a lifting exercise even when they 'knew' the lift selected by the staff nurse was unsafe.	No information provided.	50% of those surveyed indicated that they would conform to the decision of the staff nurse and use an unsafe lift. The reason for conforming was a strong desire to avoid negative reactions of the entire nursing staff.
Luntley et al. (1995) (UK)	22 anaesthetists.	Questionnaire	The number of respondents reported to have received MH training and the numbers of staff who lift patients.	0% surveyed had received training in lifting and handling or knew of the existence of a lifting and handling training officer. 73% reported lifting patients regularly.	14% had a history of back pain that had resulted in loss of time from work. It was concluded that training and planning of patient transfers in theatre is deficient.

Table 2 continued

Author	Participants	Type of survey/methods	Outcome measure	Quantity of training	Effectiveness of training/injury data
Scott (1995) (UK)	85 nurses.	Questionnaire	The number of respondents reported to have received MH training.	65.4% of qualified nurses reported receiving some kind of MH training. 20% of auxiliary staff reported receiving no formal instruction. Training varied from one 30 minute slot in the ward to a full day outside of the working area.	Staff reported that they frequently made use of the principles taught, but most admitted sometimes employing the quickest method rather than the safe lifting and handling techniques taught.
Crawford and Weetman-Taylor (1996) (UK)	67 health care workers.	Questionnaire (n=67) and structured interview (n=16). Of those interviewed, 8 had received training in MH and 8 had not.	The perception of risk in relation to MH tasks, comparisons were made between individuals who had and who had not received MH training.	88% of individuals completing the questionnaire had received training in MH.	Of those surveyed, 93% had jobs that involved lifting and handling and 22% had received an injury due to this. Interview findings revealed that perceived levels of risk associated with MH differed between trained and untrained employees.

Table 2 continued

Author	Participants	Type of survey/methods	Outcome measure	Quantity of training	Effectiveness of training/injury data
Hollingdale and Warin (1997) (UK)	168 nurses.	Questionnaire	The occurrence of back pain.	The majority of respondents had received training for 2 or more days within the past year.	59.5% of nurses surveyed reported suffering from back pain in the past year, and 36.9% had suffered back pain in the last 2 weeks.
Coleman and Brooke (1999) (UK)	36 patient transfers were observed across 6 adult theatre suits.	Observational	To describe the techniques used to transfer patients to and from the operating table and to identify the staff involved in patient handling.	Staff who most frequently acted as handlers were operating department assistants – 37% of whom had never received training in patient handling. Anaesthetists were involved in 26% of transfers, yet none had received any training. The majority of transfers involved 2 members of staff.	No injury data reported.

Table 2 continued

Author	Participants	Type of survey/methods	Outcome measure	Quantity of training	Effectiveness of training/injury data
Kilgariff and Best (1999) (Australia)	All institutions which provide training to undergraduate nurses, allied health assistants, occupational therapy and physiotherapy students in Victoria, Australia were surveyed.	Questionnaire	The amount and type of manual handling and patient handling being taught as part of the course curricula.	Not given.	The results indicated that there were inadequate practical and theoretical hours allocated to MH skills and inadequate occupational health and safety education across courses.
Bewick and Gardner (2000) (Australia)	50 nurses' aids	A review of hospitals injury data along with a self-reported questionnaire.	MH knowledge was assessed by a series of drawings showing MH tasks being performed, respondents were asked to decide whether the lifting procedure shown in each picture was correct or incorrect.	All respondents had received training in MH, training covered back anatomy, function and care, posture, body mechanics, positive lifestyle habits and fitness, first aid, ergonomics principles, MH techniques and the use of mechanical aids. Training involved both theory and practice sessions.	62% of injuries reported in nursing aids were due to MH tasks. The group had a good understanding of proper body mechanics, and the majority surveyed reported using correct MH techniques. The high injury rates were attributed to the fact that mechanical aids were rarely used.

Table 2 continued

Author	Participants	Type of survey/methods	Outcome measure	Quantity of training	Effectiveness of training/injury data
Spencer et al. (2000) (UK)	60 doctors involved in care of the elderly.	Questionnaire	The number of respondents reported to have received MH training and the numbers of staff who lift patients.	8% reported receiving formal MH training, 25% reported receiving informal training from nurses. 70% reported lifting or moving patients on their own at least once/week, 34% reported lifting on most days.	14% reported injuring themselves and 14% reported injuring patients during lifting. It was concluded that doctors frequently lift or move patients on their own and few have had any formal training in MH.
Dean (2001) (Australia)	2 'in-house' MH trainers from 2 separate residential aged care organisations.	Semi-structured interviews were conduced with the two MH trainers.	To identify factors which impact on the implementation and effectiveness of manual handling training for carers within health care settings.	Not reported.	Findings indicate that management style, time restrictions, peer culture and lack of awareness of the complexity of MH are significant issues which impact on the effectiveness of MH training.

Table 2 continued

Author	Participants	Type of survey/methods	Outcome measure	Quantity of training	Effectiveness of training/injury data
Swain et al. (2003) (UK)	139 nursing students on the adult branch in one higher education institution.	Questionnaire	Students knowledge of correct patient handling techniques.	Students' knowledge of whether particular techniques were 'recommended' was rated as 'fair'.	16% of the sample had already taken time off work with back pain. 94% reported that they were frequently unable to use recommended techniques in practice, this was most commonly attributed to the influence of other nurses. Other reasons included unavailability of manual handling aids, lack of time, lack of staff and patient needs.
Massy-Westropp and Rose (2004) (Australia)	An audit of injuries was undertaken in a community health services agency.	Retrospective audit	The annual MH injury rate was compared prior to the incorporation of Manutention training with the injury rate during and following the introduction of this form of training.	Since 1993 clinical staff working at the health services agency received the Manutention method of MH training. Since 1999, all new staff undergo training for at least 2 days, and all have annual skills updates. Training program provided staff with 15 hours of MH training.	The annual rate of 54 MH injuries/100 paramedical aids for the pre Manutention period ('90 – '94) dropped significantly to 35 injuries/100 annually for the period ('95 – '03) following the introduction of Manutention. Days lost/injury also reduced in the 9 year period following the introduction of Manutention.

Table 2 continued

Author	Participants	Type of survey/methods	Outcome measure	Quantity of training	Effectiveness of training/injury data
Cornish and Jones (2006) (UK)	106 student nurses.	Questionnaire	Perceptions of MH training and experience of patient moving and handling in the clinical setting.	88% felt that they had received adequate training at University.	71% had been asked to participate in a MH procedure that they thought was wrong, and contrary to the 'no lift' policies in the Trusts, 74% had been asked to physically lift a patient without using necessary equipment. Less than 50% observed the use of hoists for picking up a patient from the floor and less than 40% observed safety checks of mechanical equipment and risk assessments in the clinical setting.
Hignett and Crumpton (2007) (UK)	16 healthcare organisations.	Behavioural data collected on 2 patient handling tasks (sitting-to-standing and repositioning-in-sitting) were collected using observations and interviews.	Whether a higher level of compliance with the RCN competencies (safety culture) would be found in hospitals where the knowledge and skills gained from MH training could be detected in staff MH behaviour.	No information provided.	In organisations with a more positive safety culture, the nursing staff demonstrated more complex decision-making about patient handling tasks and had lower levels of associated postural risk.

3.2.1 Manual handling training interventions for healthcare workers - A summary of the main findings (Table 1)

A total of 14 papers investigating the effectiveness of manual handling training interventions in healthcare personnel have been reviewed in Table 1, of the papers reviewed, sample sizes ranged from 2 to 702, and quality ratings ranged from 41 to 81%.

In earlier studies conducted by Scholey (1983) and Stubbs et al. (1983), the effectiveness of training was measured using intra-abdominal pressure. This measure uses a radio pill to determine pressures on the body whilst conducting manual tasks. Following intensive, one-to-one training sessions conducted with two nurses, Stubbs et al. (1983) reported little improvements in intra-abdominal pressure occurring throughout training and during a follow-up session. On some occasions, a decrement in performance was observed, seen by an increase in intra-abdominal pressure.

In the same paper, Stubbs et al. (1983) conducted an analysis of the relationship between the presence or absence of back pain (at the time the survey was carried out) and the length of time spent under instruction in lifting techniques. They found no significant relationship between time spent under instruction and point prevalence of back pain. It was concluded from this additional analysis along with the training study that there was no evidence to suggest that the amount of training given, whether it be on the ward or in the classroom, was associated with the point prevalence of back pain.

Troup and Rauhala (1987) evaluated the effects of introducing ergonomics and biomechanics into a patient handling course delivered to student nurses. In their study the control group received the traditional patient handling training while the experimental group received a modified training program. As part of their assessment, all participants performed two standardised patient transfers which were videotaped and assessed by an instructor. It was reported that the trained group scored significantly higher marks than the control group, however the mean score for the trained group was still in the 'poor' range according to the assessment criteria. Similar findings were reported by both Hellsing et al. (1993) and Videman et al. (1989) who assessed the effects of a modified training course given to student nurses. When surveyed one year following qualification, no differences in the prevalence of reported back pain between the intervention group and controls were seen in either study.

In the study conducted by Wood (1987) intervention participants (nurses) were followed by a physiotherapist who provided advice on safe patient handling, intervention participants also attended a one hour training session focussing on body mechanics and correct lifting. The number of wage-loss claims due to back injuries was the outcome variable, of which no differences were found at follow-up between the intervention and control nurses.

Feldstein et al. (1993) tested the effects of an educational programme given to nurses, nurses' aids and orderlies working within one medical centre. Control participants were drawn from the same staff populations working in a similar medical centre. The educational programme comprised a two hour training session which included instruction on proper body mechanics, patient transfer techniques, use of assistive devices and the use of stretching and strengthening exercises. It was found that no significant changes in reported back pain occurred over the intervention period in the experimental group, and that the two groups did not differ significantly following the intervention in terms of their reported back pain and back fatigue.

Similar findings were observed in a high quality study conduced by Hartvigsen et al. (2005) who also assessed the effectiveness of a workplace educational style intervention. In this study, participants (nurses and nurses aids') attended weekly meetings during which they were educated, by a trained instructor, in body mechanics, safe patient transfer and lifting techniques, and the use of ergonomic aids. Upon completion of the two year study there were no

differences between the intervention and control groups in terms of reported low back pain over the past year.

Taking a different approach, Gundewall et al. (1993) evaluated the effects of a back muscle training program on back muscle strength and the occurrence of low back pain and lost work days in nurses and nurses' aids. A workout program for the back muscles designed to increase dynamic endurance, isometric strength and functional coordination, was completed in each intervention ward for approximately 20 minutes, six times per month, throughout the 13 month study. Participants in the training group increased their back strength by an average of 20% over the study, in comparison, no changes were seen in the control group who received no exercise instruction. The training group also had significantly fewer lost work days throughout the study, significantly fewer days with back complaints and a lower pain intensity than controls. No follow-up was conducted as part of this study, therefore it is not known whether the intervention group continued with their exercise regime or whether the beneficial effects seen in this group remained.

Yassi et al. (2001) investigated the effects of a 'safe lifting' policy and a 'no lifting' policy on physical discomfort and injury data in nurses and unit assistants. Both intervention groups received intensive education on back care, lifting technique and patient assessment. In addition, the 'no lifting' group received new assistive devices, and training in their use. The intervention groups were compared with a control group who followed 'normal practice'. At 12 months follow-up, the frequency of manual lifting had decreased in the 'no lifting' group and reported back and shoulder pain and physical discomfort associated with handling tasks had decreased in both intervention groups. However injury rates were not altered significantly in any group. Yassi et al. (2001) suggest that injury rates are not as sensitive a measure as self perceived discomfort, and that this could explain why statistical significance wasn't obtained with this data.

Using a sub-sample of the participants studied by Yassi et al. (2001), Daynard et al. (2001) assessed compliance with correct lifting technique and biomechanical stress to the lower back during simulated patient handling tasks. It was reported that greater compliance was found in the group using the new assistive devices in comparison with the 'safe lifting' and control groups. It was also observed however that patient-handling tasks conducted with the aid of assistive equipment took longer than those performed manually. This, along with variations in techniques, led to increases in cumulative spinal loading with the use of patient-handling equipment on some tasks. Daynard et al. (2001) concluded that the use of mechanical assistive devices may not always be the best approach for reducing back injuries in all situations. It was reported that no single intervention can be recommended, and suggested that all patient-handling tasks should be examined separately to determine which methods maximize reductions in both peak and cumulative lumbar forces during a manoeuvre.

Taking an ergonomics approach Owen et al. (2002) investigated the effects of an ergonomics intervention on injury data in nursing personnel. In their study, nurses from a control and experimental hospital reported their most stressful patient handling tasks. The following tasks were then selected for the intervention: transferring patients in and out of bed, on and off a stretcher, lifting up in bed and toileting in bed. Equipment to assist with the above tasks were first tested in the laboratory. The most appropriate equipment selected was then implemented into the wards of the experimental hospital and staff were trained in the use of each device. In the experimental hospital, injury rate decreased by 40% post intervention. Over a 5 year follow-up there were 26 injuries reported which occurred in relation to the specific tasks studied. It was estimated that if the number of injuries had continued at the same pace as found in the 18 month pre intervention period, the number would have accumulated to 67 by the end of the 5 year period. No changes were seen in the control hospital. Owen et al. (2002) concluded that

perceived physical stress to the back could be reduced through the implementation of an ergonomics program, which could be sustained over time.

Ore (2003) investigated whether 351 disability service workers in an Australian State Government agency given manual handling training had significantly lower injury rates from manual handling injuries one year post training than a control group of 351 workers who did not receive training. The training received by the intervention group comprised of a 35 hour course provided by an ergonomist. Training took place at participants' worksites and involved on-site assessment of manual handling tasks, training on specific techniques, the selection and purchase of manual handling equipment, design of manual handling tasks, factors that can increase the risk for MSDs, and the prevention of the disorders. Participants were expected to practice the techniques taught, under supervision before using them. The trained workers had an average injury rate of 49.6 per 100 full-time equivalents (FTEs) compared with 84.8 per 100 FTEs among the controls. The control group had an average compensation claims cost of $11,354, while the intervention compensation claims cost was $2,658. Ore (2003) concluded that training was effective with the intervention group having a lower risk of injury than the control group. The authors cautioned however that the study had a post-test design, with a non-randomised control group, thus any potential differences between the control and intervention participants at baseline was not taken into account.

In summary, from the intervention studies reviewed in Table 1, there is very little evidence of the effectiveness of educational based training for safe patient handling, whether it be nursing school based (Hellsing et al., 1993; Troup & Rauhala, 1987; Videman et al., 1989), or applied to qualified staff in the workplace (Feldstein et al., 1993; Hartvigsen et al., 2005; Wood, 1987). Strength and flexibility training for the lower back, as reported by Gundewall et al. (1993) shows promise as a measure to reduce patient handling injuries, although further research is needed to ascertain whether such an intervention is sustainable over the long term, and whether it has long term benefits in terms of injury reduction. Ergonomics interventions, particularly those that include risk assessments and the redesign of equipment and patient handling tasks have been shown to successfully reduce the risk of manual handling injuries (Ore, 2003; Owen et al., 2002).

3.2.2 Surveys and audits assessing prior manual handling training in healthcare workers - A summary of the main findings (Table 2)

Eighteen papers investigating the efficacy of prior manual handling training in healthcare personnel are reviewed in Table 2. Since the papers reviewed in Table 2 are not intervention-based studies, no scoring criteria was applied. The aim of the review conducted in Table 2 was to provide a descriptive overview of the findings from survey data on the effectiveness of manual handling training.

Of concern, and despite the 1992 Manual Handling Regulations requirement that all individuals involved in manual lifting should be provided with training in safe handling, a number of studies reviewed in Table 2 highlight the absence of training occurring in some professions within the healthcare industry. For example, in a survey of 22 anaesthetists, Luntley et al. (1995) observed that none of those surveyed reported receiving training in safe patient handling, despite 73% admitting that they regularly lifted patients in the operating theatre. The same findings were observed in a separate survey of operating theatre staff conducted by Coleman and Brooke (1999).

In a survey of 60 doctors involved in care of the elderly, Spencer et al. (2000) reported that only 8% of those surveyed reported receiving any formal training in patient handling, despite 70% reporting that they lift or move patients on their own at least once per week. Of concern, it was

observed that 14% reported injuring themselves, and 14% reported injuring patients during lifting manoeuvres.

A common theme occurring throughout Table 2 was the finding that, in those populations who had received training in safe patient handling, the principles taught during training were not applied in the workplace. For example, in an observational study conducted on hospital orderlies, St-Vincent et al. (1989) reported that even though those studied had received a 12 hour training course, the principles taught during training were rarely used in the workplace. A similar finding was reported by Wachs and Parker-Conrad (1989) who after observing 178 registered nurses, reported that only 2% moved patients in the prescribed manner. Similarly, in a survey of 85 nurses, Scott (1995) reported that the nurses admitted to using patient handling principles taught during training, but most admitted sometimes employing the quickest method rather than the safest.

Many surveys have been conducted assessing nursing students experiences and attitudes towards the patient handling training that they received during their nursing education. It is commonly reported that students, or newly qualified nurses, felt that they were taught the basic principles during their education, yet found it difficult to implement what they were taught in the ward environment (Cornish & Jones, 2006; Gladman, 1993; Swain et al., 2003). The reasons often identified for not using correct patient handling techniques are the attitudes of qualified, or more senior, staff, the availability of lifting aids, lack of time, patient needs, and the shortage of skilled assistance (Gladman, 1993; Swain et al., 2003).

According to Troup and Rauhala (1987), patient handling techniques used as routine in the wards are frequently dictated by the custom and usage of the more senior nurses and by furniture and equipment provided. It has been reported that students, or newly qualified, nurses adopt outdated handling techniques in the ward environment due to the desire to 'fit-in' with their more experienced colleagues (Kneafsey, 2000). In a questionnaire based survey, Kane and Parahoo (1994) presented a scenario to 16 nursing students to investigate whether students would partake in an unsafe lifting manoeuvre, requested by a staff nurse, even though they knew it was wrong. The findings indicated that 50% of those surveyed would conform to the decision of the staff nurse and take part in the unsafe manoeuvre. The main reason for conforming was the strong desire to avoid negative reactions of the entire nursing staff.

Following an interview with two 'in-house' manual handling trainers from 2 separate residential aged care organisations, Dean (2001) suggested that management style, time restrictions, peer culture and lack of awareness of the complexity of manual handling are significant issues which impact on the effectiveness of manual handling training. It was concluded from this study that technique training has been shown to be of little, if any, long term benefit, a view shared by other authors (Hignett, 1996; 2003; Pheasant & Stubbs, 1992; Venning, 1988).

One positive effect of training reported in Table 2, was that of Massy-Westropp and Rose (2004) who performed a retrospective audit of injuries occurring in a community health services agency to determine the effects of introducing the Manutention method of manual handling to the agency. The Manutention method integrates strong biomechanical principles and involves a high quantity of teaching. It attempts to change a carer's behaviour and decrease back strain and energy consumption, and increase patient comfort and safety. The method uses the semi-squat posture and weight transfer techniques such as bracing, pivoting, lunging and counterbalancing the load to decrease the amount of lifting done by the carer (Best, 1997). Since 1993 clinical staff working at the health services agency received training in Manutention. The audit was performed 10 years following the introduction of this training method. It was reported that the annual rate of 54 manual handling injuries per 100 medical aids for the pre manutention period ('90 – '94) dropped significantly to 35 injuries annually for the period ('95 – '03) following the introduction of manutention. Significant reductions in the days lost per injury were also

reported from the 5 year pre-manutention period to the nine year post introduction period. It was concluded that training in the manutention method of manual handling can reduce the incidence and severity of workplace manual handling injuries. Positive findings of the effects of training in Manutention have also been reported by Best (1997) (see Table 1). Massy-Westropp and Rose (2004) noted however that their study involved the retrospective analysis of training and injury record data, thus there may have been other factors contributing to the patterns of results that were not controlled for, such as for example, changes in work practices and reporting.

In summary, the surveys reviewed in Table 2 suggest that despite prior training in patient handling, the principles taught during training are not applied into the working environment (Gladman, 1993; Kane & Parahoo, 1994; Scott, 1995; St-Vincent et al., 1989; Swain et al., 2003; Wachs & Parker-Conrad, 1989), and that training in general is largely ineffective due to the high numbers of injury rates reported in those who have undergone training (Bewick & Gardner, 2000; Crawford & Weetman-Taylor, 1996; Ellis, 1993; Hollingdale & Warin, 1997). For example, in a survey of 168 nurses, Hollingdale and Warin (1997) reported that despite receiving training, 59.5% of the nurses surveyed reported suffering from back pain in the previous year.

According to Kneafsey (2000), nurses' attitudes and beliefs about patient handling, and the culture into which new nurses are socialised, may play a significant role in hindering changes in manual handling practice. Kneafsey (2000) attributes the failure of training in lifting and handling to its concentration on new recruits to nursing, leaving senior nurses, who tend to set the norms of behaviour on the ward, oblivious to safer practices.

Training in the Manutention method has shown positive results (Best, 1997; Massy-Westropp & Rose, 2004), however a high quality randomised control trial is needed before firm conclusions can be made about the effectiveness of this method.

3.3 WORKPLACE AND LABORATORY BASED RESEARCH INVESTIGATING THE EFFICACY OF MANUAL HANDLING TRAINING IN NON-HEALTHCARE PERSONNEL

Table 3 summarises workplace and laboratory based intervention studies conducted with the goal of improving manual handling training, and Table 4 summarises questionnaire based surveys evaluating the effectiveness of prior manual handling training.

Table 3 A summary of workplace and laboratory based research investigating the efficacy of manual handling training in non-healthcare personnel

Author	Participants	Study design	Intervention	Outcome measure	Results	QR
Gross (1984) (USA)	11 males.	Within subjects design, laboratory based.	Surface EMG's of the erector spinae muscles were recorded every 10 seconds for a 60 second period while holding loads of 4.5kg, 9.07kg, 11.34kg and 13.6kg at abdominal level. The pitch and volume of the biofeedback monitor varied with the strength of the EMG signal.	Spinal stress, measured using the EMG, during static lifting was compared between the biofeedback and no feedback conditions.	In 45% of the trials a significant decrease (in muscle activity) was recorded with the use of the biofeedback. It was concluded that biofeedback of the erector spinae muscles using surface electrodes appears to be a useful tool for the reduction of spinal stress during static lifting	38%
Chaffin et al. (1986) (USA)	26 warehouse workers.	Within subjects design, workplace intervention.	A 4-hour training session was given to employees which emphasised correct lifting techniques.	The effectiveness of training was measured by videotaping lifting postures used by workers performing their jobs before and between 31-51 days after training.	Training had a beneficial effect on two of the 5 criteria used to judge lifting behaviours, a reduction in the prevalence of jerking the load during lifting was observed post training along with a reduction in the prevalence of inadequate gripping of the objects. It was concluded that a 4 hour training program had beneficial but minor effects on lifting techniques.	47%

Table 3 continued

Author	Participants	Study design	Intervention	Outcome measure	Results	QR
Carlton (1987) (USA)	14 intervention participants, 16 controls. All participants were food services employees.	Within subjects design, workplace intervention.	The experimental group participated in a 1 hour body mechanics course, emphasising the straight back and bending of the hips and knees during lifting. Participants were videoed performing a number of lifts, and feedback was provided.	Performance on a lifting task conducted 2 weeks following training, in a simulated environment. Performance was also assessed in the working environment 3 weeks post training.	The experimental group performed significantly better on a novel task than the control group, however, there was no significant difference between groups in terms of performance in the work environment. It was concluded that learning did not transfer into the work environment.	63%
Nygard et al. (1998) (Finland)	21 female store workers.	Within subjects design, workplace intervention.	Participants trained in lifting technique by a physiotherapist using the critical mental system method, training focused on the use of the legs as opposed to the back when lifting. Training consisted of a classroom and a practical session.	Working postures, goods handled and ratings of perceived exertion (RPE) were compared pre and post training.	After training participants bent their legs more when lifting. No significant changes in back postures were observed. RPE did not change.	48%

Table 3 continued

Author	Participants	Study design	Intervention	Outcome measure	Results	QR
Rabinowitz et al. (1998) (South Africa)	10 male participants.	Within subjects, repeated measures design. Laboratory study.	Participants performed a lifting task during each visit, lasting 15 minutes. Lifting techniques used were either a squat lifting or a stoop lifting technique with or without an abdominal belt on each day.	Measurements of spinal shrinkage, heat rate and RPE were taken before and after each lifting task.	There were no significant differences in spinal shrinkage between the four lifting techniques. Heart rates were higher during the squat lift than the stoop lift. RPE were higher during the squat lifting session.	47%
Burt et al. (1999) (New Zealand)	50 participants lifted the 'experimental box', 51 participants lifted the 'control box'.	Independent samples design, laboratory study.	Participants were asked to lift a box, to help a courier. The experimental box contained symbols showing a safe lifting technique.	Lifting techniques were observed by 3 observers. Techniques were compared for participants lifting the experimental and control boxes.	The experimental box achieved significantly more 'bending of the knees', and a significant overall increase in the use of correct lifting techniques.	55%

Table 3 continued

Author	Participants	Study design	Intervention	Outcome measure	Results	QR
Jones et al. (1999) (UK)	24 pairs of participants, one of each pair received training and a guide book, the other received a guide book.	Paired samples design, workplace intervention.	The trained group attended a 2 day workshop covering MH, anatomy, biomechanics and back care, along with risk assessment. All participants were asked to review MH tasks in their departments.	All work was repeated by an ergonomist and participants' assessments were scored in comparison with the ergonomist. The trained and untrained groups were compared.	Both groups of participants appeared to be able to identify hazards though not necessarily prioritise the tasks. The trained group tended to score better in assessments although wide variation existed and the groups were not significantly different	45%
Lavender (2000) (USA)	293 warehouse workers from 7 companies.	Within subjects design, laboratory based.	Participants fitted with sensors from an electromagnetic motion measurement system called the *LiftTrainer*™. Participants practiced a series of lifting tasks with biofeedback for 30 minutes.	Comparison of peak forward bending, twisting and side bending moments at the spine compared pre and post training.	Preliminary data is only presented and no statistical tests have been conducted. The author reported improvements in side bending and twisting moments following biofeedback training.	33%

Table 3 continued

Author	Participants	Study design	Intervention	Outcome measure	Results	QR
Brown et al. (2002) (UK)	30 warehouse employees completed the pre and post study questionnaires. 79 participants from an assembly department also monitored.	Within samples design, workplace intervention. 12 month project.	A back pain management package was developed; this included increasing employee awareness of lifting and handling, risk assessment regarding MH, back school style education, observing employees in the work environment and fast-track physiotherapy.	Sickness absence statistics and responses on a musculoskeletal questionnaire (warehouse workers only) were compared pre and post intervention.	Reported musculoskeletal discomfort decreased in the warehouse workers surveyed in most body regions following the intervention. A 56% reduction in back-related sickness absence, from 87 to 38 days was observed over the intervention period.	31%
Lavender et al. (2002) (USA)	265 workers from 4 grocery distribution centres.	Within subjects design, workplace intervention.	During a 30 minute training session participants initially performed a lifting task as they normally would. They then received feedback, and were encouraged to practice the task using biofeedback, they were guided towards lifting behaviours that lowered spinal moments, and consequently lowered the pitch of the biofeedback tone.	Spinal load and case handling times were compared pre and post biofeedback training (no biofeedback was present during the assessment tasks).	No overall significant change was found in case handling time following biofeedback training, 3D spine moments reduced significantly as a result of training.	45%

Table 3 continued

Author	Participants	Study design	Intervention	Outcome measure	Results	QR
Gagnon (2003) (Canada)	10 male college students.	Within subjects design, laboratory based.	Participants received basic instruction on biomechanical principles. They then watched a video contrasting experts and novices strategies in a variety of workplace conditions. Participants then practiced a MH task, with verbal feedback.	Kinematics and ergonomic variables were assessed whilst participants completed a lifting task pre and post training.	Substantial biomechanical and ergonomics changes occurred immediately at the first post training trial when compared with the pre-training trial and these changes were maintained throughout the remainder of the session. Mechanical work was reduced post training by about 30% and back efforts by 10-30%.	47%
Agruss et al. (2004) (USA)	10 EMG feedback participants, 9 verbal acceleration index participants, 9 controls. All participants were college biomechanics students.	Within subjects design, laboratory based.	Following baseline, 2 feedback training sessions were undertaken on a simulated lifting task, feedback consisted of either real-time EMG feedback or an acceleration index delivered verbally post-lift. A control group received no feedback.	Lumbar compression pre and post training.	All three groups showed reductions in peak compression from pre-to-post training; on average the control group improved by 11.2%, the EMG group by 16.7% and the verbal acceleration group by 25.3%. The verbal acceleration group was significantly different to the control group.	63%

Table 4 A summary of surveys assessing the efficacy of prior manual handling training in non-healthcare personnel

Author	Participants	Type of survey/methods	Outcome measure	Quantity of training	Effectiveness of training/injury data
Snook et al. (1978) (USA)	191 Liberty Mutual Loss Prevention representatives.	Questionnaire	Injuries caused by MH tasks. Comparisons were made between the incidence of injuries (from compensation claims) between employers who provided MH training with employers who did not provide training.	No information provided.	MH tasks were implicated as the specific act or movement associated with back pain in 70% of cases. Just as many injuries were experienced by employers who provided training as by employers who did not provide training. Concluded that training was ineffective.
Tang (1987) (Singapore)	Safety officers from 83 plants in Singapore.	Questionnaire	The number of plants providing training for their workers in MH.	Among the 55 plants with manual lifting work, 76% provided training for workers in MH. Methods of training included demonstration of lifting techniques (67%), poster campaigns (62%), classroom lectures (38%) and regular plant tours including small group discussions (29%).	Problems associated with training included the communication barrier due to the multilingual workforce, variable educational levels, lack of qualified instructors, training aids, lifting guidelines and reference materials, and high staff turnover. It was concluded that MH training was inadequate for reducing the risk of injury.

Table 4 continued

Author	Participants	Type of survey/methods	Outcome measure	Quantity of training	Effectiveness of training/injury data
Kuorinka et al. (1994) (Canada)	16 individuals involved in manual handling working in two grocery distribution warehouses.	Observational. Participants were observed in the workplace over a 1 day period.	Lifting techniques used by workers.	Workers received on-the-job training in correct handling procedures. An occupational health worker also provided refresher training from time to time.	Workers' awareness of MH procedures were quite good and a willingness to observe 'correct methods' was evident. However, workers rarely used correct lifting techniques.
Wright and Haslam (1999) (UK)	31 individuals working in a soft drinks distribution centre.	Interview	The amount of MH training received by employees.	16% reported that they had not received MH training. A large number of those who had received training reported it as 'good' and 'interesting'.	Most workers found it difficult to practice the techniques taught during training due to restrictions imposed by their work environment.

3.3.1 Manual handling training interventions conducted in non-healthcare workers - A summary of the main findings (Table 3)

A total of 12 papers are reviewed in Table 3, the sample sizes reported in this research ranged from 10 to 109. A characteristic of the studies reviewed in Table 3 is a lack of control groups, and or no follow-up. According to the quality rating criteria applied, with the exception of two reports (with a quality rating of 63% (Agruss et al., 2004; Carlton, 1987)), the studies reviewed in this section have a relatively low quality rating, ranging from 31 – 55% (poor to medium).

The joint highest rated study in the current section, in terms of quality rating, was that of Carlton (1987) who investigated the effectiveness of instruction, in the body mechanics of lifting and lowering, on the subsequent use of body mechanics in the work environment. In this study, conducted on food services employees, intervention participants participated in an one hour body mechanics course, which emphasised the straight back and bending of the hips and knees during lifting technique. Participants were videoed performing a number of lifts and feedback was provided. Two weeks following the course, control and intervention participants were observed away from their workplace conducting a simulated lifting task. One week later, all participants were observed in their work environment. It was found that the experimental group performed significantly better on a novel task than the control group, however, there was no significant difference between groups in terms of performance in the work environment. Carlton (1987) concluded that the learning, from training, did not transfer into the work environment. This finding supports those reviewed in the previous section showing that training in healthcare workers does not transfer into the ward environment (Gladman, 1993; Kane & Parahoo, 1994; Scott, 1995; St-Vincent et al., 1989; Swain et al., 2003; Wachs & Parker-Conrad, 1989).

Chaffin et al. (1986) evaluated the effectiveness of a specific worker training program as judged by resulting modifications in lifting postures in a group of warehouse workers. Lifting postures of workers were videotaped before and after training. The training program consisted of a four hour session emphasising safe lifting techniques, the principles taught included: get as close to the load as possible, keep the torso as erect as possible, don't twist the torso while lifting, lift smoothly, do not jerk the load, and get a good grip on the object. It was reported that training had a beneficial effect on 2 of the 5 criteria used to judge lifting behaviours; a reduction in the prevalence of jerking the load during lifting was observed post training along with a reduction in the prevalence of inadequate gripping of the objects. Chaffin et al. (1986) concluded however that the training program had minor effects on lifting technique.

Nygard et al. (1998) investigated the effectiveness of training on lifting technique among 21 female store workers. Participants attended a classroom and a practical based training session which focussed on the use of the legs as opposed to the back when lifting. It was reported that following training, observations of participants revealed that they bent their legs more when lifting, however no significant changes were observed in back postures.

Using a different approach, Burt et al. (1999) reported that the display of a symbol on an experimental box, showing safe lifting techniques, prompted participants to adopt more 'bending of the knees' whilst lifting, compared to a control sample who lifted a box with no symbol.

According to Gagnon (2003), training programs should be based on workers knowledge about their jobs, and training programs based on the observation of workers strategies for manual handling appears promising. To test this hypothesis, a laboratory study was conducted where 10 male college students initially received some basic instruction about biomechanical principles followed by the observation of video films contrasting experts and novices strategies in a variety of workplace conditions. Participants then practiced a manual handling task, during which they were encouraged to try out different techniques with feedback provided. Gagnon

(2003) reported that substantial biomechanical and ergonomics changes occurred post training, with mechanical work being reduced by about 30% and back efforts by 10-30%. While these results look promising, no control group was available for comparison, nor was there a follow-up evaluation to examine where the effects of training were maintained.

Agruss et al. (2004) recently investigated the effects of a feedback training program on lumbar compression during simulated occupational lifting. Two distinct types of feedback were compared, these were real-time electromyographic (EMG) feedback, and an acceleration index delivered verbally post-lift. Following a baseline measurement session, feedback training was provided once per week over a 2 week period. The verbal acceleration group were asked to minimise an acceleration index, calculated as the percent difference between dynamically and statically determined peak compression forces at the lumbosacral junction. In the EMG group, an EMG feedback unit produced a tone that rose in pitch as a function of activation in the erector spinae muscles. Participants in this group were instructed to keep the pitch as low as possible. A control group followed the same training schedule, but without any form of feedback. Agruss et al. (2004) reported that all three groups showed reductions in peak compression from pre to post training. On average the control group improved by 11.2%, the EMG group by 16.7% and the acceleration group by 25.3%. The verbal acceleration group reduced the peak lumbosacral forces significantly more than the control group, however while the EMG feedback group improved more than the control group, this difference was not statistically significant.

In summary, less research has been conducted into the effectiveness of manual handling training in industries outside of the healthcare sector. Of the research available, there is little evidence of the effectiveness of training. As seen in the healthcare setting, the research reported by Carlton (1987) demonstrated that principles taught during training are not carried over into the work environment.

3.3.2 Surveys assessing prior manual handling training in non-health care workers - A summary of the main findings (Table 4)

Four papers investigating the efficacy of prior manual handling training in non-healthcare personnel are reviewed in Table 4. Since the papers reviewed in Table 4 are not intervention-based studies, no scoring criteria was applied. The aim of the review conducted in Table 4 was to provide a descriptive overview of the findings from survey data on the effectiveness of manual handling training in industries other than healthcare.

In a survey completed by Liberty Mutual Loss Prevention representatives located throughout the US, Snook et al. (1978) reported that manual handling tasks were implicated as the specific act or movement associated with back pain in 70% of cases. The effect of training was analysed by comparing the incidence of injuries between employers who provided training on safe lifting procedures with employers who did not provide training. It was concluded from this analysis that training on safe lifting procedures was not an effective control for low back injuries. Snook et al. (1978) observed that just as many injuries were experienced by employers who provided training as by employers who did not provide training.

Tang (1987) conducted a survey of 83 plants employing safety officers in Singapore. It was found that among the 55 plants with manual lifting work, 76% provided training for workers in manual handling. Methods of training included demonstration of lifting techniques (67%), poster campaigns (62%), classroom lectures (38%) and regular plant tours including small group discussions (29%). Among the plants that provided training, 90% taught the basic handling skills, 74% advocated the use of handling aids, 55% made the trainee aware of the dangers of careless or unskilled lifting, 38% taught the trainees to be aware of what they could

handle safely, 38% showed the workers how to avoid unnecessary stress, 31% emphasised the effects of lifting on the body, and only 4% covered the basic biomechanical aspects of lifting. Tang (1987) reported that the main problem associated with training was the communication barrier due to the multilingual workforce and variable educational levels. Other problems included lack of expertise (e.g. qualified instructors) and facilities (e.g. training aids, lifting guidelines and reference materials), high staff turnover rates, and the indifferent attitude of workers. It was concluded from this survey that control measures such as selection and training of workers in manual handling were inadequate or incomplete for reducing the risk of injury.

Kuorinka et al. (1994) observed 16 individuals involved in manual handling working in two grocery distribution warehouses for a period of one day. It was reported that workers rarely used correct lifting techniques, despite the fact that during workers initial on-the-job training, correct handling procedures were taught. An occupational health worker also provided refresher training from time to time and workers' awareness of manual handling procedures appeared to be quite good. From these findings, Kuorinka et al. (1994) have suggested that ergonomics improvements and training in material handling in general, and not just in lifting techniques and skills, could be a more effective approach.

Wright and Haslam (1999) interviewed individuals working in a soft drinks distribution centre about the manual handling training that they had received. Of those interviewed, 16% reported that they had not received training. Of those who had received training a large number reported it as 'good' and 'interesting', however most workers reported that they found it difficult to practice the techniques taught in the workplace due to restrictions imposed by the work environment.

In summary, the research reviewed in Table 4 provides further support for the argument that training in manual handling is not effective. The research findings reported by Kuorinka et al. (1994) and Wright and Haslam (1999) add further support to the findings of Carlton (1987) (reviewed in Table 3) who concluded that learning, from training, does not transfer into the work environment in a non-healthcare setting. There is considerable evidence that this is true in healthcare settings (Gladman, 1993; Kane & Parahoo, 1994; Scott, 1995; St-Vincent et al., 1989; Swain et al., 2003; Wachs & Parker-Conrad, 1989).

3.4 WORKPLACE AND LABORATORY BASED STUDIES ASSESSING THE EFFECTIVENESS OF AN EXERCISE INTERVENTION FOR IMPROVING MANUAL HANDLING CAPABILITIES

According to Garg and Moore (1992), most of the musculoskeletal and back injuries that result from manual handling, are caused by overexertion due to a mismatch between a worker's strength and the job strength requirements. Put in another way, the physical requirements of the job exceed the physical strength of the worker (Garg & Moore, 1992).

One approach to reduce injuries associated with manual handling has been to improve the physical capabilities of the worker, i.e. fitting the worker to the task. A number of studies have been conducted investigating the effectiveness of a physical training program on improving the capabilities of the individual for manual handling, and these are reviewed in Table 5.

Table 5 A summary of workplace and laboratory based research investigating the efficacy of exercise training on improving manual handling

Author	Participants	Study design	Intervention	Outcome measure	Results	QR
Asfour et al. (1984a) (USA)	10 male college students.	Within subjects design, laboratory based.	Participants underwent training for flexibility, cardiovascular endurance, muscle endurance and static strength over a 6 week period, at a frequency of 5 times/week.	Changes in VO_2 max, heart rate, muscle strength, and maximum weight lifted pre and post training.	VO_2 max increased by 24% following training, and heart rate decreased significantly. Shoulder strength increased by 14%, arm strength by 36%, leg strength by 19% and back strength by 30%. The maximum weight lifted also increased significantly following training.	44%
Asfour et al. (1984b) (USA)	7 male college students.	Within subjects design, laboratory based.	Participants underwent training for flexibility, cardiovascular endurance, muscle endurance and static strength over a 3 week period, at a frequency of 5 times/week.	Changes in static muscle strength pre and post training, and the effects of walking speed and gradient on maximal acceptable carrying load.	Overall strength increased by 22% following training. Maximum acceptable load to be carried decreased as the speed and/or the gradient level of the treadmill increased.	42%

Table 5 continued

Author	Participants	Study design	Intervention	Outcome measure	Results	QR
Sharp and Legg (1988) (USA)	8 soldiers.	Within subjects design, laboratory based.	Participants underwent 5 training sessions per week for 4 weeks. During each session participants were presented with one empty and one heavily loaded box and asked to adjust the box mass to the maximum load they felt capable of lifting for 1hr. The load was lifted at a rate of 6 lifts/min to a height of 132cm for 2 15-minute periods each session.	1 hour maximal repetitive lifting capacity, box mass selected post training, changes in heart rate and RPE.	At the end of 4 weeks of training, participants did not select a heavier training load, nor did they exhibit a decreased training heart rate, or report a decreased RPE. The training program did produce a significant increase in 1-hr maximal repetitive lifting capacity, as indicated by a greater box mass selected, but there was no concomitant change in VO_2, heart rate, or RPE.	38%
Genaidy and Asfour (1989) (USA)	11 male participants.	Within subjects design, laboratory based.	Participants underwent training for flexibility and muscle endurance. Training took place over 8 sessions, and each session lasted for 8 hours. The frequency of lifts and the weight of the object varied during each session.	The effects of the weight of the load and the frequency of lifts on endurance time.	Endurance time decreased as the weight lifted and the frequency of lifting increased.	47%

Table 5 continued

Author	Participants	Study design	Intervention	Outcome measure	Results	QR
Genaidy et al. (1989) (USA)	11 male, new employees, inexperienced in MH, 10 controls, consisting of students.	Within subjects design, laboratory based.	Exercise based training. Lifting and carrying a 20kg box. 8 training session conducted over 2.5 weeks.	Psychophysical endurance time.	Mean endurance time doubled from 45 min to 90 min over the training period. No change was seen in the control group.	50%
Genaidy et al. (1990a) (USA)	12 symmetrical lifting participants, 10 asymmetrical lifting participants, 5 controls. All participants were college students.	Within subjects design, laboratory based.	Exercise based training. One group practiced a symmetrical lifting task, while another trained in an asymmetrical lifting task during 16 training sessions, occurring every other day. Controls attended 2 sessions, separated by a 4 week period.	Frequency of handling (the average number of cycles performed per minute) and endurance time compared pre and post training.	Endurance time increased significantly by 248% and 46% for the symmetrical and asymmetrical groups respectively. There was a 44% and 34% increase in the frequency of handling values for the symmetrical and asymmetrical groups respectively. No changes were seen in the control group.	59%

Table 5 continued

Author	Participants	Study design	Intervention	Outcome measure	Results	QR
Genaidy et al. (1990b) (USA)	5 intervention participants in group 1 (6 repetitions), 5 intervention participants in group 2 (10 repetitions), 5 controls.	Within subjects design, laboratory based.	Participants trained in a sequence of lifting, lowering, pushing, pulling and holding tasks. 16 training sessions over a period of 6 weeks.	Changes in endurance time, heart rate, RPE, static and dynamic strength.	Increases in endurance time, static and dynamic strength, along with decreases in heart rate observed in two intervention groups. No changes in RPE. No changes in any measure were seen in the controls.	50%
Genaidy (1991a) (USA)	5 separate intervention participants and 5 separate controls completed Parts 1 and 2. The 20 participants were all male college students.	Within and between subjects design. Laboratory study.	In Part 1, intervention participants completed a MH task designed to enhance muscle endurance. In Part 2, intervention participants completed a training program to enhance muscle endurance for upper extremity MH tasks. Training took place 3 days/week for 6 weeks.	Changes in dynamic and static strength, endurance time and heart rate, measured whilst performing a MH task pre and post training.	Endurance time increased over 500% for the intervention participants conducting the MH task. No changes were seen in static and dynamic strength in this group. Endurance time increased over 1200% for the intervention participants conducting the upper extremity handling task, increases in static and dynamic strength were also seen. Heart rate decreased by 18% and 9% in the two experiments, respectively. No changes seen in control groups.	50%

Table 5 continued

Author	Participants	Study design	Intervention	Outcome measure	Results	QR
Genaidy (1991b) (USA)	5 males in an intervention group, 5 females in an intervention group and 5 male controls. All participants were college students.	Within subjects design, laboratory based.	Intervention participants attended 16 training sessions, conducted 4/week over 4 weeks. A range of truncal flexibility exercises were practiced during each training session. The control group received no training.	Dynamic strength, muscle endurance, low-back flexibility and truncal rotation assessed pre and post training.	Improvements in low-back flexibility, truncal rotation and dynamic strength were observed post training in the intervention groups. The muscular endurance of the female group improved as a result of the training program, while no improvements were seen in the male group. No changes in any variables were seen in the control group.	61%
Guo et al. (1992) (USA)	Two groups of 6 trained for flexibility, and two groups of 6 trained in strength and flexibility. All participants were maintenance workers.	Within and between subjects design. Workplace intervention.	Prior to training, participants attended two educational sessions. Participants trained 5 times/week for 4 week. 2 groups were trained for flexibility, and 2 were trained using strength-flexibility exercises, which involved training in a manual handling task, in addition to flexibility exercises. Following the training period, all participants continued with flexibility exercises twice/week for 4 weeks.	Changes in dynamic and static strength, muscular endurance and flexibility, measured whilst performing a manual handling task pre and post training, and at 4 weeks follow-up.	The flexibility training groups had significant improvements in dynamic strength, endurance time, and flexibility measures during the short/intensive training. Each strength-flexibility training protocol resulted in significant improvements in employees physical capacity. There were no major difference between the strength-flexibility and flexibility groups in terms of physical capacity. Static and dynamic strengths remained almost unchanged during the course of the follow-up programme, however a reduction in flexibility was seen.	58%

Table 5 continued

Author	Participants	Study design	Intervention	Outcome measure	Results	QR
Gundewall et al. (1993) (Sweden) (Also in Table 1)	28 intervention participants and 32 controls. All participants were nurses and nurses' aids.	A normalised, randomised prospective design.	The intervention group performed a workout program for the back muscles designed to increase dynamic endurance, isometric strength and functional coordination, for 20 minutes 6 times/month for 13 months. No exercises were given to the control group.	Isometric back strength measured at the beginning and end of the study. The presence of low back pain, and the number of days off work because of low back pain, recorded by participants throughout the study.	Training group participants increased their back strength by an average of 20% over the study; no change was seen in the control group. 1 training participant had been absent from work for 28 days due to LBP during the study, versus 12 participants from the control group who had been absent for 155 days in total. The training group also had significantly less LBP complaints and a lower pain intensity than the controls.	69%
Genaidy et al. (1994) (USA)	Employees experienced in manual handling from 3 manufacturing plants. 11 participants in intervention group 1, 5 participants in intervention group 2 and 12 controls.	Within and between subjects design. Laboratory based.	The intervention groups trained in a manual handling task 4 times/week for 4 weeks. In addition, the second intervention group performed trunk flexibility exercises. Controls were tested twice, separated by a 4 week period.	Changes in static and dynamic strength, endurance time and RPE measured whilst performing a manual handling task pre and post training.	Endurance time increased significantly in both intervention groups. Dynamic strength but not static strength improved in the first intervention group. Greater improvements were seen in static and dynamic strength in the second intervention group. No changes in RPE occurred in any group, no changes in any variables occurred in the control group.	50%

Table 5 continued

Author	Participants	Study design	Intervention	Outcome measure	Results	QR
Knapik (1997) (USA)	13 female soldiers.	Within subjects design, field study.	Participants completed a generalised physical training program that emphasised progressive resistance (strength) training on 3 days/week, and CV training 2 days/week for 14 weeks.	Performance on a manual handling task conducted pre and post training. Weight of box lifted and RPE were the main outcome measures.	Participants increased the maximum mass they could lift from floor to knuckle height by 19%, and from floor to chest height by 16%. They also improved by 17% in their ability to lift 15kg as many times as possible in 10 minute lifts. RPE did not change.	47%
Williams et al. (2002) (UK)	52 army recruits.	Within subjects design. Workplace intervention, modification of training.	The basic training package was modified to included strength training, endurance training, agility, manual handling, sports, circuit training and swimming. Training was conducted over an 11 week period.	Performance on a battery of tests performed pre and post training. Six tests of manual handling ability were conducted, which included: maximal lift, repetitive lift and carry, and loaded march.	Improvements were observed in all six manual handling tasks, which included 8-12% improvement in maximal box lifting, 15-19% for repetitive lifting and carrying, and 9-17% for loaded marching, post training measures were all significantly higher than baseline measures for each task.	47%

3.4.1 Workplace and laboratory based research investigating the efficacy of exercise training on improving manual handling – A summary of the main findings

A total of 14 studies investigating the effectiveness of exercise training to improve manual handling capabilities are reviewed in Table 5. The studies reviewed have a sample size range of 7 to 60, and a quality rating ranging from 38 to 69%.

The highest rated study in the current section, in terms of the quality rating applied, was that of Gundewall et al. (1993) who investigated the effectiveness of a back strengthening intervention in nurses and nurses' aids, and this study has previously been discussed in Section 1.

The majority of studies (with the exception of Gundewall et al. (1993)) investigating the efficacy of exercise-based training have been conducted using relatively small sample sizes, with participants largely consisting of university students. In addition, very few studies have incorporated follow-up assessments. Favourable effects have generally been reported following the application of an exercise training intervention, however considering the limitations mentioned above, further high quality studies are required to confirm this evidence.

Following relatively short training programs, ranging from 3 to 6 weeks, involving training for flexibility, cardiovascular endurance, muscle endurance and muscle strength, Asfour et al. (1984a; 1984b) reported beneficial changes in all outcome measures occurring post training in small numbers of male college students.

Genaidy et al. (1989) investigated whether the endurance time of new employees engaged in frequent industrial carrying tasks can be significantly increased through a short training programme. In this study, endurance time was defined as the maximum length of time during which an individual can continuously carry a 20 kg load over a 4 meter distance at a rate of 8 times per minute. Participants attended 8 training sessions, over a two and a half week time period. Genaidy et al. (1989) reported that endurance time increased from 45 minutes to 90 minutes following training in the intervention group. No changes in endurance time were reported in a control group consisting of college students who were assessed on two occasions, separated by a two and a half week interval.

Similarly, Genaidy et al. (1990a) reported improvements in endurance time and handling times (the number of cycles performed per minute) in college students, following 16 training sessions, for both a symmetrical and asymmetrical lifting task. Greater improvements were seen in the symmetrical training group and it was speculated that improvement in the physical capabilities of individuals takes a longer duration as the complexity of the task increases.

In a study using a simulated manual handling task, Genaidy et al. (1990b) reported that participants trained using a sequence of lifting, lowering, pushing, pulling and holding tasks over a period of 16 training session, exhibited significant increases in endurance time, static and dynamic strength, along with decreases in heart rate post training.

The majority of research summarised in Table 5 has been conducted on specific populations such as university students and soldiers, it is therefore not clear whether the benefits seen in these individuals will also be found in workers involved in manual handling in the industrial setting. To address this limitation, Guo et al. (1992) investigated the effectiveness of an exercise based training intervention on hospital maintenance employees. The training programme had a duration of four weeks and participants trained at a frequency of 5 times/week, for 30 minutes at a time. Two groups of participants were trained for flexibility, while the other two were trained using strength and flexibility exercises, involving training in a manual handling task, in addition to the flexibility exercises. Increases in the employees' physical capacity for manual handling tasks were observed in both types of training group.

During a four week follow-up period a flexibility exercise program was implemented at the beginning of the shift and performed on two days of the week. Static and dynamic strengths remained almost unchanged during the course of the follow-up programme; however a reduction in the flexibility measures were reported. Guo et al. (1992) concluded that a follow-up performed at a rate of twice per week is not adequate to maintain performance levels gained from initial training, it was suggested that follow-up exercises should be performed on a daily basis.

According to Knapik (1997), most studies that have examined the effects of exercise training on manual handling capability have used task-specific exercise programs. In such studies (Genaidy et al., 1989; 1990a; 1990b; 1991a; 1991b; 1992; 1994; Genaidy & Asfour, 1989; Sharp & Legg, 1988) the task specific training uses the same manual handling task for both testing and training and it is therefore possible that the improvements seen were due to improvements attributable to psychomotor learning (described as improvements in technique), and the portion of the improvement due to physical conditioning cannot be estimated. Knapik (1997) has stated that the major disadvantage of task-specific training, as used widely, is that performance improvements are largely restricted to the task for which the subjects are trained, and the benefits gained are not transferable to other tasks.

Using a different approach, Knapik (1997) tested the effectiveness of a generalised physical fitness training program, encompassing strength training, on manual handling capabilities of 13 female soldiers. Pre and post training, participants undertook a manual handling task that required lifting a box from the floor to shelves of various heights. The training program was 14 weeks long and included progressive resistance training on 3 days of the week and running with interval training 2 days per week. In comparison to pre-training, participants increased the maximum mass they could lift from floor to knuckle height by 19%, and from floor to chest height by 16%. They also improved by 17% in their ability to lift a mass of 15kg as many times as possible in a series of lifts undertaken in a 10 minute period. It was concluded that a general physical fitness training program was effective in improving the manual handling capabilities of women.

In summary, the research summarised in Table 5 has examined the effects of exercise programmes on human capacity for manual handling tasks over the short term, since the majority of studies had a training intervention lasting for six weeks or less (with the exception of the high quality study conducted by Gundewall et al. (1993)). The research highlights beneficial effects resulting from exercise training, in terms of improved physical capacity for manual handling tasks, over the short term. However, the majority of studies have used small numbers of college students and very little research has been conducted on workers involved with manual handling in the industrial setting. None of the research reviewed incorporated a follow-up period of any sufficient length, thus it is unclear whether the beneficial effects seen with exercise training are maintained, or how soon the effects wane following the discontinuation of training. Exercise training does show promise, as highlighted in the study by Gundewall et al. (1993), however further research, in the form of high quality, longitudinal studies with follow-up are required before firm conclusions can be made.

Following a review of the literature on exercise-based training, Genaidy et al. (1992) highlighted that no longitudinal study had been conducted to determine the best method to maintain the improved work capacity seen with exercise based training, and furthermore that no study has yet correlated the improved physical fitness resulting from such training with injury statistics in industry.

3.5 THE EFFICACY OF BACK SCHOOLS FOR PREVENTING INJURES LINKED WITH MANUAL HANDLING

The first Back School was organised in 1969 in a hospital near Stockholm (Zachrisson-Forssell, 1981). The Back School was initially designed to treat and prevent further back problems in individuals already suffering from back pain. They are programs developed by physiotherapists, and taught in a group setting, that are directed towards pain management. Back schools consist of elements of education and the training of skills, with the aim of increasing the patients' ability to take care of his/her back. Topics covered by Back Schools include teaching patients aspects of anatomy and physiology of the back, mechanisms of pain and pain management, good posture, exercises to strengthen the abdominals and muscles of the lower back, the importance of physical fitness, and correct carrying and lifting techniques (Daltroy et al., 1997; Keijsers et al., 1990; Zachrisson-Forssell, 1981).

A more recent use of the Back School however has been to apply this approach to workers in industry with the aim being to prevent or reduce low back pain (Snook & White, 1984). In the industrial setting, Back Schools are an attempt to educate the worker in all aspects of back care and their comprehensive approach encompasses all elements of the Back School, initially designed for patients, described above (Snook, 1988)

Table 6 summarises research conducted in an industrial setting examining the effectiveness of the Back School approach in reducing and preventing manual handling injuries.

Table 6 A summary of the research investigating the efficacy of back schools

Author	Participants	Study design	Intervention	Outcome measure	Results	QR
Donchin et al. (1990) (Israel)	46 participants assigned to a callisthenics group, 46 assigned to a back school intervention and 50 controls. All participants were hospital employees who had previously reported back pain.	Randomised control trial.	Callisthenics for the back were administered in 45 minute sessions, biweekly, for 3 months. The back school was administered in 4, 90 minute sessions during a 2 week period plus a fifth session after 2 months. The control group received no treatment.	Physical capacity was examined 3 months post intervention and after an additional 6 month follow-up. Monthly surveillance of the entire population was run parallel to the intervention study for a whole year.	A significant improvement in trunk forward flexion and abdominal muscle strength was observed in the Callisthenics group 3 months post intervention. No changes were seen in the other groups. A monthly surveillance for the whole year showed a mean of 4.5 'painful months' in the Callisthenics group compared with 7.3 and 7.4 months in the back school and control groups respectively.	75%
Keijsers et al. (1990) (Nether lands)	77 individuals suffering from low back pain, referred by their GPs. Intervention and control groups completed the study, however the numbers in each group are not given.	Randomised trial, testing the effectiveness of the Maastricht Back School.	Intervention participants attended seven sessions, each lasting 2.5 hours, plus a refresher session after 6 months. Sessions were directed towards pain management, and education and/or training of skills.	Pain was assessed via questionnaire at baseline and at 2 and 6 months after assignment to either the treatment or control group. Other outcome variables included absenteeism and general well being.	Both groups showed improvements over time, the experimental group did not show significantly more progress than the control group. It was concluded that the Maastricht Back School is an ineffective method of managing low back pain.	63%

Table 6 continued

Author	Participants	Study design	Intervention	Outcome measure	Results	QR
Daltroy et al. (1997) (USA)	1703 intervention participants, 1894 controls. Participants were all US postal workers.	Randomised control trial, lasting 5.5 years. Workplace intervention.	Back School. The intervention group were taught principles of back safety, correct lifting and handling, posture, exercises, and pain management. Additional reinforcement training was provided 6 months after the first sessions and yearly thereafter. Control participants received no educational programme.	Low back injury rate, injury cost, time off work, and rate of repeated injury throughout the 5.5 year study.	Comparison of the intervention and control groups revealed that the education program did not reduce the rate of low back injury, the medium cost per injury, the time off from work per injury, the rate of related musculoskeletal injuries, or the rate of repeated injury after return to work.	84%

3.5.1 Back Schools - A summary of the main findings

Three papers, all of relatively high quality (ranging from 63 to 84%) were reviewed in Table 6. In the highest quality paper included in the current review, Daltroy et al. (1997) developed a back school for the primary prevention of low back injury and evaluated it in a large, randomised, controlled trial in the industrial setting. Approximately 4000 US postal workers at two mail-processing facilities took part in the study. Workers were randomised into either an intervention or control group. The intervention included all elements of typical employee-education programs on low back safety. Workers and supervisors, in groups of 10-12, were taught principles of back safety, correct lifting and handling, posture, exercises, and pain management, by a team of physical therapists. In addition, the therapists examined each work station and suggested physical and procedural modifications, such as adjustments to shelf heights, lumber supports on chairs etc. The therapists provided additional reinforcement training 6 months after the first sessions and yearly thereafter. Attendance at training sessions was mandatory for the intervention group. No training was provided for the control participants.

Following the 5.5 year study, no differences were observed between the intervention and control groups in terms of the rate of low back injury, the medium cost per injury, the time off from work per injury, the rate of related musculoskeletal injuries, or the rate of repeated injury after return to work. From these findings, Daltroy et al. (1997) concluded that no long term benefits were associated with the back school approach to worker training. Similar findings were also reported by Keijsers et al. (1990) in their study testing the effectiveness of the Maastricht Back School. Similarly, in a high quality study conducted by Donchin et al. (1990), it was reported that after a one year follow-up, no differences in the number of 'painful months' were observed between health care workers (suffering from low back pain) administered a Back School intervention with those in the control group.

Following reviews of the literature, Cromie et al. (2001), Linton and Kamwendo (1987), and Westgaard and Winkel (1997) have all reported that there is limited evidence supporting the effectiveness of the Back School approach. According to Cromie et al. (2001) studies of the effectiveness of back schools have typically demonstrated increased knowledge of back injury amongst participants, but little or no reduction in injury rates. Linton and Kamwendo (1987) have reported that almost no data have been presented concerning whether patients comply with the instructions they receive in low back schools. According to Linton and Kamwendo (1987), the data that have been reported indicate that patients do not improve their self care. Following their review, it was concluded by Westgaard and Winkel (1997) that no improvements in musculoskeletal health are associated with health education, i.e. Back Schools.

In summary, the literature provides no strong evidence for the effectiveness of back schools in treating or preventing low back pain (Cromie et al., 2001; Daltroy et al., 1997; Donchin et al., 1990; Keijsers et al., 1990; Linton & Kamwendo, 1987; Westgaard & Winkel, 1997).

3.6 THE EFFICACY OF ERGONOMICS TRAINING AND JOB REDESIGN IN PREVENTING INJURES LINKED WITH MANUAL HANDLING

One of the more recent approaches to attempt to reduce injuries associated with manual handling has been to adjust the workplace to fit the worker, as opposed to earlier approaches of adapting the worker to fit the workplace.

Following a review of the literature concerning the relationship between education and the primary prevention of back injuries among nursing personnel, Venning (1988) concluded that education alone will not solve this occupational problem, and suggested that an ergonomics approach that considers the intrinsic stress of job tasks is most likely to bring about the greatest reduction in back injuries among nurses. It is thought that this can also apply to all members of the workforce, outside of healthcare, involved in manual handling.

A number of studies have been conducted investigating the effectiveness of ergonomics training and redesign of the workplace in reducing injuries associated with manual handling, and these are summarised in Table 7.

Table 7 A summary of workplace and laboratory based research investigating the efficacy of ergonomics training on improving manual handling

Author	Participants	Study design	Intervention	Outcome measure	Results	QR
Hultman et al. (1984) (Sweden)	6 janitors.	Within subjects design. Educational intervention in the workplace.	Following an analysis of participants work tasks, an educational program was devised based on ergonomic principles.	Participants were observed pre intervention, 1-4 days, and 3 months post intervention. Trunk movement in the sagittal plane and RPE were compared.	The movement pattern of the spine in the sagittal plane changed after the janitors had attended the preventative educational back care programme, and the beneficial change was maintained 2.5-3 months after the programme.	48%
Wickstrom et al. (1993) (Finland)	29 office workers and 39 sheet metal workers completed the study. Participants were compared with employees from another metal company.	Within samples design, workplace intervention.	A 1 year intervention aimed to increase workers knowledge of the function of the lumber spine, ergonomic work techniques and the prevention of injury. Basic biomechanical principles of the back were presented on notice boards. A fitness program was also provided.	A questionnaire assessing the occurrence of low back pain was completed pre and post intervention. Video recordings of workers (n = 3) postures were compared pre and post intervention.	Video analysis revealed that in the 3 sheet metal workers assessed the load on the lumber spine was moderate prior to the intervention and diminished during the intervention. There was a declining trend in low back pain over the intervention period, but this was not significant. In sheet metal workers the occurrence of sick leave dropped from 3.1 pre-intervention to 1.9 days/person-year at follow-up.	48%

Table 7 continued

Author	Participants	Study design	Intervention	Outcome measure	Results	QR
Carrivick et al. (2001) (Australia)	Intervention group consisted of 145 cleaning services staff within a hospital. Controls consisted of 140 orderlies from the same hospital and cleaners from a similar hospital.	Longitudinal, between subjects design. Workplace intervention.	A consultative team formed to assess risks of MH in the workplace. The team identified, assessed, and recommended controls for MH and other injury risks for cleaning services staff.	Injury data collected before and up to 36 months after implementation of the team's recommendations were compared for the 3 groups along with data from all cleaners from the State of Western Australia.	A significant reduction in the number and rates of injuries, but not the severity of injuries, were found in the intervention group. No changes were seen in the control groups. It was stated that reductions were contributed to by a fall in risks of both MH and other injuries. Possibility of a Hawthorne effect was discussed.	73%
Godbey et al. (2002) (USA)	12 intervention participants and 12 controls.	Independent samples design, workplace intervention.	4 months after attending a 3-day ergonomics course, that included the NIOSH lifting equation, participants determined the weight of a load a worker could safely lift over an 8 hour shift. The control group completed the same task before receiving training.	The safe weight determined for both a simple MH task and a complex MH task by managers.	The mean safe weight determined for the simple lifting task by the trained managers was 18.6lbs, compared to the benchmark of 20.7lbs, and compared to the value obtained from the untrained workers, 32lbs. The mean safe weight determined for the complex lifting task by the trained managers was 10.8lbs, compared to the benchmark of 11.0lbs, and compared to the value obtained from the untrained workers, 25.8lbs.	45%

Table 7 continued

Author	Participants	Study design	Intervention	Outcome measure	Results	QR
Saleem et al. (2003) (USA)	8 controls, 8 'instruction' participants, 8 'tool' participants, and 8 'tool and instruction' participants. All participants were college students.	2 factor, between subjects design. Laboratory based.	Participants tasked with re-designing a simulated lifting task. The 'instruction' group were trained in ergonomics workplace design and manual lifting, the 'tool' groups were given the NIOSH lifting equation, a third group received both and the control group received no instruction.	The number of risk factors identified in the original lifting task, and the number of risk factors eliminated during the job re-design.	The ergonomics instruction group identified more risk factors in the original job and eliminated more risk factors in the redesign than the control group and the tool group. The tool group did not eliminate more risks than the control group. Participants who received both interventions did not have any advantage over those who just received the instructions.	55%
Straker et al. (2004) (Australia)	31 small/medium workplaces assigned to intervention group, 17 small/medium workplaces assigned to a control group.	Randomised control trial.	Intervention workplaces received a participatory ergonomics intervention, aimed to improve workplace's management systems to support participation in a risk assessment and control process, and to provide supervisors and work teams with knowledge and skills to enable them to perform manual task risk and control.	Manual tasks conducted at all workplaces were audited in late 2000, workplaces in the experimental group received the intervention between March and July 2001. All workplaces underwent a similar audit 9 months following delivery of the intervention.	The total assessed risk exposure decreased for the experimental group compared to the control group. The reduction in overall workplace risk for the experimental group was a product of both a reduction in the number of tasks which inspectors considered needed assessment and a reduction in the number of tasks which, when assessed, exceeded recommended thresholds.	72%

Table 7 continued

Author	Participants	Study design	Intervention	Outcome measure	Results	QR
Carrivick et al. (2005) (Australia)	137 hospital cleaners	Longitudinal study, within subjects design.	A consultative team formed to assess risks of MH in the workplace. The team identified, assessed, and recommended controls for MH and other injury risks for cleaning services staff.	Injury rates and workers compensation claim costs along with hours lost from work were compared between the 4 year pre-intervention and 3 year intervention period.	Reduction in injury rate by two-thirds, along with reductions in compensation claims costs by 62% and hours lost by 35%, for manual handling injuries were found to be associated with in the intervention period.	50%
Poosanthanasarn et al. (2005) (Thailand)	35 intervention participants, 17 controls. Thai workers (male) in a pressing and storage section of a metal auto parts factory.	Quasi-experimental pretest-posttest design, with a non-equivalent control group. Workplace intervention.	Training in work posture, health education classes, manual handling training, pre-work warm-up exercises, ergonomic re-design of equipment.	EMG recordings of the lower back taken pre intervention and at 4 months post intervention.	Significant decreases in the low back muscular load of the intervention group were observed post intervention. No changes were seen in the control participants.	66%

3.6.1 Ergonomics interventions - A summary of the main findings

A total of 8 studies investigating the effectiveness of ergonomics training and job redesign on manual handling abilities and injury rates are reviewed in Table 7. The studies reviewed have a sample size range of 6 to 285, and a quality rating ranging from 45 to 73%.

In the highest quality study reviewed in the current section, based on the quality assessment criteria used, Carrivick et al. (2001) tested the effects of an ergonomics intervention among cleaning services staff in a large hospital. Within this hospital, injury rates for both cleaners and orderlies were reportedly double that of nurses, and the main cause of injury was attributed to manual handling. The hospital sanctioned a consultative team, consisting of representatives from management, employees and the hospital's ergonomist, to assess the workplace risks of manual handling within the cleaning services. The consultative team conducted a 3 stage process of identification, assessment, and control of workplace risks from manual handling. Recommendations of the team were applied to the workplace of cleaners within the study hospital. Participants were followed for a period of 36 months, following the formation of the consultative team. Carrivick et al. (2001) reported that a significant reduction in the number and rates of injuries, but not the severity of injuries, were found in the intervention group. No changes were seen in control groups consisting of orderlies from the same hospital, and cleaning staff from a nearby hospital.

In a follow-up study, using the same participants involved in the consultative intervention described above, Carrivick et al. (2005) conducted a further analysis to determine whether there was a change in the rate and severity of injury from manual handling, in a cohort of cleaners employed in both the pre- and participatory ergonomics intervention periods. It was reported that a reduction in the rate of injury by two-thirds, and reductions in compensation claims costs by 62% and hours lost by 35%, for manual handling injuries were found to be associated with the intervention period.

In another relatively high quality study reviewed, Poosanthanasarn et al. (2005) tested the effectiveness of an applied ergonomics intervention program (AEIP) aimed at reducing work-related low back muscular discomfort among Thai workers in the pressing and storage section of a metal auto parts factory. The intervention took place in one building of the factory while a similar building, conducting the same type of work, acted as the control environment. The working conditions of the intervention participants were observed prior to initiation of the intervention. Intervention participants, along with senior management attended health education and training sessions. These sessions included a description and practice of exercises for strengthening the lower back. Working postures were observed throughout the intervention period and any unsafe postures were corrected. Warm-up exercises were also performed prior to commencing work each day in the AEIP group. Anthropometric measures were also taken from this group and 6 types of equipment and workstations were designed/redesigned. The 5th percentile of elbow height was utilised to improve equipment and workstations. EMG recordings of erector spinae activity were taken during lifting and lowering activities from the intervention and control groups prior to and at four months following involvement in the intervention. Poosanthanasarn et al. (2005) reported that significant changes in the low back muscular loads of the AEIP group were seen after the intervention. No changes in muscular load were seen in the control group. It was noted that the two groups did not vary at baseline in terms of muscular activity. After the intervention the means were significantly different between the 2 groups, and this was attributed to the intervention. No injury data were reported as part of this study however.

According to Straker et al. (2004) the basic concept of a participative ergonomics approach involves workers in improving their workplaces to reduce injury and increase productivity. It is anticipated that in this way the expert knowledge workers have of their own tasks is utilised to

assist in risk assessment and control. Straker et al. (2004) tested the effectiveness of a participative ergonomics intervention aimed at reducing injuries associated with manual tasks. In this study, small to medium sized workplaces in 3 diverse industry sectors (food, construction and health) in Australia were targeted. Thirty one workplaces were randomly assigned to the experimental group and 17 were assigned to the control group. Manual tasks conducted at all workplaces were audited in late 2000, workplaces in the experimental group received the intervention between March and July 2001, and all workplaces underwent a similar audit between April and July 2002. The intervention aimed to improve each workplace's management systems to support participation in a risk assessment and control process, and to provide supervisors and work teams with sufficient knowledge and skills to enable them to perform manual task risk assessment and control. The intervention was delivered to each workplace over a series of 4 sessions. Straker et al. (2004) reported that the results from the second audit revealed that the total assessed risk exposure decreased for the experimental group compared to the control group, and this change was consistent across all industries. The reduction in overall workplace risk for the experimental group was a product of both a reduction in the number of tasks which inspectors considered needed assessment and a reduction in the number of tasks which, when assessed, exceeded recommended thresholds. It was concluded that a participative ergonomics intervention can be effective in reducing the risk of musculoskeletal disorders in the workplace. Beneficial effects of ergonomics intervention on manual handling technique and injury data have also been reported by Hultman et al. (1984) and Wickstrom et al. (1993)

In summary, the ergonomics interventions applied in the studies reviewed in Table 7, most of which were of a high quality rating, all had a beneficial outcome on manual handling injury rates and techniques (Carrivick et al., 2001; 2005; Hultman et al., 1984; Poosanthanasarn et al., 2005; Straker et al., 2004; Wickstrom et al., 1993). According to Straker et al. (2004), knowledge of anatomy is not essential for effective manual task risk management and that time will be better spent on risk assessment and control skills. In their paper, Straker et al. (2004) argued that training in lifting technique is not effective in reducing musculoskeletal risk, the participative ergonomics intervention therefore applied by the authors contained no lifting technique training but focused on developing effective risk assessment and control skills in workers and on effective management systems within the workplace.

3.7 EXPERT GROUP AND REVIEW ARTICLES

Table 8 outlines the findings from expert groups and review papers, relating to the effectiveness of manual handling training.

Table 8 A summary of the findings from expert groups and review papers addressing manual handling training

Author	Types of experts/article	Focus of paper	Comments
McIvor (1991) (Australia)	Discussion of the new Legislation of manual handling training in Australia. Commentary.	This paper aimed to provide a model for training people to identify and control manual handling risks to fit with legislation. The author suggests that manual handling training is a team based approach that incorporates: 1) A practical approach, based on actual experience and including case studies 2) A group approach, where the team identifies the problem and suggest solutions The aim of this training is to develop participant's knowledge, skills and understanding. A risk assessment prior to training is also important.	Workers and managers need to take a group responsibility for the training.

Table 8 continued

Author	Types of experts/article	Focus of paper	Comments
Genaidy et al. (1992) (USA)	Review paper on the effects of physical training on manual handling ability.	The aim of this review was to evaluate studies on the effects of physical training on individuals engaged in manual handling tasks. 10 articles were summarised and evaluated. The findings of the studies reviewed indicated the following: 1) If the training objective is to improve muscular endurance, the exercise load may be increased by increasing the duration of the exercise. Using this approach, maximum gains are obtained when the employee is given feedback about his/her previous training session. 2) A muscular endurance training protocol may improve muscular strength only if the training load taxes the participant about 50% or more of his/her initial dynamic strength. 3) The 'repetition maximum' approach is effective in both increasing muscular strength and endurance. 4) A flexibility-strength training protocol could be used to improve muscular strength more than a strength training protocol alone. 5) A strength training protocol cannot improve the flexibility of certain parts of the body. 6) A flexibility exercise programme based on the static stretching technique could be used to improve both flexibility and muscular strength. The effects on muscular endurance are inconclusive. 7) Complex motions of the body such as asymmetrical lifting may require a longer period of time to be improved as compared to simple motions of the body such as symmetrical lifting. 8) It is possible to increase the endurance capability of employees without changing job demand perception. 9) A combined manual handling task designed for the overall body may improve cardiovascular endurance. Recommendations for an intervention study conducted in an industrial setting were made, with such an intervention comprising the following: a review of medical records, task analysis of manual handling jobs resulting in MSDs, the design of specific training programs, design and implementation of a follow-up training program, revision of training where necessary, and a study of injury data post training.	It was highlighted that no longitudinal study has been conducted to determine the best method to maintain improved work capacity gained following training. It was also stated that no study has correlated the improved physical fitness with injury statistics in industry.

Table 8 continued

Author	Types of experts/article	Focus of paper	Comments
Kroemer (1992) (USA)	Review paper on training as an approach to improving manual handling safety.	Wide ranging review, citing 95 articles, incorporating both published evaluation studies and published commentaries on the topic (the review does not differentiate between the two in terms of weighting of evidence).	Results on manual handling show no clear indication of what content or which approach should be used.
Lahad et al. (1994) (USA)	Review paper on the effectiveness of interventions for the prevention of low back pain.	Four types of intervention were included in the review, these were: exercise based training, education, the use of mechanical supports, and modification of behavioural risk factors. 64 articles were reviewed. The main conclusions were as follows: 1) There is limited evidence that exercise aimed at strengthening back or abdominal muscles and exercise aimed at improving overall fitness can decrease the risk of low back pain, but the effect of exercise training is modest and of an unknown duration. 2) There is insufficient evidence to recommend that either back education programs or mechanical supports be used routinely to prevent back pain. 3) There is no evidence that cessation of smoking, weight loss, or attention to psychological risk factors can prevent the development of low back pain.	It was noted that the conclusions drawn from the review should be viewed cautiously since they were based primarily on studies conducted in the workplace as opposed to the clinical setting.

Table 8 continued

Author	Types of experts/article	Focus of paper	Comments
Blamire (1995) (UK)	6 physiotherapists comment on what is required for a framework in manual handling. Physiotherapy working group.	12 Principles of manual handling are discussed: 1) Training should be designed specifically for the needs of those involved in manual handling and provided to the whole group at around the same time. 2) The aims and objectives of the teaching must be clearly presented. 3) The expected outcome must be clearly defined in order to prevent misleading assumptions. 4) Some of the staff being trained may become trainers themselves, so additional training skills need to be taught to these individuals. 5) The manual handling skills should be taught so that they may be applied to a single situation but be adaptable and flexible if the situation changes. 6) Needs assessment is an important foundation for good decision making and preparation. 7) Moving and handling disabled people must be managed in the context of promoting independence. 8) Lifting patients should be regarded as a last resort, and make use of any mechanical aids available. 9) The starting point of training should be the 1992 HSE Manual handling: Guidance on Regulations. 10) Manual handling activities are not limited only to the workplace. 11) Manual handling training should be evaluated and audited to allow for appropriate changes. 12) A full and accurate record of the training provided must be kept at all times.	Discussion paper on what should be included in manual handling training based on views from the medical and ergonomics community.

Table 8 continued

Author	Types of experts/article	Focus of paper	Comments
Hignett (1996) (UK)	Review paper on work related back pain in nurses.	The paper reviewed 80 studies over three decades looking at work related back pain in nurses. The studies reviewed indicate that when patient handling is frequent the incidence of low back pain increases. The author makes the point that manual handling training alone has shown little or no long term benefits. In addition, the author indicates that the value of ergonomics still remains to be seen. A number of studies have taken place in the laboratory and a level of quantification could be made about the different techniques. However the author questions if this is practical based on the fact that so many variations exist when lifting patients. The review also indicates that very few published articles exist on participative or interview methods to obtain qualitative data which might identify contributory factors of occupational low back pain in nursing staff.	Most studies are laboratory based and there is a need for more practical studies. Practical studies may be able to identify the factors that contribute to effective manual handling training.
Maher (2000) (Australia)	A systematic review of randomised control trials investigating workplace interventions to prevent low back pain.	Only randomised control trials testing the effectiveness of a workplace intervention to prevent low back pain were included in the systematic review. 13 articles were included in the review. It was concluded from the review that education alone is ineffective in preventing low back pain, while education combined with workplace modification is of unknown value. Exercise intervention programs were found to be effective in the prevention of work-related back pain.	It was noted that while exercise interventions appear to be beneficial in the short term, the long terms effects are unknown. In addition, the cost effectiveness of such programs need to be evaluated.

Table 8 continued

Author	Types of experts/article	Focus of paper	Comments
Straker (2000) (Australia)	Review paper on interventions aiming to reduce work related back pain.	Six types of interventions were categorised following a literature search, these included: worker selection, education, exercise based training, workplace design by experts, participative work design, and back belts. Key papers for each intervention were described in the review. 10 articles were described in detail. The main findings from the review were: 1) There is insufficient evidence available to determine whether worker selection can be effective in the primary prevention of low back pain. 2) The available evidence is insufficient to judge the efficacy of education (including the back school approach). It was suggested that the effect of education in the primary prevention of work-related back pain is small. 3) There is insufficient evidence to judge the effectiveness of exercise based-training, it was speculated that exercise may have a mild positive effect however. 4) The little evidence available on work designed by experts suggests a significant potential of this approach. 5) The little evidence available on participative work design suggests that this approach may have a positive effect.	The author states that there are only a handful of good quality studies published which evaluate an intervention aimed at reducing work-related back pain. The need for more high quality intervention studies is stressed.

Table 8 continued

Author	Types of experts/article	Focus of paper	Comments
Graveling et al. (2003) (UK)	37 experts in the field of manual handling. HSE Report.	A 'Delphi' exercise was held whereby experts, in a variety of disciplines relating to manual handling, attended a meeting which was designed to develop a consensus on the basic physical and behavioural elements of good handling principles. On the basis of the experts comments and discussions, a series of principles were identified relating to conventional lifting. These principles either supplemented, or refined those presented in the 1992 Manual Handling Regulations. The principles identified were as follows: 1. Try to warm-up prior to handling Warm-up the muscles before lifting by performing simple stretching exercises 2. Plan the task The how, when and where of lifting 3. Prepare for the handling task Stabilise the load; split the load if appropriate 4. Minimise the horizontal distance between lower back of the handler and the centre of gravity of the load throughout the manual handling operation where possible, hold the item close to the body 5. Create and maintain a stable base Have the feet apart with one leg forward. Be prepared to move your feet if necessary 6. Get a secure hold of the load Use handles if available, balance the load. 7. The lumbar spine, hips and knees should be moderately flexed (bent) at the start of the lift 8. Don't flex the spine any further as you lift 9. Try not to twist the trunk or lean sideways especially while the back is bent 10. Keep your head up when handling 11. Move smoothly Try not to jerk when lifting as this could result in injury (e.g. parts of the item may slip As you attempt the lift). 12. Don't move more than you can easily manage If in doubt, don't lift the item. Seek help or use a lifting aid to move the item to its desired position.	Findings showed an extension of the original principles of manual handling training, as well as an extension of the terms used.

Table 8 continued

Author	Types of experts/article	Focus of paper	Comments
Hignett (2003) (UK)	Systematic review paper on patient handling.	The paper aimed to discuss and analyse articles looking at intervention strategies to reduce the risk factors associated with patient handling. Articles were researched between 1960 and 2001. 2796 papers were found and 880 were appraised of which 63 papers were found to be significant. The results of the systematic review suggest that technique training alone has no impact on working practice or injury rates. Approaches that use multiple factors such as a risk assessment are more likely to be successful in identifying risk relating to patient handling. The seven most commonly used strategies in patient handling were identified: 1) Equipment provision 2) Education and training 3) Risk assessment 4) Policies and procedures 5) Patient assessment systems 6) Work environment redesign 7) Work organisation and practices changed	It would be useful for future studies to indicate financial savings associated with a multi factorial strategy, as this data will be helpful for managers to determine the financial benefits of these strategies.

Table 8 continued

Author	Types of experts/article	Focus of paper	Comments
White and Gray (2004) (UK)	Focus groups conducted with 45 back care advisors.	Back care advisors participated in focus groups designed to explore their perceptions of the effectiveness of manual handling education. Five key factors were identified in which the back care advisors perceived as having the greatest influence on manual handling education, these were: 1) Training – training was believed to be more effective if it integrated theoretical and practical components, involving problem solving scenarios and interactive sessions. Classroom based training was considered to be less effective. 2) Culture and the organisation – management support was identified as a crucial factor influencing the efficacy of manual handling training programmes. It was suggested that management should always be trained initially. 3) The back care advisor – the importance of competent and enthusiastic trainers was highlighted. 4) Resources – the lack of resources was considered as an important factor that can prevent the uptake of safe manual handling practices. 5) Evidence-based practice – it was suggested that the advisors should be assessed to provide a measure of the effectiveness of the services that they provide, such as injury data collected pre and post training.	It was highlighted that more accredited training courses need to be developed for back care advisors with the aim of standardising manual handling education and the competencies of the advisor. It was also felt that a more robust evidence base needs to be established so that back care advisors can tailor their education appropriately.
Tuncel et al. (2006) (USA)	Review paper on the effectiveness of controlled workplace interventions in preventing lower back disorders.	4 studies were included in the review. Due to the small number of papers reviewed, all of which were rated as either 'marginal' or 'moderate' in terms of quality, it was suggested that no definite conclusions about the effectiveness of controlled workplace interventions, to reduce the occurrence/reoccurrence of low back pain, could be drawn.	There is a need for more, high quality, workplace intervention studies to be conducted.

3.7.1 Expert groups and review papers - A summary of the main findings

A total of 12 papers are summarised in Table 8. The table includes 8 review papers, 3 papers or reports documenting the views of experts in the field of manual handling on manual handling training, and one commentary on new legislation for manual handling training.

Following a review of the literature on exercise-based training to improve manual handling capabilities, Genaidy et al. (1992) concluded that this form of training shows promise in the short term, a view shared in other reviews (Lahad et al., 1994; Maher, 2000; Straker, 2000). Genaidy et al. (1992) highlighted however that no longitudinal study had been conducted to determine the best method to maintain the improved work capacity seen with exercise based training, and that no study has yet correlated the improved physical fitness resulting from such training with injury statistics in industry.

A number of reviews summarised in Table 8 have concluded that training alone is ineffective in reducing the rate of back injuries associated with manual handling (Hignett, 1996; 2003; Kroemer, 1992; Lahad et al., 1994; Maher, 2000; Straker, 2000). In the most recently published, and thorough, review of patient handling, Hignett (2003) reported that manual handling training alone was ineffective in reducing back injury rates in nursing personnel, and that more beneficial results were found with interventions employing a more multifactor approach, involving risk assessments and work environment redesign along with technique training. In the review, Hignett (2003) suggests 7 strategies (listed in the table) that could form a basis for a generic intervention strategy; this would need to be tailored to organisations and cultural factors and a cost effectiveness element added to highlight the benefits of implementing such a strategy.

The findings from the papers/reports documenting the views of experts (in the field of manual handling) on manual handling training, suggest that training needs to be part of a broad based approach which encompasses: needs assessment, understanding the principles of manual lifting and tailoring the training to the task and work environment (Blamire, 1995; McIvor, 1991). In addition, management support for any training program was highlighted as a crucial factor influencing its success, by the back care advisors taking part in the focus groups reported by White and Gray (2004).

Graveling et al. (2003) reported the findings of a 'Delphi' exercise whereby experts, in a variety of disciplines relating to manual handling, attended a meeting which was designed to develop a consensus on the basic physical and behavioural elements of good handling principles. On the basis of the experts comments and discussions, 12 principles (listed in Table 8) were identified relating to conventional lifting. These principles either supplemented, or refined those presented in the 1992 Manual Handling Regulations. The opinions of the experts in this group were wide ranging and the derived principles have yet to be tested.

In summary, the findings from review papers suggest that the traditional manual handling training approaches are ineffective in preventing low back pain, while exercise-based training shows promise. Recommended principles relating to manual handling training have been outlined by both Blamire (1995) and Graveling et al. (2003) however these principles are yet to be evaluated.

3.8 DISCUSSION

The aim of this report was to undertake a systematic review of the literature examining the evidence for and against the effectiveness and appropriateness of different approaches to training in manual handling. A total of 84 papers were included in this review, these consisted of intervention studies (n = 50), questionnaire based surveys and audits (n = 22) assessing the effectiveness of prior manual handling training, and review papers and reports documenting the views of expert groups on manual handling training (n = 12). The papers reviewed were grouped according to the type of intervention reported, or the population targeted. The following aspects of manual handling training were covered in this systematic review: manual handling interventions and the effectiveness of training in healthcare workers; the effectiveness of manual handling training and interventions in non healthcare workers (encompassing a range of industries, other than health care, employing the use of manual handling); the effectiveness of exercise/physical training interventions on manual handling capability; the effectiveness of the back school approach for treating and preventing manual handling injuries; and the effectiveness of ergonomics training and ergonomics interventions on manual handling.

In the healthcare setting there is very little evidence of the effectiveness of educational based training for safe patient handling, whether it be nursing school based (Hellsing et al., 1993; Troup & Rauhala, 1987; Videman et al., 1989), or applied to qualified staff in the workplace (Feldstein et al., 1993; Hartvigsen et al., 2005; Wood, 1987). There is also similar evidence that technique and educational based training in manual handling are ineffective in industries outside of healthcare (Carlton, 1987; Chaffin et al., 1986; Kuorinka et al., 1994; Nygard et al., 1998; Snook et al., 1978; Tang, 1987). In healthcare, there is a great deal of evidence supporting the idea that despite prior training in patient handling, the principles taught during training are not applied into the working environment (Bewick & Gardner, 2000; de Castro et al., 2006; Gladman, 1993; Kane & Parahoo, 1994; Scott, 1995; St-Vincent et al., 1989; Swain et al., 2003; Wachs & Parker-Conrad, 1989), and this has also been reported in other industrial settings (Carlton, 1987; Kuorinka et al., 1994; Wright & Haslam, 1999). In general, evidence for the lack of effectiveness of manual handling training in the healthcare setting is provided from a number of studies reporting high injury rates occurring in workers who have undergone training (Bewick & Gardner, 2000; Crawford & Weetman-Taylor, 1996; Ellis, 1993; Hollingdale & Warin, 1997).

Strength and flexibility training for the lower back, as reported by Gundewall et al. (1993) and Genaidy and co workers (Genaidy et al., 1989; 1990a; 1990b; 1991a; 1991b; 1992; 1994; Genaidy & Asfour, 1989; Guo et al., 1992) shows promise as a measure to reduce manual handling injuries in the short term, although further research is needed to ascertain whether such an intervention is sustainable over the long term, and whether it has long term benefits in terms of injury reduction in an industrial setting. High quality, longitudinal, randomised control trials with follow-up assessment are needed to further establish the benefits of exercise based training interventions. It is suggested that a more general approach to improving whole body physical fitness and strength, as applied by Knapik (1997) would have greater benefits in terms of reducing manual handling injuries than task-specific training alone, as used in many studies (see Table 5). The major disadvantage of task-specific training is that performance improvements are largely restricted to the task for which the individuals are trained (Knapik, 1997), and the benefits gained are not transferable to other tasks.

The literature, which includes some very high quality studies, provides no strong evidence for the effectiveness of back schools in treating or preventing low back pain (Cromie et al., 2001; Daltroy et al., 1997; Donchin et al., 1990; Keijsers et al., 1990; Linton & Kamwendo, 1987; Westgaard & Winkel, 1997).

Ergonomics interventions, particularly those that include risk assessments, the observation of workers in their working environment, the tailoring of training to suit the specific task requirements and the redesign of equipment and patient handling tasks have been shown to successfully reduce the risk of manual handling injuries in the healthcare setting (Ore, 2003; Owen et al., 2002). Strong evidence, in the form of relatively high quality studies, evaluating ergonomics interventions in non healthcare settings have also shown beneficial outcomes on manual handling injury rates and techniques (Carrivick et al., 2001; 2005; Hultman et al., 1984; Poosanthanasarn et al., 2005; Straker et al., 2004; Wickstrom et al., 1993). According to Straker et al. (2004), knowledge of anatomy is not essential for effective manual task risk management and time would be better spent on risk assessment and control skills.

The lack of effectiveness of technique and educational based training is a conclusion drawn by many authors (Dean, 2001; Edlich et al., 2004; Graveling, 1991; Hellsing et al., 1993; Hignett, 1996; 2003; Hollingdale & Warin, 1997; Kroemer, 1992; Pheasant & Stubbs, 1992; Snook et al., 1978; St-Vincent et al., 1989; Straker, 1989; Stubbs et al., 1983; Tang, 1987; Videman et al., 1989). Kroemer (1992) has described the issue of training for the prevention of back injuries in manual handling as "…confused, at best…" (pp1130), and has listed possible reasons for why the literature suggests that training is not effective, these include; 1) people tend to revert to previous habits and customs if practices trained to replace previous ones are not reinforced and refreshed; 2) emergency situations, the unusual case, a sudden quick movement, increased body weight, or reduced physical well-being may overly strain the body if these conditions did not exist in training, and 3) if the job requirements are stressful, 'doctoring the symptoms' such as behaviour modification will not eliminate the inherent risk. According to Kroemer (1992) – designing a safe job is fundamentally better than training people to behave safely, and money and effort put into training programmes would be better spent on research and implementation of techniques for ergonomic job design. According to Snook (1988) the problem is not training the worker, but the workers' compliance with the training.

According to Graveling (1991), when evaluating manual handling training "*…training is seen by many as the easy option. It is easy for an employer to buy a training package 'off the shelf' and to feel that showing the video and other material to the workforce had met his obligations. Any continuation of injuries subsequently is seen as the intransigence of the workforce in 'not doing what they've been told'. Small wonder therefore that training is regarded by many as totally ineffective!*" (pp429).

There is support in the literature for a more ergonomic approach to reducing the risks associated with manual handling, in terms of ergonomically redesigning the workplace, as opposed to relying on the more traditional approaches of fitting the worker to the work environment. For example, according to Stobbe (1996) "*Despite the best training efforts, Murphy's Law will prevail. Therefore, prevent injury by fixing the workplace rather than trying to change the worker*" (pp537). According to Graveling (1991) in a badly designed work place, even the strongest worker will be at risk, and no amount of training – however good- will be effective.

According to de Castro et al. (2006) healthcare facilities are beginning to embrace the concept of patient care ergonomics through the implementation of safe patient handling programs. Essential elements of such programs include a "no manual lift" policy. Such a policy however requires substantial investment in ergonomic lifting devices and of equipment redesign. It is likely though that such investments will pay off, as de Castro et al. (2006) have reported that healthcare facilities that have incorporated safe patient handling programs have reported positive results and dramatic reductions in nursing injuries.

Similarly, Hignett and Crumpton (2007) investigated whether a higher level of compliance with the Royal College of Nursing competencies (safety culture) would be found in organisations where the knowledge and skills gained from manual handling training could be detected in staff

manual handling behaviour. Following observations conducted in 16 healthcare organisations within the UK, it was reported that in organisations with a more positive safety culture the nursing staff demonstrated more complex decision-making about patient handling tasks and had lower levels of associated postural risk.

Further, high quality, longitudinal, randomised control trials are required in order to develop a comprehensive, multidimensional, intervention package involving ergonomics training, particularly in terms of risk assessments, physical training to improve physical fitness and job design/redesign, which can be applied to all industries requiring the use of manual handling. In further research, the inclusion of a sufficient follow-up period is essential, since a general theme observed in the current review is a lack of follow-up assessments, a view also held by Straker (2000).

According to Westgaard and Winkel (1997) when planning a work-based intervention study, outcome assessment requires adequate observation time to take into account the latency for the development of musculoskeletal complaints, Westgaard and Winkel (1997) state that the evidence points to recommended pre and post observation times of at least 1 year. They believe that an observation time shorter than 6 months is problematic when health outcomes are to be assessed. Ideally, more than one follow-up observation/assessment is also preferable.

Westgaard and Winkel (1997) also recommend that a control group, comparable to the intervention group with respect to individual and job exposure variables should be included in any study, and that "Hawthorne effects" are best dealt with by administering non-effective treatments to the control group, they give the example of introducing workplace modifications that look good, but do not change the mechanical exposure. However, the allocation of workers to control conditions known by the researchers to be of no value clearly carries with it certain problems in terms of ethical considerations.

Westgaard and Winkel (1997) further recommend that measures of compliance and the sustainability of the intervention should be provided in any long term intervention study. Compliance concerns the willingness of the participants, organisation etc. to comply with the intervention measures. For example, physical training can be effective in theory, but those most in need may not adhere to the training requirements. Westgaard and Winkel (1997) define the intervention sustainability as the maintenance of the intervention over time, which is often considered as a compliance issue, however this can be a separate issue in studies spanning over many years. Westgaard and Winkel (1997) give the example that the intervention may be successful in the short term when highly motivated experts are present, but it may not be sustained when the experts are withdrawn.

When planning an intervention study, and assessing the outcome variable, it is also important to take into account psychosocial factors within the organisation as according to Gundewall et al. (1993) psychosocial factors, such as low job satisfaction or a lack of fellowship with co-workers can be a strong predictor of reporting back injury at work. In addition, according to Hayne (1995) training should always begin at the top (i.e. management) and work down, since it is pointless training the workforce if the managers and supervisors do not have the same level of knowledge. Moreover, recent research has demonstrated that interventions to reduce MSDs can be made considerably more effective by tailoring the interventions to managers' and workers' level of awareness and readiness to change (Haslam et al., 2007; Whysall et al., 2006; 2007).

In conclusion, this report has reviewed the evidence for and against the appropriateness and effectiveness of different approaches to manual handling training. It is noted that no research based in the agricultural and farming industries were included in this review, despite high levels of manual handling injuries being reported in these industries (Solomon, 2002). This is a sector which seems to have been neglected in terms of research investigating methods of reducing the risks associated with manual handling. This review has also highlighted the absence of manual

handling training occurring in some environments, for example, patient handling training in anaesthetists, despite the requirements of the 1992 manual handling regulations.

In the following section the main outcomes of this review are summarised, in terms of what aspects of manual handling training work, and what aspects are not effective.

MANUAL HANDLING TRAINING – WHAT DOES NOT WORK?

- There is strong evidence, supplied from many studies of varying quality, to suggest that training in lifting technique is ineffective in reducing injuries involving manual handling

- There is also strong evidence, supplied from many studies ranging in quality, that educational based training is also ineffective

- There is strong evidence, from many studies of varying quality, that principles learnt during training are not transferred into the working environment, this applies to all industries involving manual handling

- There is strong evidence, from high quality studies, that the Back School approach is not effective in preventing or treating injuries caused by manual handling

- There are differing views on what constitutes appropriate handling techniques

MANUAL HANDLING TRAINING – WHAT WORKS?

- There is evidence that exercise training has a beneficial effect in terms of improving capacity of the individual for manual handling tasks, however this has not been evaluated in the long term

- There is some evidence that comparing the lifting strategies of novice and expert workers may be helpful in devising safe lifting techniques

- Training that is tailored to recipients' knowledge and awareness of risks is likely to be more effective - this is supported by recent research (funded by HSE) which has shown that interventions tailored to workers and managers knowledge and awareness of risks are more effective in reducing MSDs than standard approaches (Haslam et al., 2007; Whysall et al., 2006; 2007).

- There is evidence that training workers and managers to assess and report risks in the workplace, is effective in reducing manual handling injuries

- There is strong evidence, from high quality studies, that ergonomics interventions adopting a multidimensional approach, including both the tailoring of training to suit the person and specific task requirements, along with equipment design/redesign, are effective in reducing manual handling injuries

- The most successful ergonomics interventions are those that have included the observation of workers in their working environment, prior to the development and implementation of an intervention

4. TELEPHONE SURVEY - AIMS AND METHODS

4.1 RESEARCH AIMS

The aim of the telephone interview survey was to conduct a cross-sectional investigation of current manual handling training programmes undertaken within UK organisations from a broad spectrum of industrial sectors. The study also aimed to established whether such training is considered to be effective and how organisations and manual handling training providers judge the effectiveness of manual handling training courses.

4.2 RESEARCH APPROACH

A series of semi-structured interviews were conducted with representatives from organisations and training consultancies to collect detailed information about the scope of manual handling training undertaken within organisations. These interviews provided the opportunity to gain insight into current training practices. In total, 150 telephone interviews were conducted, of which 120 were conducted with organisations undertaking some form of manual handling training, whether in-house or externally sourced and 30 interviews were conducted with training consultancies responsible for delivering manual handling training to various industrial sectors. Telephone interviews are a convenient research method to use as they share many of the advantages of face-to-face interviewing whilst reducing the burden and compliance costs for participating organisations. Using telephone interviews in this study also facilitated the participation of a geographically dispersed sample.

4.3 RESEARCH INSTRUMENT

Two semi-structured interview schedules were developed for the telephone survey, one for the interviews undertaken with organisations and the other for interviews with trainers. The former determined the level of training offered by organisations, the components of this training and the extent to which the training was tailored to particular industry needs or task needs. The latter explored the specific components of manual handling training offered by external training consultancies. Using semi-structured interviews allowed flexibility to follow up interesting responses and the investigation of underlying motives. Such an approach permits respondents to comment on issues from their own unique perspective. Broad, open-ended questions were used with additional questions to clarify responses or probe particular issues. The interviews were conducted during working hours and were arranged at a time that was convenient for the participant. Participants were fully informed as to the aims of the study and were assured that any information provided by them would be presented anonymously and that they were able to withdraw from the study at any time. The interview schedules were piloted and refined in the light of those pilot studies. The interview schedules used for both organisations and trainers can be found in the appendices (appendix 2 and 3).

4.4 PARTICIPANTS

The Thomson Business Search Pro Directory, a database which allows the user to search for organisations according to criteria such as number of employees, SIC codes and type of business, was used to recruit organisations for this study. The selection procedure involved quota sampling to ensure that the final sample comprised organisations from a range of industrial sectors. The sectors represented within the final sample were: agriculture, hunting and forestry (SIC A); manufacturing (SIC D); electricity, gas and water supply (SIC E); construction (SIC F); wholesale, retail and trade (SIC G); hotels and restaurants (SIC H); transport, storage and communication (SIC I); public administration and defence (SIC L); health and social work (SIC N) and other community, social and personal service activities (SIC O). Efforts were also made to ensure that the participating organisations were located throughout England, Scotland and Wales in order to achieve a wide geographical spread across the UK.

4.5 DATA ANALYSIS

Each telephone interview lasted between 20 and 30 minutes and was recorded on tape with the knowledge and permission of the participants. The recorded interviews were subsequently fully transcribed. The data was subject to both quantitative and qualitative analysis.

Each interview schedule was coded and analysed using the statistical package SPSS (Statistical Package for the Social Sciences, Version 14.0). Frequency calculations were then obtained for all the structured variables on the interview schedule.

The interview transcripts were imported into the qualitative software tool, NVivo (Version 2.0). The data were analysed by sorting the material into emergent themes as described by Dey (1993). The analysis was directed by the original guiding questions and new themes that emerged from the data.

5. TELEPHONE SURVEY – QUANTITATIVE FINDINGS

This section presents the quantitative findings from the telephone survey. A total of 150 telephone interviews were conducted across a wide range of British employers within a variety of industry sectors. Interviews are conducted with 120 organisations undertaking some form of manual handling training. In addition, 30 interviews were conducted with training consultancies offering manual handling training to organisations.

5.1 RESULTS

The survey respondents comprised 92 Health and Safety personnel, 21 Managing Directors and 7 Supervisors. The composition of participating organisations within the final sample was 23 small, 38 medium and 59 large companies, shown in Figure 1

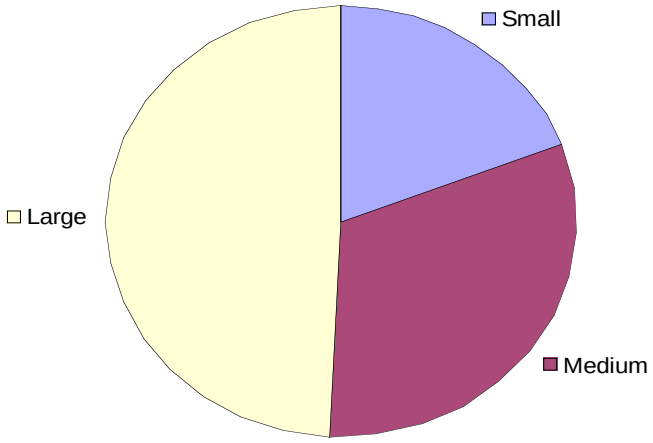

Figure 1 Distribution by Industry Sector

The organisations participating in this study were drawn from a range of employers across a variety of industry sectors. A full breakdown of these sectors and industries is shown in Figure 2 and Table 9.

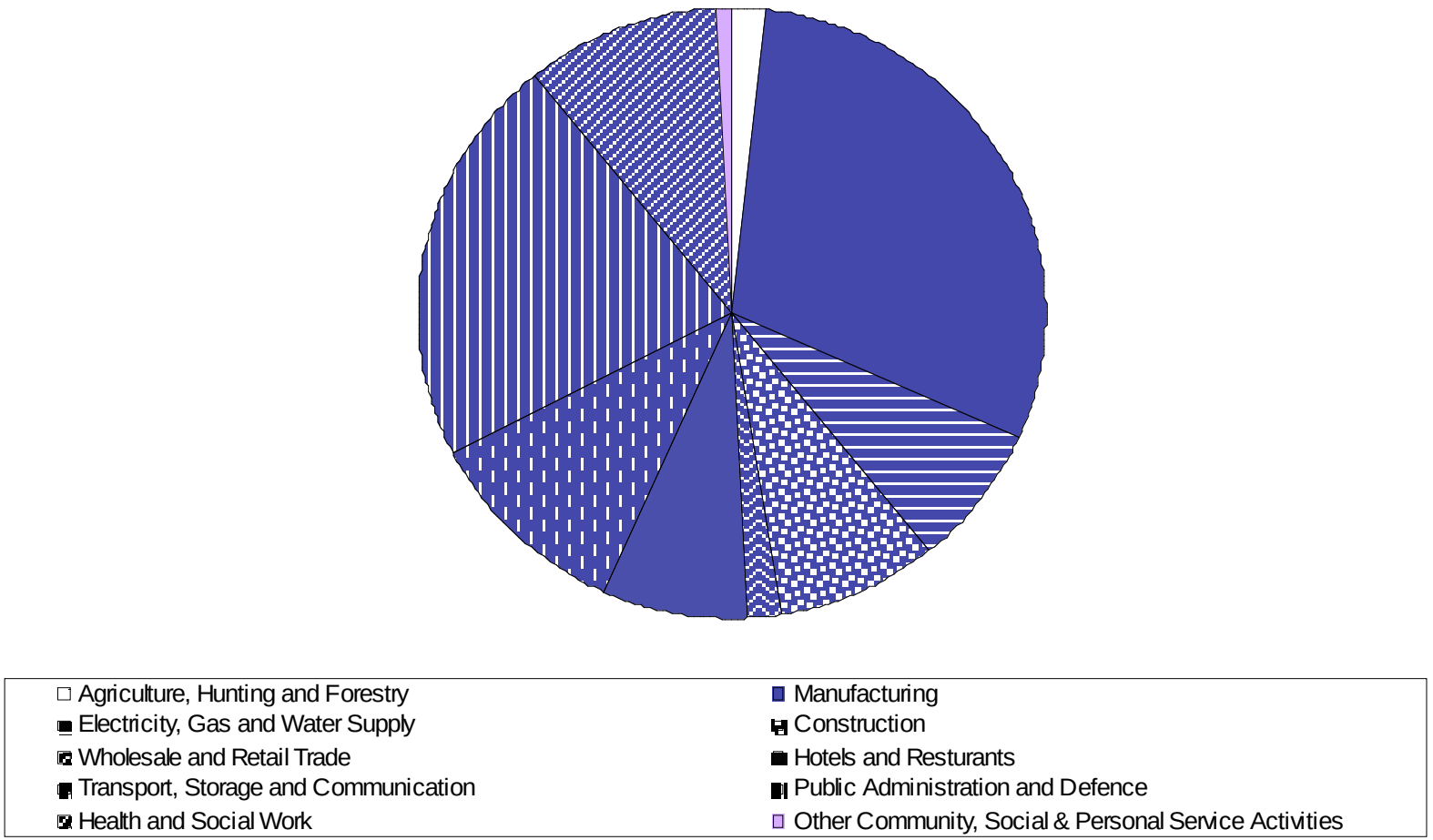

Figure 2 Distribution by Industry Sector

Table 9 Distribution of industry within each sector

SIC Code	*Sector*	*Industry*	*Number*
A	Agriculture, Hunting and Forestry		
		Farming	2
D	Manufacturing		
		Soft Drinks Manufacturing	6
		Food Manufacturing	1
		Car Manufacturing	1
		Plastics Manufacturing	1
		Small Office Equipment	1
		Metal Production	2
		Parts Production	7
		Equipment Manufacturing	3
		Electronics Manufacturing	2
		Chemical Manufacturing	2
		Petroleum Manufacturing	2
		Insecticides Manufacturing	1
		Pharmaceutical Manufacturing	1
		Concrete Manufacturing	1
		Brewery	5
E	Electricity, Gas and Water Supply		
		Water Supply	8
		Electricity Supply	1
F	Construction		
		House Building	5
		Industrial Construction	5
G	Wholesale, Retail and Trade		
		Food Retail	2
H	Hotels and Restaurants		
		Hotels	9
I	Transport, Storage and Communication		
		Air Transport Baggage Handling	3
		Logistics	10
L	Public Administration and Defence		
		Fire Fighters	5
		Local Government	20
		Ministry of Defence	1
N	Health and Social Work		
		Hospitals	12
O	Other Community, Social and Personal Service Activities		
		Pest Control	1
	Total		**120**

The organisations were drawn from various regions in Britain. The breakdown in terms of participation from within each region is shown in Figure 3.

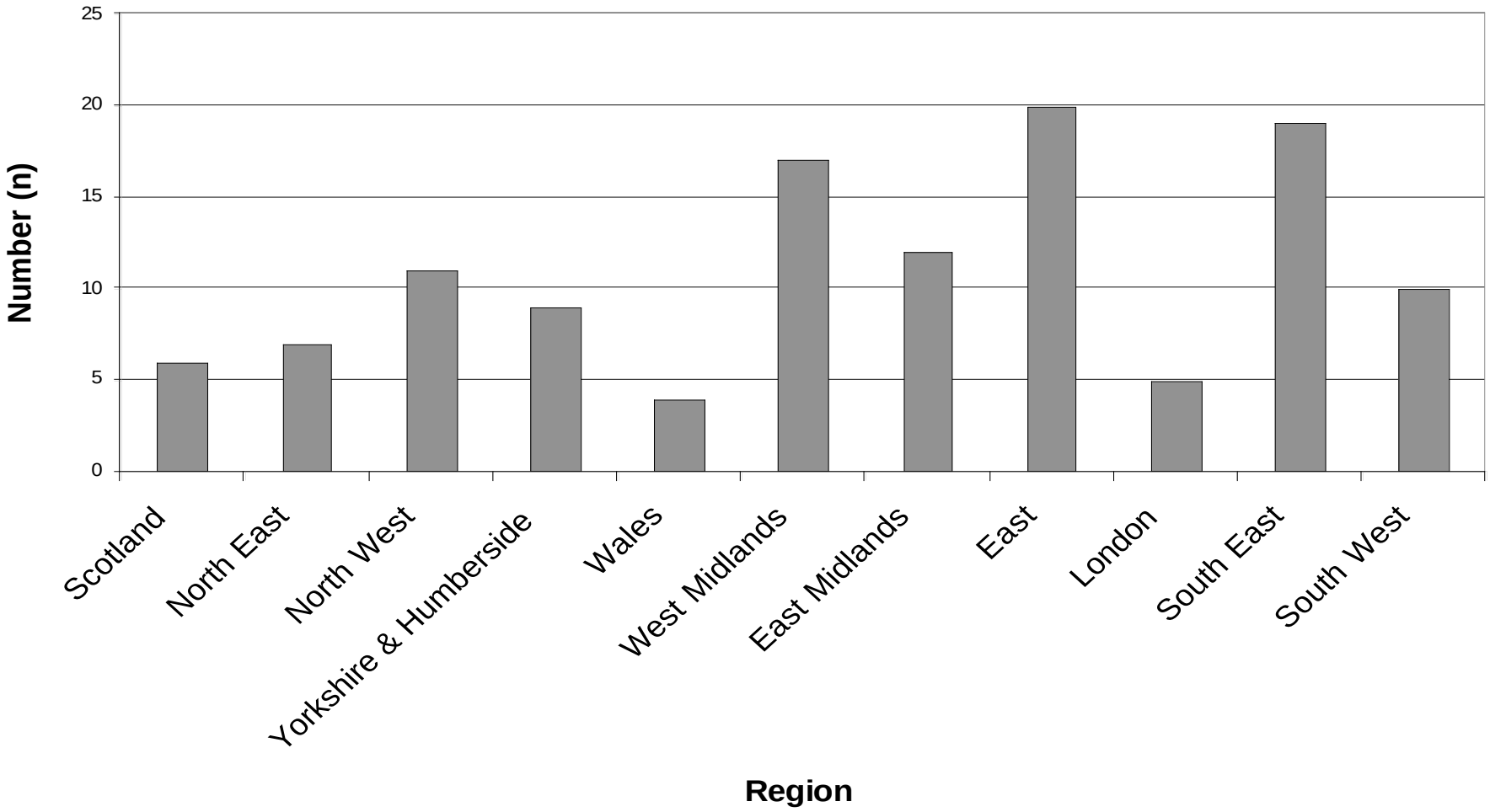

Figure 3 Participation by Region

5.2 FREQUENCY DATA

Of the 120 companies interviewed 86.7% reported that they had undertaken some form of manual handling training within the previous 12 months. Five organisations reported that manual handling training was taking place all the time. The frequency of this manual handling training varied amongst participating organisations. Some organisations offered manual handling training to employees every year whilst others reported training on a less frequent basis. The frequency with which interviewees felt that manual handling training should be offered also varied. The data gathered in relation to the frequency of manual handling training enabled a comparison of how often organisations actually offer such training with how often they felt it should be offered. Figure 4 shows a comparison of this data.

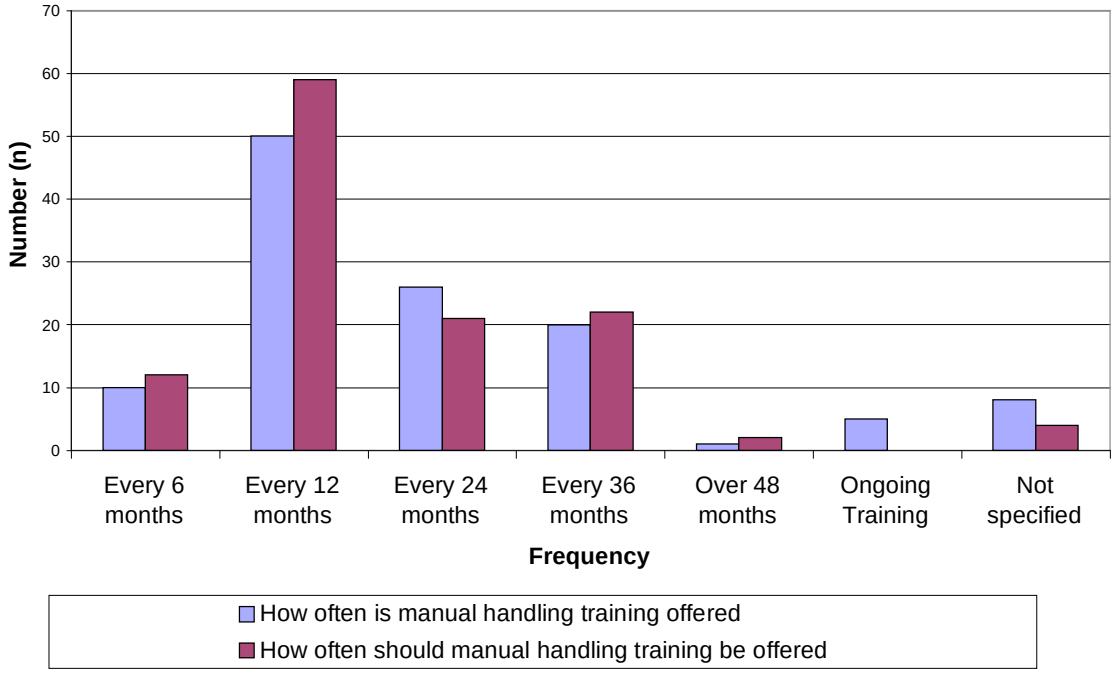

Figure 4 Comparison of Frequency of Manual Handling Training

From this data, it is evident that the majority of those interviewed felt that manual handling training should be undertaken every 12 months (n = 59). Whilst the majority of organisations did report undertaking manual handling training every 12 months, this was not always for all employees, but was directed primarily at new recruits and was offered as part of their induction process.

The majority of companies confirmed that manual handling training was mandatory for all employees with only 5.0% of those interviewed stating that attendance on a manual handling training course was an elective process. In the cases where it was an elective process, interviewees reported that line managers select employees for training rather than employees themselves being able to present themselves for a training course.

Following the recruitment of new employees most companies reported offering manual handling training to these new recruits shortly after their induction. Many organisations (n = 76) reported that new recruits were given manual handling training within one week of starting with the organisation. However, some organisations reported a much longer time span between recruitment and training. Figure 5 shows the distribution of the time span between recruitment and manual handling training for all organisations interviewed during the course of this study. A number of organisations reported that some form of generic induction training which incorporated certain aspects of manual handling was offered to all recruits upon induction. This explains why it was reported that so many employees receive manual handling training within the first week of their employment.

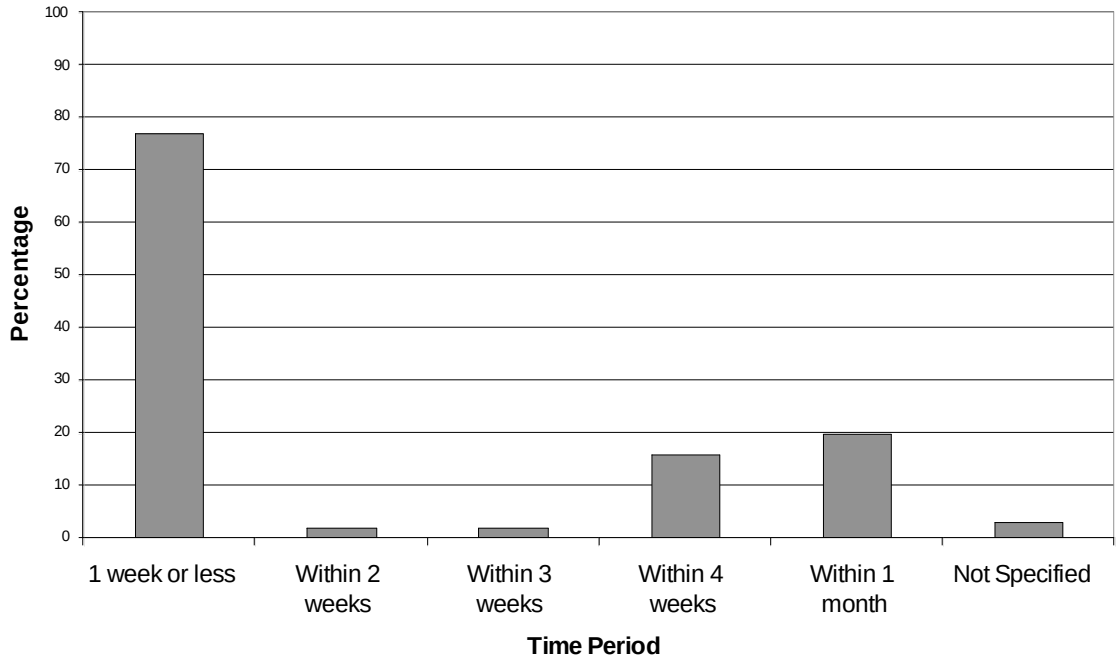

Figure 5 Distribution of time span between recruitment and manual handling training

Although many companies offered manual handling training to their employees within the first week of employment, a third did not (n = 44). Of those interviewed, 43.3% stated that there could not be a gap between training and practice, whilst 55.0% stated that there may be a gap between the two (unspecified 1.7%).

Of the 120 organisations surveyed, 77.5% undertook 'in house' manual handling training, i.e. using their own staff to deliver training packages for employees, whilst the remaining 22.5% used an external training consultancy to deliver the training on their behalf. The remainder of this section deals separately with those undertaking in house training and those out sourcing their training to an external company.

5.3 ORGANISATIONS UNDERTAKING 'IN-HOUSE' MANUAL HANDLING TRAINING

Of the 120 participating organisations 93 reported using 'in house' methods for the delivery of manual handling training. The most common reported driver for undertaking manual handling

training amongst these organisations was the recruitment of new employees requiring induction training. A full breakdown of other drivers is shown in Table 10.

Table 10 Drivers for manual handling training (in house training)

Driver	*Percentage of organisations*
Sickness / Injury Reports	84.9
Induction of New Employees	97.8
New Working Practices	89.2
Regulatory Requirements	95.7

A risk assessment in relation to manual handling training was undertaken in 87.1% of cases (n = 81), but the information from this risk assessment was not always integrated into the subsequent training program. Of those who did undertake a risk assessment 13.6% of organisations (n = 11) reported that they did not incorporate this information into their training.

Interviewees were asked about the length of their training sessions. The majority of those interviewed reported that the typical length of any manual handling training session was half a day or less (n = 78). Very few organisations reported that their manual handling training was longer than one day in duration. A full breakdown of the reported duration of training sessions is shown in Figure 6.

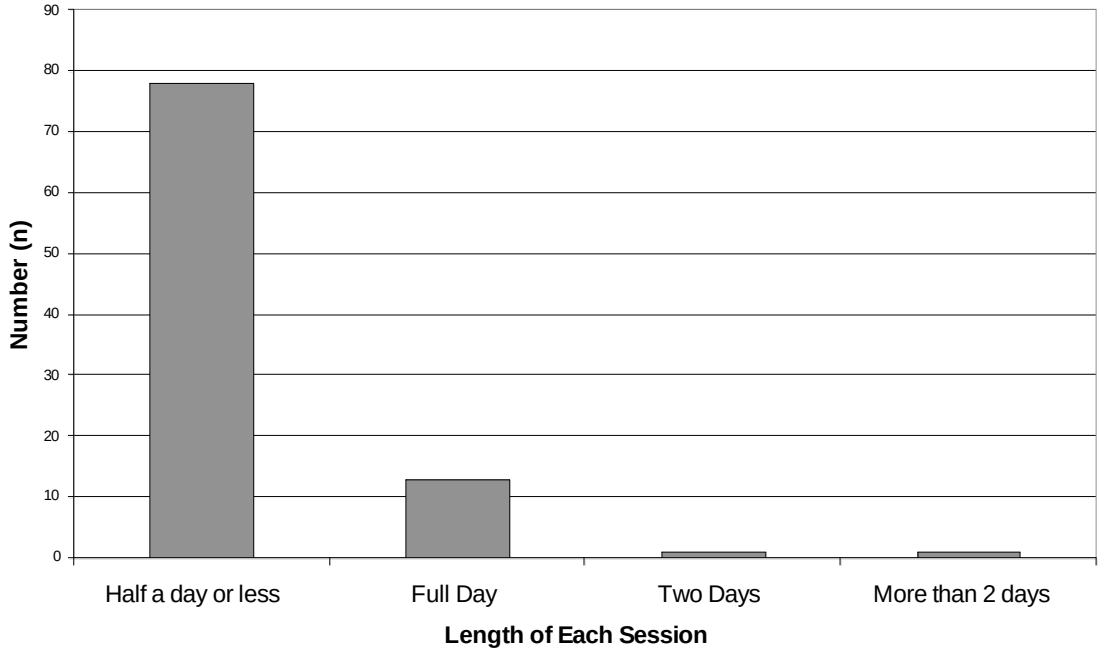

Figure 6 Length of Training Sessions

A variety of methods of delivering the manual handling training were reported by interviewees; 10.9% of organisations (n = 10) stated that all their manual handling training was delivered by a trainer in person, 1.1% of organisations (n = 1) used computer based methods only, and 88% (n

= 81) stated that their training was delivered in a variety of ways, for example by a combination of in person, via a video or via computer based learning.

For the majority of organisations interviewed (98.9%) a practical element was incorporated into their training programs. No practical element was reported by 1.1% of interviewees. The range of practical elements covered during training is shown in Figure 7.

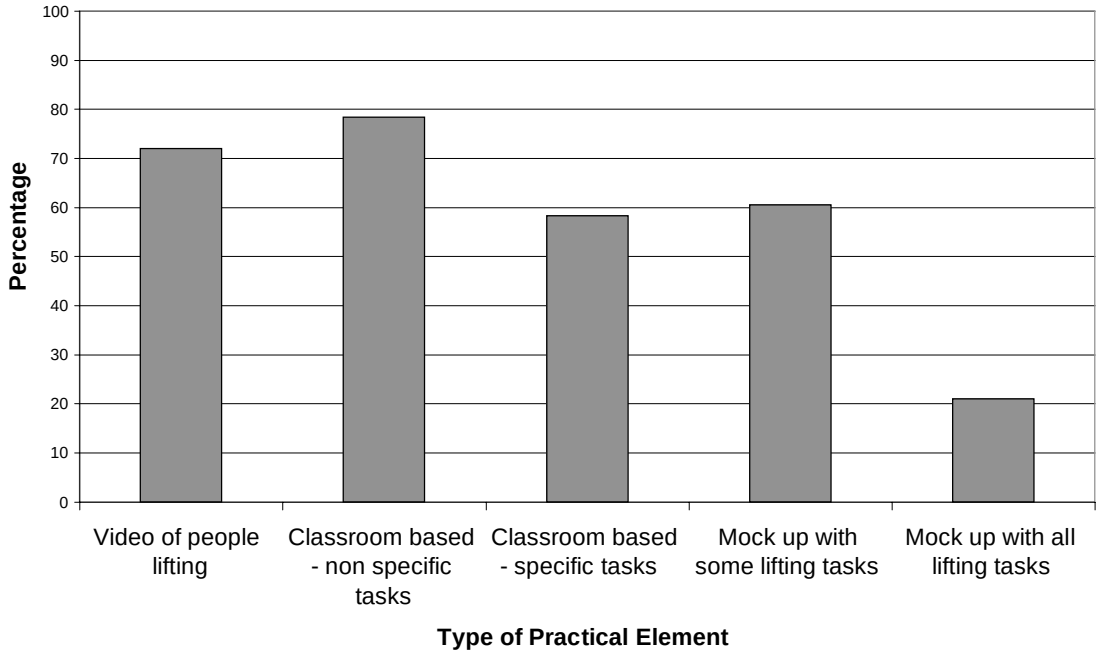

Figure 7 Practical Elements of Manual Handling Training

All but 8 (8.6%) of the organisations received feedback from their employees regarding what type of training the employees preferred. Where feedback was recorded, 8.6% of organisations (n = 8) reported that employees preferred classroom based training, 28.0% (n = 26) preferred practically based training, whilst 52.7% (n = 49) stated employees preferred a combination of classroom and practically based activities. Other respondents stated that the type of training preferred was very much dependent on the type of people being trained and whether or not the practical element was undertaken outside of the classroom (2.2% n = 2). Of the representatives interviewed, 90.3% (n = 84) stated that they felt that a combination of theoretical and practical elements of training was most effective in manual handling training.

Of the 93 organisations offering 'in-house' training for employees, 81.7% (n = 76) reported that the training given to employees was industry specific, i.e. tailored to cover specific manual handling risks common within any one industry. A slightly larger proportion (82.8%, n = 77) offered task specific training for employees whereby workers were offered training in particular manual handling tasks relevant to their job role.

The effectiveness of 'in-house' manual handling training was measured by organisations in a number of different ways including the following measures; productivity, sickness absence, cost-benefit analysis or staff morale. A full breakdown of the methods used by different organisations is shown in Table 11.

Table 11 How effectiveness of manual handling training is measured

Measure	*Yes (n)*	*No (n)*	*Don't Know*	*Total*
Productivity Measures	11	81	1	93
Sickness Absence	85	7	1	93
Cost-Benefit Analysis	26	66	1	93
Staff Morale	55	37	1	93
Other Means	28	64	1	93

The most common method of evaluating the effectiveness of manual handling training was to monitor sickness absence. In addition to this 28 of the interviewees reported that they evaluated the effectiveness of manual handling training using an 'other' means. A variety of measurements were described including the use of on line suggestion boxes, spot checks on workers techniques and monthly reports from occupational health.

5.4 ORGANISATIONS OUTSOURCING MANUAL HANDLING TRAINING TO A CONSULTANCY PRACTICE

Of the 120 organisations participating in this study 27 reported using an external consultancy practice for the development and delivery of their manual handling training. A breakdown of the drivers behind their manual handling training is shown in Table 12.

Table 12 Drivers for manual handling training (out sourced)

Driver	*Percentage of organisations*
Sickness / Injury Reports	63.0
Induction of New Employees	92.3
New Working Practices	81.5
Regulatory Requirements	88.9

Organisations reported that external training consultancies did not always visit the organisation prior to the commencement of any training. A site visit from consultancies was reported by approximately half (48.1%) of the organisations (n = 13). Where a site visit was undertaken by the trainers, all organisations reported that the information gained during the visit was integrated into the subsequent manual handling training programme.

A manual handling risk assessment was reported as being undertaken by 22 of the 27 organisations (81.5%), but the organisations went on to confirm that the information from the risk assessment was not always integrated into any subsequent training. Of the 22 organisations in which a manual handling risk assessment was undertaken, 17 reported that the information was used during subsequent training.

Organisations reported that external training consultancies discussed the objectives of the manual handling training prior to the course being delivered. This was reported in 24 cases (88.9%), and 22 organisations (91.7%) stated that they believed that these objectives had been met.

As with the organisations providing 'in house' training for their employees, the duration of the training courses offered by external consultancies varied between less than half a day to a full day. A breakdown is shown in Table 13.

Table 13 Duration of training offered by external training consultancies

Length of Training Session	***Number of Organisations***
Half a day or less	23
Full Day	4

A practical element to the manual handling training was reported in all 27 organisations outsourcing their training. Different types of practical activity were reported and a breakdown of the types of activities offered to trainees is shown in Figure 8.

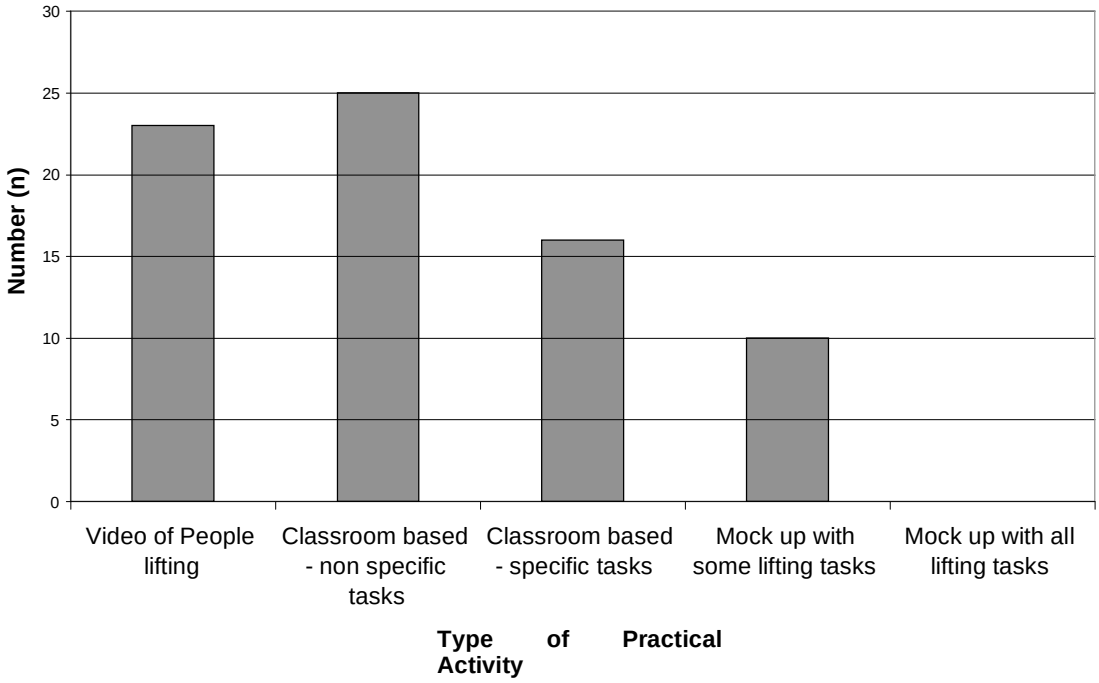

Figure 8 Practical elements of manual handling training (external consultancy)

During the telephone survey, organisations outsourcing their manual handling training were asked if the training provided was industry specific. Training tailored to their industry was reported by 74.1% of the organisations (n = 20) with slightly more (81.5%, n = 22) being offered with task specific training by the external consultancies. Feedback on the type of training preferred by trainees was obtained by 21 of the 27 organisations, with the most popular method of training being a combination of class and practically based activities. A full breakdown of the preferences for training is given in Figure 9.

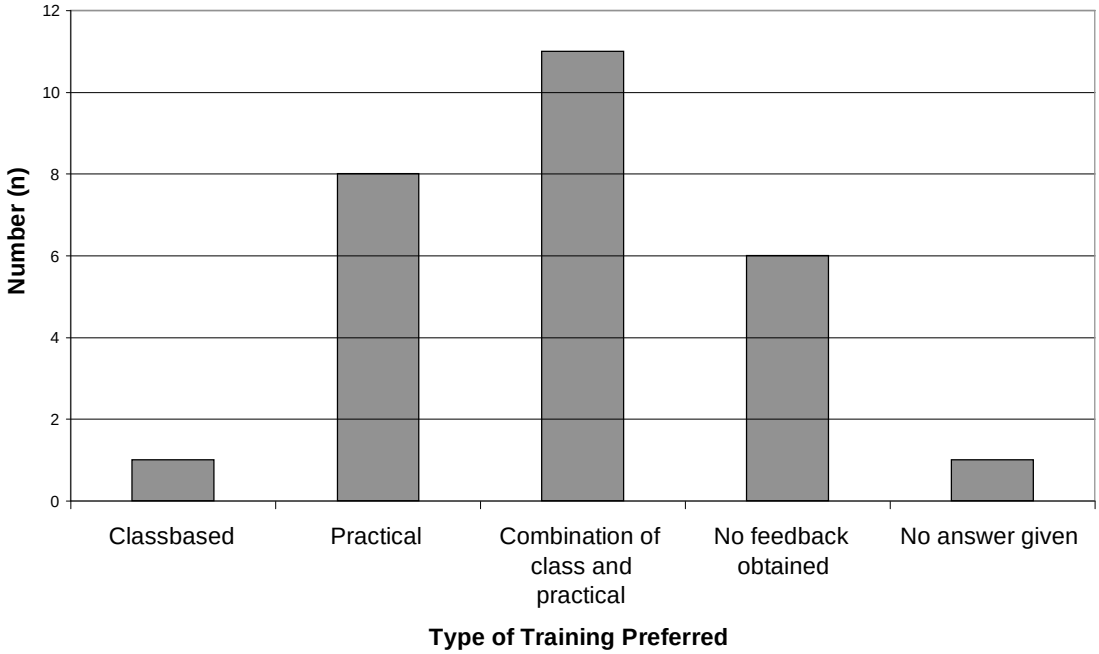

Figure 9 Type of training preferred by trainees receiving external manual handling training

An evaluation into the effectiveness of the manual handling training was undertaken by only 44.4% of organisations (n = 12) seeking an external consultancy to deliver the training. The effectiveness of manual handling training offered by external training consultancies to organisations was measured by the organisations themselves in a number of different ways including using the following measures; productivity, sickness absence, cost-benefit analysis or staff morale. A breakdown of the methods used by different organisations is shown in Table 14.

Table 14 How effectiveness of manual handling training is measured

Measure	***Yes***	***No***	***Total***
Productivity Measures	5	22	27
Sickness Absence	22	5	27
Cost-Benefit Analysis	6	21	27
Staff Morale	15	12	27
Other Means	2	25	27

As with those organisations offering in house training, for those using external consultancies the most common method of evaluating the effectiveness of manual handling training was to monitoring sickness absence.

5.5 FINDINGS FROM CONSULTANCIES PROVIDING MANUAL HANDLING TRAINING

Thirty training consultancies responsible for the development and delivery of manual handling training were interviewed. In all cases, the training provided to organisations was delivered solely by trainers employed by the training consultancies. A variety of qualifications were reported as held by the trainers and an overview of the types of qualifications held can be seen in Figure 10.

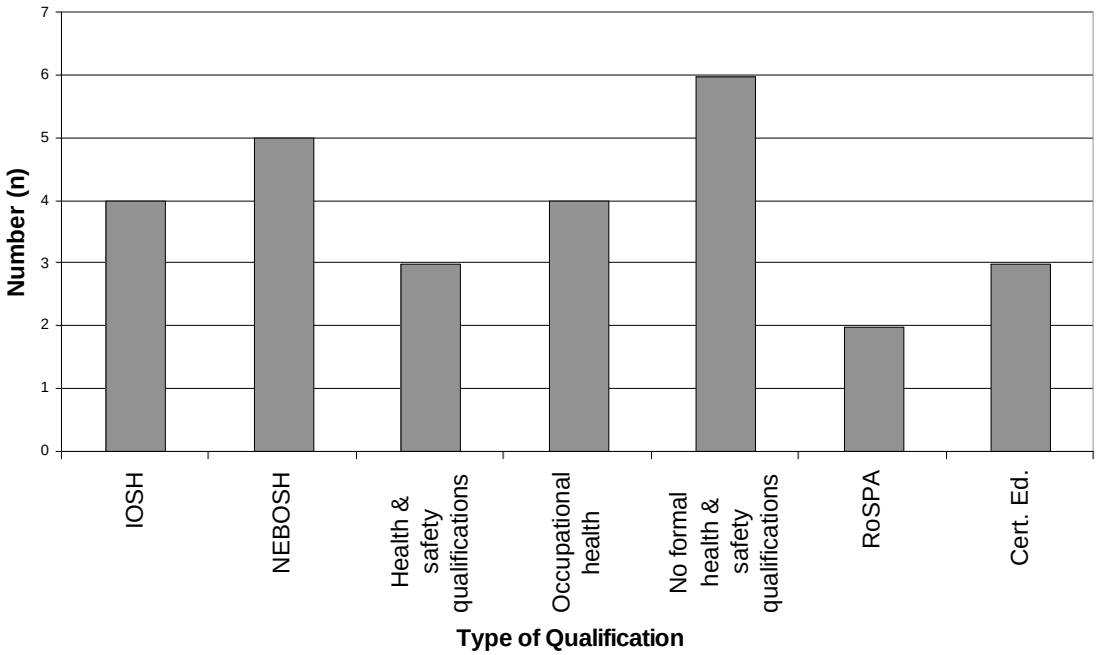

Figure 10 Types of qualifications held by trainers

The training consultancies were asked to describe what they thought were the drivers that prompted organisations to use their services. The majority (n = 28) reported that regulatory requirements were the main driver behind any training. A full breakdown of this and other drivers mentioned are shown in Figure 11.

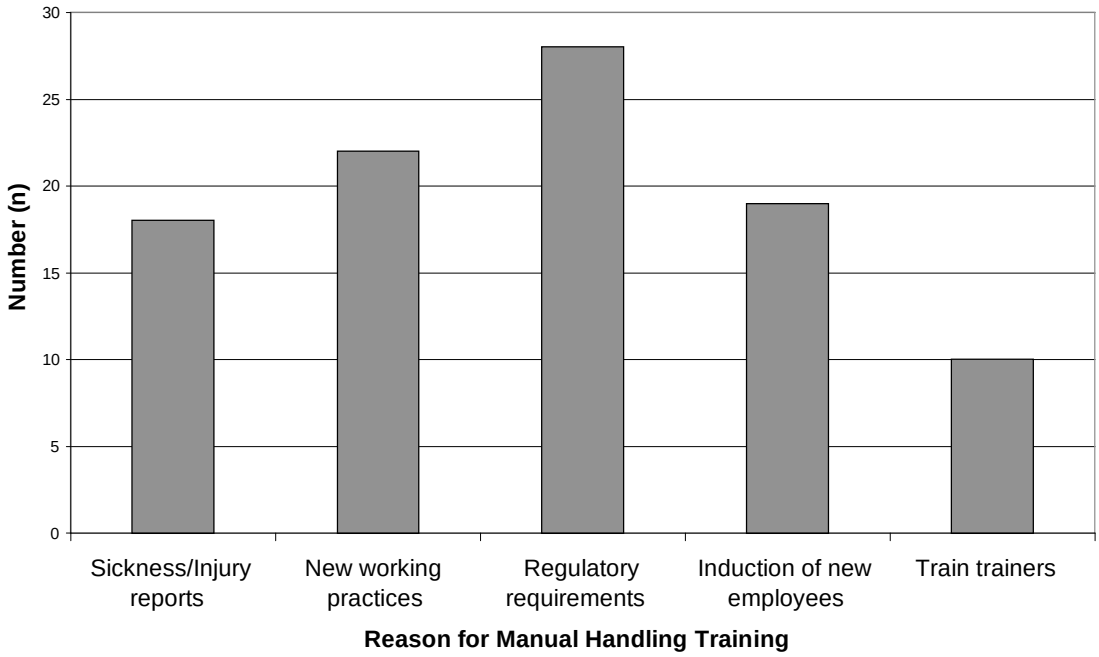

Figure 11 Reasons why manual handling training consultancies are used

Of the 30 training consultancies interviewed, two thirds (63.3%, n=19) reported that they conducted a site visit to organisations before the commencement of a manual handling training course. In each case, the information obtained during the course of this visit was incorporated in the subsequent training programme.

The number and duration of the training sessions offered to organisations varied across the sample. In all but 5 cases, each consultancy offered just one training session. In the five exceptional cases, one consultancy offered two sessions, one offered three sessions, one four sessions and one five sessions. One training consultancy reported that the number of training sessions offered varied according to organisational needs. The length of the training sessions varied between one hour and eight hours. A full break down of duration of training sessions can be seen in Figure 12.

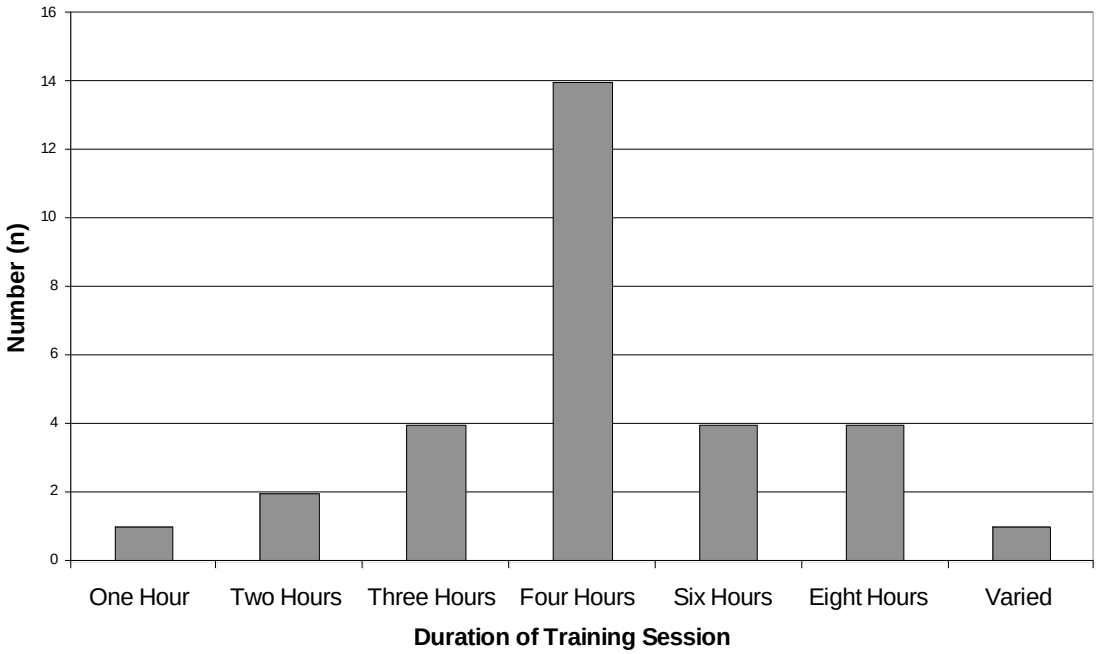

Figure 12 Duration of each training session

A variety of topics were covered during the manual handling training offered by training consultancies. Of those interviewed, all of them reported covering aspects of the law when delivering training. In addition to this, they all reported incorporating some aspects of anatomy and physiology. Table 15 shows the range of topics offered and the number of training consultancies who reported covering these.

Table 15 Topics covered during manual handling training

Topic	***Number of Consultancies***
Law	29
Responsibilities	30
Statistics (prevalence MSDs)	29
Anatomy & Physiology	30
Principles of good lifting	30
Other	18

All the training consultancies interviewed reported incorporating a practical element into their training (n = 30). The types of practical elements and the frequency with which they are used varied and full details are shown in Figure 13.

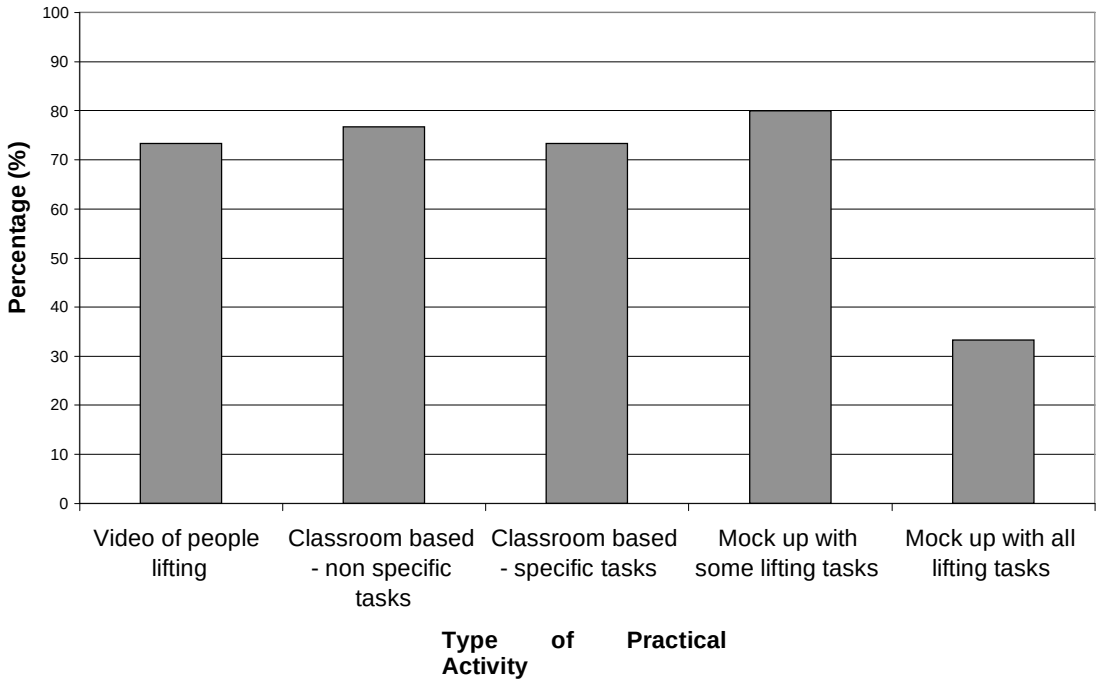

Figure 13 Practical elements within manual handling training

The most common practical element used within a course developed and delivered by a training consultancy was a mock up situation using some lifting tasks. Amongst those interviewed, 24 training consultancies reported incorporating this into their training. The least popular practical aspect amongst trainers was a mock up situation presenting all lifting tasks to employees (n = 10).

Nearly two thirds (n =19) of the training consultancies interviewed reported conducting some form of follow-up with organisations to evaluate the effectiveness of any manual handling training offered by their consultancies to organisations. Feedback from the trainees on the training was obtained in the majority of cases (n = 28) but this is not always communicated to the organisations involved.

5.6 SUMMARY OF CURRENT MANUAL HANDLING TRAINING PRACTICES

The telephone survey indicated that induction of new employees and statutory requirements are the main drivers for manual handling training. Most training is on an annual basis and training is generally conducted in half a day. More than 75% of companies surveyed conduct in-house manual handling training. Only 2/3 of trainers conduct a site visit prior to conducting manual handling training and a similar proportion report follow-up the organisation to evaluate the effectiveness of the training. Most training incorporates some level of practical elements but this can vary from showing of a video of people lifting, practical tasks undertaken within the classroom using non-specific items, practical tasks undertaken within the classroom using task specific equipment and a mock-up situation using non-specific items and a mock-up situation using task specific equipment. The majority of organisations and trainers record feedback on training and sickness absence is regarded as the main outcome measure of effectiveness.

6. TELEPHONE SURVEY – QUALITATIVE FINDINGS

6.1 CURRENT PRACTICE

6.1.1 Drivers for training

The organisations conducting in-house manual handling training and those outsourcing their training to external consultancies identified induction of new recruits and regulatory requirements as the main drivers for manual handling training. Some of those interviewed described other influences which direct the training of their employees. A health and safety manager from a large water company outsourcing training described how training needs were identified through the process of risk assessment:

> *'Obviously manual handling is one of the biggest causes of accidents. Slips, trips and falls is another so those are two of the ones that we are looking at as a company. It goes through risk assessment and the biggest risks are the manual handling and slips and trips.'*

A health and safety manager from a large transport organisation conducting in-house manual handling training emphasised that his organisation felt that training was important because employees were exposed to a high level of risk:

> *'So the reason we are so, you know, hot on basically doing manual handling training is because it's a great risk area.'*

The majority of trainers interviewed stated that they felt that regulatory requirements were the main driver for organisations to undertake manual handling training. However, over half of the trainers interviewed mentioned additional drivers that prompted organisations to request manual handling training. These included insurance company requirements, the identification of risk through the process of risk assessment, employee absenteeism and a need to act on direct advice from an HSE inspector. One trainer from a training company explained:

> *'Predominantly we find that the reasons that companies will look for manual handling training is awareness of manual handling operations regulations - made aware by either HSE intervention or quite often through insurance. And then the other main thing will be through risk assessment from their health and safety advisor or manager.'*

This view was supported by another trainer who commented that training was sometimes requested by an organisation following an inspection visit:

> *'I think generally what they do is they have either had a visit from the environmental health or HSE or they are maybe in the process of doing some risk assessments or something like that.'*

Some trainers (n = 4) stated that more recently they had become aware that insurance companies were requiring organisations to undertake manual handling training to comply with their insurance requirements. One trainer described the situation:

> *'Because some companies, the insurance companies are stating that they must have a certain amount of statutory training before they will give them their insurance certificate.'*

6.1.2 Frequency of training

The quantitative results show that the majority of organisations interviewed reported that they had undertaken manual handling training within the previous 12 months (86.7%, n = 104). A large majority of organisations felt that manual handling training should be offered to employees on an annual basis. A number also considered that training should also be given whenever there are changes in work practice or reported health problems. For example, a manager from a large manufacturing organisation stated:

> *'This should be offered once at least every year but it should actually be offered as a result of changes in work activity or as a result of a musculoskeletal disorder.'*

Other organisations reported that the frequency of training should be dependent on the level of risk to which employees are exposed, whereby those exposed to greater risks received more frequent training. A health and safety manager from a large local government organisation explained that manual workers received more frequent training:

> *'It depends on risk. Generally every two years for admin staff, but every year for manual workers.'*

Most of the trainers interviewed reported offering refresher courses to organisations. One trainer reported that their consultancy did not offer refresher courses, whilst trainers from two other consultancies described there being little demand for such courses from organisations themselves. One trainer from a small consultancy explained that it was typically larger organisations who required refresher courses, and that this was normally written into organisation policy:

> *'I'd say it's probably the larger businesses that will send people on refresher courses. Because they will have more of a company policy that they do refreshers every five years.'*

In addition to regular training, most organisations described incorporating some form of initial manual handling guidance into their induction training for new employees. Although manual handling training was incorporated into induction programmes within organisations, the level of this instruction was described as covering the basic elements only. A health and safety officer from a large hotel explained:

> *'We have an induction and that will include an element of very basic manual handling instruction.'*

A health and safety manager from a medium sized organisation within the construction industry stated that in his organisation there was no formal policy regarding how soon new employees were required to attend a manual handling training course. On site 'tool box talks' were used as an initial training measure before employees were able to attend a full manual handling training course:

> *'Our tool box talk basically covers the basic principles of safe handling …. It's very much covering the basic principles.'*

In some cases, the mandatory manual handling training for employees was supplemented within organisations with periodic 'tool box' talks which were undertaken throughout the year. A health and safety manager from local government described how these 'tool box' talks were implemented in his organisation:

'I suppose probably once or twice a year there'll be a manual handling toolbox talk which will be a summary of their training.'

It was often reported that manual handling training courses were only offered to new employees when there were sufficient numbers to attend to make the course cost effective. This would lead to a time delay between an employee starting a new job and receiving training. A health and safety manager from a large manufacturing organisation said:

'It depends on numbers. We would take it probably over a three-month period for new starters to be able to attend a generic manual handling course.'

6.1.3 Type of training

Much of the manual handling training which is currently undertaken within organisations was reported to be generic in nature, whereby employees were trained in general principles which could be applied to any task. For example, one training manager from a small training organisation said:

'Once they understand those fundamental principles they're then in a position to be able to apply the principles on every occasion that they can within the working environment.'

A trainer from one training organisation explained that the manual handling courses delivered through his company were attended by employees from a variety of industries and therefore had to be generic in nature:

'Its a generic course because we don't know what industry people are coming from there will be generic, not necessarily boxes but generic objects. So it could possibly be a pallet and how to load pallets.'

However, current training practice was criticised by a few interviewees because of the generic nature of course content. One health and safety manager responsible for the in-house training of employees within a large hotel explained how some of the available training material was not relevant to his employees:

'This is one of the problems to be honest with you with using generic off the shelf training videos for example, the feedback that we get from staff is its not specific to our industry. Its more office based or industrial based and our industry is quite unique in that regard so we have tried to be careful to use material that is as relevant to us as possible.'

A training manager identified how generic training was not suitable for all employees:

'It's all very well training someone to lift a box. But if they never lift boxes it's not a lot of good'

A further trainer with twenty years experience of health and safety training stated:

'I have often expressed my prejudices about too many courses being off the peg and not tailored'

It was also reported that manual handling training was expensive and that cost may be a barrier to organisations in implementing a full training programme. One trainer recognised this and

stated: *'Because it's expensive to purchase training, they will only do what they literally have to do.'*

6.1.4 Practical training

All but one organisation and all the training consultancies incorporated some form of practical element into their manual handling training courses. The type of practical element offered during these training courses varied from the showing of a video of people lifting, practical tasks undertaken within the classroom using non-specific items, practical tasks undertaken within the classroom using task specific equipment and a mock-up situation using non-specific items and a mock-up situation using task specific equipment. There was considerable diversity in the type of practical training offered during manual handling training of employees. Despite this, most organisations reported that they felt that having a practical element to the training was important. A health and safety manager from a small manufacturing organisation stated that employees preferred the practical element of the training: *'Because they are practical people tend to prefer the practical things.'*

One trainer from a small training organisation explained that a practical element was used during the training to maintain the interest of trainees:

> *'They start the day with the theory of anatomy and then the regulations. But before lunch we try and throw in a couple of exercises there as well, keep people awake.'*

The generic nature of some current manual handling training courses was also reflected in the type of practical element implemented during the training. For example, not all training courses offered task or site-specific practical training but instead, offered classroom based training only. One training manager from a small training consultancy explained that although the practical element was undertaken within the classroom, efforts were made to simulate the employees working environment:

> *'We simulate their working environment with the use of appropriate settings and equipment.'*

A trainer from another small training organisation emphasised that during their training the theoretical aspects were applied to the work environment within the work environment itself:

> *'We generally we try to do lifting of a small square box, the principles behind that and then we go into the work environment and try and incorporate it within their work place.'*

One health and safety manager from a medium sized hotel reported conducting in house training sessions for employees explained that his training covered theoretical aspects within the classroom environment and then incorporated task specific practical training within the workplace:

> *'We discuss it in the classroom but then we go through each of their tasks in their own department.'*

However, it was also recognised that not all work environments are suitable as training areas. This was highlighted by one trainer from a small training consultancy: *'well, it depends, some work sites are dangerous.'*

Although almost all of the organisations and trainers interviewed stated that they included some form of practical activity in their manual handling training, two of the trainers interviewed reported that they felt insufficient practical work was undertaken generally. One trainer from a small private training company explained that he felt that there was insufficient practical work undertaken on some manual handling courses undertaken within organisations:

> *'I am aware that some organisations where we go, they do it in house via video or something like that but its not practical enough, people don't concentrate much really.'*

And a further trainer with over 20 years experience within health and safety stated:

> *'I found my overall conclusion is that too many people don't do the practical.'*

6.1.5 Risk assessments

The quantitative findings show that a risk assessment in relation to manual handling training was undertaken in the majority of cases. However, the information gleaned during the risk assessment process was not always incorporated into the subsequent training of employees. A health and safety officer with public administration stated that he recognised that no information from the risk assessment was considered within the in-house training undertaken within his organisation. He had taken steps to address this situation:

> *'Well, up until now, it really hasn't been, to be quite honest. I have been here one year now and we're looking at integrating, making the training more practical, practically-based, and looking at moving kit rather than boxes.'*

The generic nature of some training courses prevented the training being driven by the risk assessment process. One health and safety manager from a large water company explained that because of the generic nature of the training, it was difficult to incorporate all aspects from the risk assessment into the training:

> *'Because we might have twelve people on the training from twelve different areas of the business all undertaking slightly different manual handling tasks. So therefore it's not practicable to introduce all of it.'*

One health and safety officer from a medium sized transport organisation responsible for the in-house training offered reported how the information from the risk assessment and subsequent training were interrelated:

> *'It's sort of like there's a cross reference between the risk assessment and the training and vice versa'*

Not all organisations receiving outsourced training from an external consultancy reported that a site visit by the trainers prior to the commencement of training. A site visit was reported by just over half of those organisations interviewed. Amongst the trainers interviewed, 19 reported that they always undertook a site visit before any training. The trainers reported a number of benefits of conducting a site visit including the opportunity for a risk assessment to be undertaken which was subsequently incorporated into the training. One trainer from a small training consultancy reported:

> *'We look at the worst case manual handling jobs or the ones that are maybe just typical of what's going on in the organisation. And if we can we'll try and include those as case studies and film them if we can, to become case studies in our training courses.'*

6.1.6 Evaluation of training

The effectiveness of manual handling training was generally measured by monitoring sickness absence. However, other methods were reported, for example, one line manager with responsibility for health and safety within a small manufacturing organisation stated:

> *'Every six months we review all data and see accident reports, internal comment from staff, and any problems would be highlighted within the review which is a six-monthly process.'*

One training manager from a small training consultancy stated that they gave out specific audit materials to assist organisations in evaluating the effectiveness of their training. Cost was identified as a barrier for some organisations in evaluating the effectiveness of out-sourced training. A trainer from a small independent training company described how organisations cannot afford to implement such a process:

> *'I mean in an ideal world you know we would be able to go back 3 months later and observe people who we had done the training with but businesses just can't afford to do it.'*

It was recognised that any evaluation of manual handling training using sickness absence as a single measure would not accurately reflect the effectiveness of any training. A health and safety officer from local government pointed out that a large amount of manual handling is undertaken at home:

> *'Obviously we look at the sickness absence rates, with reference to the manual handling days off. But it is very difficult to know in real life what is happening. Because manual handling is not only about being at work, a majority of it is undertaken at home.'*

6.2 WHAT ASPECTS OF CURRENT MANUAL HANDLING TRAINING ARE EFFECTIVE?

6.2.1 Tailoring the training

Participants interviewed from the organisations and also those who were responsible for delivering manual handling training placed a large emphasis on the need for manual handling training to be tailored to meet industry specific needs and also individual task specific needs. This was emphasised by a senior trainer within a consultancy organisation: *'tailor it to whatever they were doing.'*

Participants reported that using industry and task specific training can provide a number of benefits. For example, task specific training would involve using familiar equipment and this may help consolidate the training provided. One trainer from a small training consultancy stated:

> *'We take a pride in giving training that has a flavour of authenticity to the client that we're dealing with.'*

Participants reported that using familiar terms which employees can relate to during the delivery of training was also particularly important. A training manager from a small consultancy reported: '*We don't use any anatomical terms, we use terms that people can relate to'.*

One health and safety officer responsible for in-house training within a medium sized hotel stated:

> *'Some companies really go all out to name all the bones and go into great detail in anatomy and physiology. And if you've got a roomful of college professors, that's fine. But if you've got a room full of factory workers I think you have to have simple, easy to understand, worthwhile and effective, and lots of practical tasks.'*

A trainer from a small consultancy explained that in using familiar terms and equipment during the training she felt this assisted employees understand the concepts she was trying to deliver:

> *'Then you have groups of people that just because of the way they've been working for say, twenty odd years, trying to change their behaviour can be very difficult. So if we're using things that they know about, that's just going to help to back up what you're doing.'*

Participants also felt it was important to consider the content of manual handling training courses and to relate the content to those trainees present on the course. One trainer from a private consultancy stated:

> *'Now the thing is when you are looking at content, especially for something like manual handling you have got to look at what is necessary information for that person and also what is going to motivate them to change.'*

The majority of organisations (n = 111) and two thirds of the trainers (n = 20) stated that the manual handling training undertaken took account of recipients' learning styles. This was considered an important aspect of effective training and was illustrated by a training manager of a small training company:

> *'All of our courses are designed in order that they appeal to all different types of learning styles.'*

Another trainer from a small private consultancy also expressed the need to consider different learning modes:

> *'With trainees you are always looking to embrace 3 major learning styles of visual, auditory and kinaesthetic.'*

Another consideration in respect to effective training was that the training should assess the body as well as the task. One senior trainer from a training consultancy explained:

> *'And we start of by getting them to listen to their bodies so we're getting them into different positions to start with and say, can you feel that stretch, can you feel it? You know, your muscles working, to get them to exercise. And we say, you've got to step back and listen that because when you're working often it's too late'*

6.2.2 A practical element

A practical element to the training was regarded as essential to help maintain employee's interest and to facilitate the implementation of learning. This was commented on by a number of interviewees. One trainer from a training consultancy stated:

> *'We aim to get the key exercises and the risk assessment exercises in just after lunch so implementing what they've already learned and things.'*

It was also suggested that a practical element was more effective if it was task-specific, i.e. if the trainees were practising manual handling tasks using equipment that was relevant to their work. One training manager from a small training organisation described how the practical elements of their training were relevant to the trainee's workplace:

> *'And then the practical modules will be linked into what's relevant for them to achieve in their work place.'*

Some training consultancies delivered practical training within the workplace itself as opposed to within the classroom. This was described by one training manager from a small training consultancy:

> *'We are training with some enormous companies, the reason why it is this way is because of the package we deliver when the package is very realistic and achievable it dispels myths and fallacies and it is mainly carried out on the workplace not classroom.'*

A manager from a large manufacturing organisation offering in-house training to their employees described how the manual handling training within that organisation was implemented within the workplace:

> *'What we try to do is train on the job and make the work activities as near to the real world as possible. And that actually means changing the ergonomics of the workplace in such a way that distance of lifting and moving are actually minimised.'*

6.2.3 Reinforce the training

Organisations and training consultancies reported using additional materials to support and reinforce their training such as the use of a handout or the showing of a video. The majority reported using paper based handouts which were given to trainees, but some reported other means of reinforcing their training message which they felt were particularly effective. One trainer from a small private firm reported using step-by-step summaries which were clear and easy to understand:

> *'So the fairly simple step by step summaries really rather than something which reads like War and Peace.'*

One training manager from a small consultancy reported using interactive work books:

> *'We provide very high quality interactive work books which students complete during the training and take away at the end with them.'*

This consultancy also reported offering on-going support for trainers who had completed their training through the consultancy:

> *'And we also provide ongoing support for people who train with us as trainers in a number of ways via the web, email and news letters.'*

A number of organisations recognised the importance of ongoing support for employees after training. The role of the organisation and workplace supervisors was considered significant in reinforcing correct procedure. One health and safety officer within local government said:

> *'People go on training and they get the theory and maybe they get the practical experience, but it also needs to be reinforced all the time because behaviours change in*

a training environment to what they do in the workplace. People become complacent, peer pressures, and it goes on and on. And there might be pressure of work if their doing piecemeal work and things like that.'

A health and safety manager from a small transport organisation also stated:

'You need to observe it in practice and reinforce it through the supervisors and then the employees.'

6.2.4 Adequately qualified trainers

The qualifications of the trainers currently conducting manual handling training varies greatly, from in-house training qualifications to more formal qualifications. Whilst a variety of qualifications are used to justify competence in manual handling training, some participants mentioned that personal experience within manual handling itself was equally important. One trainer from a small training company emphasised this: *'Qualifications don't mean anything. Personal experience is the main thing.'*

Another trainer explained the value of experience to his training consultancy:

'The qualification will be in the subjects that are being trained and usually the second qualification will be of benefit to that topic as well we don't use people who are simply trained to do a training course. We train them, or that comes through experience.'

6.2.5 Characteristics of an effective trainer

In addition to trainers holding suitable qualifications to deliver a training course on manual handling, they can facilitate and reinforce the manual handling training in a number of different ways. During the interviews with organisations and trainers a number of methods employed by trainers which proved to be effective were described. Covering the legislative requirements during training was described as having a negative effect on trainees motivation and engagement with the subject. One health and safety officer from a large organisation within public administration gave the following example:

'I think really that manual handling is a very dry subject and sitting in a classroom learning about regulations and lifting a box isn't relevant to them.'

A further training from a small private consultancy was of the same opinion:

'And unfortunately in health and safety and I have done this as unofficial research on the courses i.e. talking to operatives and if you talk about regulations it has quite often a negative effect on the training.'

He went on to describe how his company found it effective to focus on the positive aspects of manual handling training:

'If you focus on the positive .... when we talk about the health problems and injuries that can occur from poor manual handling we look at the impact on individual's lives. So in the opening exercise we will find out hobbies and interests and we relate it to how it would impact their lives from that perspective and how by embracing manual handling techniques it will actually help them continue their quality of life as it is.'

Focusing on the positive aspects of manual handling training allowed trainees to engage with the material during training. Engaging trainees in this way was described by one trainer from a small training company as being effective and essential to learning:

> *'I think what we often find is that people have an expectation that manual handling training will be boring and I think one needs to engage candidates to achieve learning.'*

Engagement of trainees can be elicited through a positive relationship between the trainer and the trainees. One trainer from a small private consultancy offering manual handling training to organisations stated than when working with organisations her consultancy tried to use the same trainer in order that a positive relationship was established with the organisation:

> *'And try and marry them up with the same trainer so that if we're working with the company they get a good relationship with that person.'*

This trainer could then became known to the organisation and could offer continuing support for both the organisation and its employees. However, some trainers and organisations expressed that both the training and continued support would only be effective if the trainer was familiar with the industry and understood the specific tasks undertaken by the trainees within their job role. This was highlighted by one trainer from a small consultancy:

> *'No training is effective if the person delivering training doesn't understand what the job entails.'*

A further consideration was the need for trainees to be assessed as fit to complete the training. This was highlighted by a health and safety manager from a large manufacturing organisation:

> *'Well what we would do is we would make sure that number one all of the people presenting themselves were fit and healthy carry out the practical exercise. I would ask them their state of health, about their state of health and would also want them to let me know how they felt that particular day before we actually did anything at all.'*

An additional benefit from such an approach would be the identification of employees at particular risk of manual handling injuries within their tasks. One training manager gave an example:

> *'[An employee] was saying it's all very well you telling me I should bend in the knees but I have arthritis in my knees. And of course then it was a case of looking at him and saying to the employer, really should this person be in a position where he has to do this sort of task?'*

6.2.6 Refresher Courses

The implementation of regular refresher courses was also considered important by participants, but a number of the training consultancies reported that there was little demand for such courses. One trainer from a small training company explained:

> *'We went round to all the businesses and offered them all a free place on the course and not one of them wanted it.'*

When participants were asked how often they felt refresher courses should be offered a variety of responses were elicited. Fundamentally however, it was felt that refresher courses should be offered on a regular basis and also in the event of any legislative changes. For example, one trainer stated:

'If lets say the legislation has changed, it depends if it stays still for a few years they won't come back but if things change and are updated then they might then send them on refresher courses.'

And another training manager explained how their training organisation monitored course attendance and offered refresher courses on a regular basis:

'It's a yearly refresher and we keep all the records and we inform them two months in advance when it's due.'

However, eight of those organisations outsourcing their training and six of those training consultancies interviewed did not offer refresher training courses. One trainer from a small training consultancy explained:

'No, this is another thing, this refresher stuff, there is no need. The reason why is if you train them correctly once, once you have shown them, they change their culture straight away. Why train them again when they have got it right?'

6.2.7 External training consultancies

Almost a quarter of the organisations interviewed (n = 27) relied on consultancies to provide manual handling training for their employees. Not all of the consultancies delivering this training made a visit to the organisation before the training commenced. However, it was felt by some that the training offered was more effective if a visit had been made. One training manager who was asked about making a site visit before training commented: '*It is imperative, that's the first thing that happens you go in and do an assessment.'*

One trainer from a small consultancy explained that a pre-visit enabled the trainer to build up a profile of the organisation. Through the exchange of information between the organisation and the training consultancy, trainers would then gain an awareness of any high risk tasks within that particular organisation and gain an understanding of the equipment used by employees. One trainer from a small consultancy explained the process of a site visit:

'We'll actually go on site, have a look beforehand and identify through risk assessment the harder work jobs or the most difficult ones. And then actually during the course we'll go out there and have a look at those jobs, and you're going to get assessing them in actually doing the manual handling of those particular tasks.'

One trainer described how photographs taken during the site visit were incorporated into the training: *'I find taking photographs is a great way of explaining'*

Another trainer from a private consultancy stated:

'Normally we would say that we would have some time in the diary that would be charged for where we would go and take a video or photographs of the tasks that they consider or in the area that they consider the most problematic for them.'.

Various benefits were highlighted by interviewees. However, as illustrated in the above comment, the cost of these visits is borne by the organisation requiring training. Such a cost was identified as a barrier for some organisations. This was illustrated by one training manager:

'So visiting sites is, whilst not impossible, no company is effectively going to double their bill to allow for that.'

6.2.8 Effective Evaluation

Participants described certain aspects within the evaluation of their training that they found particularly effective. Course evaluation sheets were the most commonly reported tool used in evaluation however some remarked that they may not be a reliable method. One health and safety officer from a large public organisation stated:

> *'I don't think the evaluations always say the true facts because at the end of the course they usually want to get away as quick as possible.'*

One trainer described how she used the evaluation sheets to report back to the organisation she had worked for:

> *'We always do an evaluation sheet and then we write a structured report at the end as well to go on to the client.'*

6.3 EXAMPLES OF GOOD PRACTICE

Although the interviews undertaken during the course of this research were largely structured, the qualitative analysis of the transcribed interviews identified examples of good practice described by interviewees.

6.3.1 Supporting activities and materials

One training manager from a training consultancy described establishing a support group within the organisations that he has worked for:

> *'What we then do is train what we call a support group. What that support group does is monitor, we train them how to spot incorrect technique. But more importantly how to correct lifting behaviour within their area.'*

This allows continued support to be given to the trainees upon their return to the workplace. In addition to the support offered within the workplace, some trainers continue to offer support via the telephone: *'And we give them a huge support on the phone.'*

Another method of on-going support was the provision of bespoke posters displayed at work. Such measures were considered effective methods of reinforcing the training:

> *'If you have got you support group and you got your poster up there .... that's refreshing them every single day.'*

6.3.2 Competency based training

One trainer described a particularly effective approach to training that his training company had been involved in. This involved competency based training based on the Welsh Passport Scheme (modular training scheme adopted for consistency across Wales). He described the outcome:

'And everyone must sign to say that they are competent in the techniques they're being taught and also the trainer has to sign to say that they are confident that they are competent in each case.'

Some organisations (n = 8) reported that they found the acronym T.I.LE. effective in guiding their training. This acronym dictates that the following aspects are covered within any manual handling training, the task, the individual, the load and the environment. One manager from a large manufacturing organisation described how this was implemented within the training undertaken within his organisation:

'TILE. Do your risk assessment what is the task, is it lifting is it lowering is it pulling is it carrying is it moving loads and how many times are they going to be doing that. What about the individual - how fit are they? I always say this to my engineers, gentleman would you please stand up. Would you empty your pockets please. I have seen screwdrivers, I have seen Stanley knives, I have seen weapons of all description. Empty your pockets now that is the individual, now how fit and healthy are they. What about the load, now I get them to think about the load, the size the shape. How hot how cold is it? Get them to look at that load and size it up. Is there is any information on the side of the load?'

6.3.3 Organisation Culture

A number of trainers reported that in order for training to be effective, the management should be aware of what is being included in training in order to be able to offer ongoing support to their employees. One trainer from a small training consultancy explained that his consultancy expected a commitment from management before training commenced:

'And that we also put to them what we expect their commitments to be. For their staff, that we would expect management to make improvements for their employees.'

Another trainer from a small training company explained that in addition to offering training for employees, her company trained chief executive officers in order to influence organisation culture:

'We train the managers, the CEOS, everybody. So that they know we're embedding the culture throughout the whole company.'

Another interviewee from a small training consultancy reinforced the need for organisation change for effective manual handling training:

'One of the things I make clear when I am training instructors is if they deliver a one half day training course to operatives with an expectation that that is going to create any change, they are just banging their heads on brick walls. So we go through and do a basic need analysis of their organisation looking at the culture and looking at what support network is required prior to actually delivering the training.'

6.4 EFFECTIVE MANUAL HANDLING TRAINING

This section summarises the qualitative findings of the survey and details the aspects of manual handling training reported to be effective.

- Manual handling training is considered more effective if it is tailored to specific industry and task demands. In addition, the training should meet the needs of the individual and this is best achieved by using familiar terms that the trainees can relate to and by embracing recipients' learning styles.

- A practical element to the training can reinforce learning. A practical element is more effective if it is tailored to individual job demands, i.e. trainees undertake manual handling tasks during training using familiar equipment relevant to their work.

- Manual handling training is thought to be effective if it is adequately reinforced with suitable materials and through ongoing support within the organisation itself. Examples which have proved to be effective include the use of simple summaries of the course content, interactive workbooks and the provision of ongoing support for employees from manual handling specialists.

- Trainers with experience and knowledge of a particular industry have a greater understanding of specific risks within an organisation and this may lead to more effective training. A number of benefits of using experienced and suitably qualified trainers have been identified including the delivery of relevant information, securing the engagement of trainees and the identification of specific risks within manual handling.

- Manual handling training may be more effective if refresher courses are offered to employees on a regular basis to update and refresh their learning. These should be offered on a yearly basis, or as a result of changes in equipment or working practices.

- Manual handling training offered by external consultants is likely to be more effective if consultants develop an understanding of organisational needs. This is best achieved through a site visit undertaken before training commences.

7. EXPERT PANEL ONE

7.1 PROFILE OF EXPERT PANEL

An expert panel discussion was held at Loughborough University in Feb 2007. The panel was hosted by the research team and comprised 11 experts from the disciplines of occupational health, ergonomics, health and safety, and organisational behaviour. The profile of the expert panel is shown in Table 16.

Table 16 Members of the expert panel

Jim Bowden	Managing Director, COPE Occupational Health and Ergonomic Services Ltd
Claire Bradshaw	Staff Development Adviser, Loughborough University
Matthew Birtles	Ergonomist, Health & Safety Laboratory
Dr Alistair Cheyne	Lecturer in Organisational Behaviour, Business School, Loughborough University
Kevin Fear	Head of Health, Safety & Environment, CITB Construction Skills.
Richard Graveling	Principal Ergonomics Consultant, Institute of Occupational Medicine
Elizabeth Leigh	Manual Handling Advisor, Southend Hospital
Melissa Lovell	Health & Safety Consultant, ROSPA
Chris Quarrie	HM Specialist Inspector, HSE
Simon Monnington	HM Specialist Inspector, HSE
Katrina Stevens	Freelance Ergonomist

7.2 ANALYSIS OF DATA

The expert panel was recorded and fully transcribed. The transcribed material was analysed by sorting the material into emergent themes as described by Dey (1993). The themes are illustrated by verbatim quotes from panel members. The reliability of the analysis was ensured by having two researchers independently analyse the data.

7.3 OPEN DISCUSSION OF EFFECTIVE MANUAL HANDLING TRAINING

The expert panel started with an open discussion about the general principles of good manual handling training. Participants stressed the need to achieve the right organisational culture to promote positive changes:

'I think that first of all establishing the right culture for changes to take place, having achieved a positive change you've got to maintain it …. particularly participatory ergonomics we found invaluable. Some organisations that have used these principles have said; it's been a real eye opener and we are now applying these principles to other elements of management throughout the company. When we first started courses there was massive resistance because of the culture, the people attending would say they [the organisation] are just doing this to protect their rear ends, putting it politely. But once we got over the fact that the organisation is prepared to listen, then that made a real difference. We found that if you go in and prepare for all the things that are likely to come up as resistance from them, because change has never taken place, address them, get some quick wins, the psychology changes and you get a momentum going for it, so I think that's critical.'

'I think what you're talking about are the pre-requisites within an organisation in order for training to be successful. I think when we've tried behaviour change programmes, it doesn't work unless there are certain pre-requisites there …. things like an accepting, evolving culture, an appropriate work place.'

One expert emphasised the need for increasing understanding as opposed to specific training:

'There is the trite statement that we educate people and train dogs …. the whole ethos of it has got to be one of really understanding where they're coming from rather than just saying "right, do this". The problem of course with the off the shelf video tape, which shows somebody lifting a box …. you go and you have to lift various other things. Training actually has to be applicable otherwise it devalues the whole training experience.'

The question of lifting technique was discussed by the group who felt there was no clear consensus on what constitutes a safe lift:

'I'm not sure that actually there is one. When say, unhitching a trailer from the back of a vehicle having driven for three hours, going and lifting it correctly but still wondering why their back goes! Not realising all the exposure that brought the back close to fatigue was how they sat in the vehicle, going to the manual handling point.'

Another expert added:

'I've found successful companies have really tried to hammer home the integration between what an employee does, how they conduct their work from a quality and efficiency point of view, but at the same time adding in the health and safety messages. Companies who try to falsely divorce the health and safety message from "this is what you do, this is we want you to do, this is why you get paid" end up losing battle. Inevitably you've got to be talking about something more than just a one shot event. You've got to be talking about follow up. You've got to be thinking about mentoring, coaching and trying to influence and modify people's behaviour. You're talking about a complex mode of behaviour. So it's unlikely that people are going to have that postural awareness after a single event.'

This expert also highlighted the personal characteristics of trainers:

'It's helpful to have an appropriate and suitably qualified person who's charismatic and influential, so they've got to have a partnership approach with the work force as well. So that's where sometimes these things can be a bit difficult because it can be a personality based thing. And the number of companies I've been to where you've got the most abrasive, obnoxious person who's the training/risk assessor, which makes it really difficult to actually get things moving forward.'

The role of mentoring in the workplace and the importance of promoting appreciation of risk was discussed:

'I've done manual handling training for quite a while now and I change my mind constantly about what I think would be the better approach. If I'm involved in train the trainer I always come away thinking it's so much better not to do that. And if I deliver the training myself, I wish I done train the trainer. I can't work out what would be the best way, and the big problem is most of the people on a train the trainer course have been told to come along - they don't want to stand up in front of people and they certainly don't want to talk about the spine and have to tell their colleagues how best to do things. I tried so many different ways and the best way I think would be to actually try and develop these people and then they can go around on the shop floor, spotting problems and helping.'

'Mentors can be quite useful if they go back into the departments and areas and work as a coach because they'll see things that are dangerous and become problem solvers.'

'… getting the people who we train in to becoming trainers and getting them to a position where they can actually instil enough confidence in their own ability to change the climate, change the culture and influence the senior management, is very difficult. It's very difficult indeed to send people from a train the trainer course to say right, now go forth and change the world.'

'I go to places and say well, what do you remember from your manual handling training? Bend your knees, keep your back straight. And what did you lift on your training? An empty box. And how many empty boxes do you lift from the floor in your working day? Well, none - but it's impossible to cover all of the tasks. Training is very separate to risk assessment in most organisations but actually it links right back into risk assessment. You try and say to them well, you must report that. You've got to play your part in risk assessment and you've got to be involved. And I think that's been working quite well.'

'There is a cultural context outside the organisation that manual handling training is regarded as the universal panacea. I do a lot of expert witness work and you see they've done passable risk assessments; identified risks which they could have done something about. Solution: provide manual handling training. If they get a legal case against them and they failed to provide training (no question or whether or not that manual handling training would have done any good) they are in trouble. I actually think, even in the best ergonomically designed environment, it's very difficult to remove risk altogether. You can design an environment which is possible for handling to be carried out properly. But you've still got to make sure that people use that environment in the correct manner. I've come across examples of good designs have failed because people haven't had the explanation or training as to how they should use them. This wider cultural expectation of training, that it's the answer to all the ills.'

'Having done a lot of work with the ambulance service I know full well that there are situations where you cannot avoid what is essentially dangerous manual handling. Now people are heavy and there is no safe way of manually lifting a person. There are safer ways of doing it than others but I challenge anybody to come up with a safe way of lifting even an eight stone person.'

'Manual handling training is only effective if you are giving an individual competence with the right skills, knowledge, attitude, training and experience, to actually determine whether they will lift or not lift or how they're going to lift when presented with that particular circumstance. And I'm slightly conscious that we're looking at the input but we also need to measure output. It's easier to measure the input than it is to measure the output. I work in the construction industry, the majority of companies in the construction industry are ten people or less. It's the small micro organisations who haven't even identified the need to do manual handling training in the first place let alone how effective that training is. Particularly when you throw into the mix migrant workers and people that are coming from outside the UK to work in our industry, then you've got language problems. It just adds into the mix of what it means to have effective training. If you're in a long supply chain where you may not be working for the organisation that has control of the site, you might be working for a sub contractor of a sub contractor of a sub contractor. And you may be a labourer, you're just provide bodies to do things, how is someone in that position, if they do have the right attitude and competence; realistically how are they actually going to effect change?'

The panel discussed the approach of organisations to training and how this is often based on statutory requirements:

'It's the other side of the coin which is driving change quite, and that is civil claims market and legal counsel. I was speaking to someone the other day and they said: if people haven't got the training records, even if it is just to tick and a signature, the case would be heard and found in favour of the person who was injured. Without that basic risk assessment, without that paperwork, it's all for nothing; which kind of distracts you from the key message which is getting people to work safely in favour of just having nice paperwork on the shelf.'

'… it's never mind the quality, feel the width. As long as you've ticked the box it doesn't matter what the training is like.'

'Unfortunately popular culture for manual handling training has forced it even more into compliance. It's about getting the task done in the most safe way and ticking that risk assessment box. It just doesn't work; it goes in one ear and out the other. But we're seeing a real step change, that the effective development of people is happening actually in the work place and that requires some form of coaching and mentoring. It isn't really about training per se.'

7.4 CANDIDATE PRINCIPLES

The panel were presented with a set of candidate principles for manual handling which were derived from the systematic review, the telephone interview survey and expert opinion. The aim was to obtain expert feedback and validation of the principles.

Principle 1. Training should be part of an overall risk management programme

Should follow on after consideration of:

- **task**
- **load**
- **working environment**
- **individual capability**

2. Before even thinking about training

- **conduct MH risk assessment**
- **adopt a participatory ergonomics approach**
- **screen employees for pre-existing injuries**

Feedback from panel:

Participants were in favour of the term 'risk management programme' rather than risk assessment because assessment is just the first part of the process. The group discussed the tension within training providers selling the service and those who actually have to deliver it. So those delivering the training, may very well have views on how it should be done but that's compromised by the need to get the business:

> *'I must say I think I do myself out of an awful lot of work because I wouldn't feel comfortable going into an organisation unless I'd done a site visit, unless I'd see the risk assessments, unless I understood the risk managing and where this training is going to sit in. You know, which is probably why I don't get as much work as other people!'*

3. Training should be viewed as an on-going process

- **Training is not a 'one-off'**
- **Needs to build and maintain knowledge and skills (refresher courses)**
- **Need to discourage 'tick box' mentality, focusing on legal compliance**
- **Consider 'cascade' training**

Recommendation:

Regarding the need to build and maintain knowledge and skills the group felt that it is important to bring in training that affects attitude and understanding as well:

'You know people do break rules….often for quite understandable reasons. And actually I think by just highlighting the pressures that they may be under to break the rules, having got the knowledge and skills….by equipping them in that way it strengthens their attitude …. it goes back to the hazard awareness and risk perception.'

Discussion of cascade training:

Cascade training may be included as a way of embedding the training into organisation processes and achieving sustainability. This was considered in relation to patient handling:

'The idea of training the trainers, have some mentors; people who can give on the job, shop floor advice. Not just going in, doing your training, going away …. trying to set up a system to support people. One aspect with the health service that comes out in the literature a great deal is people go on these courses but when they're back on the ward they don't always lift as they were told to do. Because it doesn't fit in with ward practice and people would rather fit in with the ward environment than do what they have been told on the training course – the safe way to do it. So it comes back to trying to change the culture of the place, so if you've got people who are mentors, monitoring what's happening people feel more comfortable in putting into practice what they've been taught on their training course.'

Regarding the concept of cascade training, the group discussed the importance of organisations providing appropriate support to staff in these roles so that the role is not perceived as an additional burden:

'I was up at ……. Hospital and the key workers were saying they weren't given the support or anything; in the end they just said oh, I'm not bothering to do it. The system just broke down.'

The expert panel discussed different methods that organisations can use to promote safe handling at work:

'One of the most successful interventions that I've ever seen, the organisation which was a large packaging organisation – based on their messages from their training provider, who had T shirts made with jam donuts on the T shirt and the caption was "keep your jam in your donut". And it absolutely enthralled them, and actually got this buy into this crazy notion to keep your jam in your donut, which is a central concept of the spinal movements. But it seemed to just encapsulate all they required to get them to buy into the idea and you couldn't walk around there without them shouting at each other: "keep your jam in your donut mate!" it's quite absurd but there's lots of iconography that can be used to maintain this kind of interest in good manual handling technique.'

4. Management support is crucial to success

- **needs visible commitment**
- **managers need to be familiar with course content**
- **suggest including managers in training session**

Feedback:

The group discussed the fact that managers need to provide visible support to the training.

> *'I think it's important that the managers are supporting this message about lifting and moving in a safe way so that it is seen as an equal if not greater priority than productivity.'*

> *'Yes, they need to be involved in the training and they'd probably need education themselves because they need to be signed up to it and they need to spot when it's not being done correctly.'*

Trainers themselves had differing views on involving managers in training sessions:

> *'I've been involved in a training programme recently about musculoskeletal upper limb issues. The manager had to sit in on one of the courses and on every department I went to, it was the quietest course ever, there was no discussion.'*

> *'We've done training sessions where we insisted on the manager being there but not necessarily for the practical. They were there either at the beginning of the training session or at the end, and in places where there was lots of bad blood where the participants would be saying to the trainer: "well, you tell us that but no-one here supports us" or "the management don't like that". We facilitated the manager being there so they heard it and had to either say: "you're right, we don't listen" or explain the situation. But it was about facilitating the behavioural change in a way because they were such a blocker to anybody moving on, because they said managers don't care. And that may well have been true but we had to make the manager face up to that being the case.'*

5. How often should MH training be conducted?

- **evidence from literature weak**
- **MH training should be a planned programme – no end point**

One expert commented:

> *'These periodic interventions, whether they're three months apart, a year apart, three years apart, are not enough. It's about changing people's behaviour …. embedding it into the day to day it's not something that's done to you. It's just something that's there every single day.*

6. The trainer should have:

- **charisma**
- **credibility**
- **experience**
- **breadth of knowledge**
- **ability to engage and communicate**

Feedback:

The group agreed with these characteristic and reinforced the importance of experience:

> *'Having the experience of being able to put the information across to different types of groups; from the manual workers to office workers, a breadth of experience as well as breadth of knowledge.'*

7. What qualifications should trainers have?

- **Formal qualifications not as important as experience? (cascade training involves no formal qualification)**
- **City and Guilds?**
- **Health and Safety?**
- **Ergonomics?**

Feedback:

> *'As long as the company themselves are aware of what they want and set the aims and objectives of the involvement of the person who's competent and check that they are competent, then it can all work quite well I think.'*

> *'But there are, you know, numerous examples where people have been bought in to provide competent advice and something's gone wrong and you end up then with a lapse or a failure which might result in people being injured or hurt at work.'*

8. Training style

- **make it relevant**
- **use a mixed approach to learning**
- **consider different learning styles**
- **include a practical element – ideally task specific practice**

It was considered that incorporating different strategies in training was important and that having a practical element was essential:

> *'Having a mixture of theoretical input, having practical experience, having different media; so it's audio, visual and kinaesthetic and all the rest of it. The evidence proves that the way adults learn, they do need that mixture. And some people will have a natural leaning towards one style of learning as opposed to another.'*

9. Understand the audience

Determine participants':

- **level of awareness**
- **physical fitness**
- **literacy/language skills**
- **screen employees for pre-existing injuries**

Feedback:

> *'I think it's really important if you're going to do a practical, you need to know what their capabilities are. And actually certainly from the training sessions that we've done in the past, if you've got somebody who can't bend their knees for example, then actually that encourages a problem solving approach. This person needs to do this job; how are we going to do this well for you? And it's part of the education of people to think that there isn't a set way that I must lift this thing or move this thing.'*

> *'We might discuss on the principles that they've learned in the classroom, what are the key features that we want to look for when we're moving and handling? And someone will say well I can't do it that way because my left knee is fused or something like that. So then you build up the idea saying well, what do you do? How do you move that? It just encapsulates for people that they don't have to do text book learning of only one way to move or lift. '*

> *'We facilitate them to produce their own solutions …. they work it out for themselves and we then go away with them empowered.'*

10. What is the optimum group size in relation to training?

- **Welsh Passport Scheme – 8 people**
- **Not more than 12?**

Feedback:

It was felt that for practical activities, having a group of more than 12 is unmanageable. But classroom situations could be larger:

> *'I think if you're creating a training package then think about the space you've got, think about what operations you're going to be practicing and tailor appropriately.'*

> *'It's also supervision of delegates isn't it as well? If they're learning a new skill, it's important to ensure that they're being supervised appropriately.'*

> *'It about empathy …. in theory you could bring fifty people in, provide them with the classroom bit and then over a period of the following weeks go round and see them in little groups of four or five at a time to do the practical bit. But you're not going to get the same rapport with that fifty.'*

11. What is the ideal length of a manual handling course?

- **A half day session**
- **A one day session**
- **Welsh Passport Scheme – three days**
- **What the client wants**

Comments:

'… probably not what the client wants (as they are paying for it for it) …'

12. Core content should cover:

- **Why MH matters**
- **Statutory requirements**
- **Anatomy and physiology**
- **Care of the back**
- **Lifting techniques**
- **Hands on experience**
- **Dealing with problems**

Feedback:

> *'It seems like a reasonable syllabus.'*
>
> *'Knowledge of how their body works, knowledge of how to look after their backs. Knowledge of lifting techniques. Hands on experience. Equipping them to deal with the kind of problems that may present when they encounter a task that they haven't encountered before'*
>
> *'If they're using hoists, getting things onto the hoist and off - even simple level transfers. There's a good way and a less good way. So looking at work performance, people often think of lifting; well, that's just the act of picking something up when manual handling broader for a start but also people's work patterns and their musculoskeletal load is affected by many different exposures across the shift. Trying to get a reasonable cross section of those in a training event is going to be quite useful I think.'*
>
> *'For me personally I try and avoid the term techniques in a training. I generally use principles.*'

Recommendations from the panel:

Change 'techniques' to 'handling principles'.

Regarding statutory requirements – emphasise that as an employee they have duties as well - duties to comply with their employer and the provision made.

13. Equip workers to risk assess for themselves

- **encourage workers to assess their work tasks**
- **encourage workers to report problems**

> *'There should be a feedback loop which says if there are things that you are doing out there that you feel you shouldn't be doing and there must be better ways of doing them, then do tell somebody.'*

14. Aim to improve physical fitness (work hardening)

- **evidence that physical fitness reduces injury**
- **general strength training better than training specific muscle groups**
- **improved worker fitness also beneficial for morale**

General agreement with these principles.

15. Teach how to warm up

- **warm up before lifting**
  (some evidence that this is beneficial, not clear for 'warming down')
- **how this is presented is important**
  - cultural differences
  - gender differences

While the experts acknowledged that warming up in the sports context was important in achieving peak performance, they were sceptical about the value of warming up prior to manual handling to avoid injury:

> *'There is undoubtedly evidence that muscles, tendons and other tissues have a significant precondition effect in that they don't behave in the same way when they're cold as they do when they're warmed up. But if you're dealing with a job where people are going to be coming in and working at a high degree of their capability, then that's going to be a bit more problematic. But you would hope you would be building in – after a risk assessment – a kind of job where people are in that moderation zone where the activity's generally good for them and that they can warm up gradually without you know, any additional kind of risk to themselves.'*

> *'When we looked at the literature we didn't really see any evidence to – to strongly support the benefit of warming up. There is a great belief out there that warming up is beneficial but even if you look in the sports physiology text books you will find that they say there isn't actually any evidence for it. People say "oh, what about all these athletes?" How often do you get athletes who pull a muscle when they sprint. They've just spent three hours warming up and they come out onto the race track and pull a muscle. So I'm very sceptical. The physiology of it is that the working muscle comes up to temperature very rapidly and is probably at working temperature in any case because that's what we do. We maintain our body temperature. I mean there might be exclusions in terms of if you are in cold conditions where the muscles have become*

chilled, but that's the exception. But I would be very wary about advocating warming up.'

'Similarly again stretching as well because nobody really thinks of that do they? Actually the evidence was that – that the worst thing you could do was stretching.'

'I think we need to move away from this view that people are going to be working to a high degree of their capability straight from the off. And risk assessment, the first principles are that you're trying to reduce and avoid those situations because you're at that high end level of risk.'

16. Teach good lifting technique

- **teach transferable skills (based on most recent L23)**
- **incorporate MH tasks familiar to the workers**
- **draw attention to lifting outside of work (lifting children, gardening)**
- **experienced workers MAY set a good example**

Recommendations:

There was general acknowledgement, based on previous discussion that the preferred phrase is 'good handling principles' rather than 'good lifting technique'.

'…. we see an awful lot of training that's based on the 92 revision of the Regs and it's everywhere, we come across it almost on a weekly basis.'

There was wide agreement that training should be based on the most recent revision of the MH regulations (published 2004) incorporating the key principles from the IOM report.

17. Training needs to have a feedback loop

- **Training and evaluation should be an iterative process**
- **Refine training in line with evaluation**
- **Establish audit procedures**
- **2 levels of evaluation**
  - satisfaction with course
  - organisational outcomes
- **Responsibility for evaluation with trainer or organisation?**

It was generally agreed that the evaluation of training should consider both the process of training (was the training well received by the recipients?) and the outcome of training (reduced injury rates and sickness absence etc). The issue of responsibility for evaluation was considered and it was felt that responsibility for evaluation resided with both the trainer and the employer:

'… presumably it would be a dialogue, if it's an external trainer you hope that there will be a dialogue between the employer and the trainer …. impact on sickness absence may well come further down the line if at all, being realistic.'

In concluding the discussion, the expert panel reiterated the need to promote general principles rather than techniques:

> *'I think it is wider than that, it should about educating and information. What we're trying to do here is not just about lifting, it's about trying to change people's attitudes. We're trying to change behaviour …. that has to come from educating and raising awareness of risk.'*

7.5 SUMMARY OF EXPERT PANEL ONE

The panel stressed the importance of achieving organisational culture change and increased understanding of risk among the workforce.

There was a good deal of consensus among the panel regarding the candidate principles however, the panel did have specific suggestions for improving the principles and these were incorporated into the next draft of the principles for inclusion in panel two.

8. EXPERT PANEL TWO

8.1 PROFILE OF EXPERT PANEL

A second expert panel discussion was held at Loughborough University in March 2007. The aim of this panel was to present the candidate principles (revised in light of the previous discussion) to a panel of key stakeholders. The second panel was selected to incorporate manual handling training providers, industries commissioning manual handling training and union representatives. The panel was hosted by the research team and comprised 14 key stake holders and manual handling experts. The profile of the expert panel is shown in Table 17.

Table 17 Members of the expert panel

Neil Budworth	Health & Safety Officer, E.ON UK plc
David Cockayne	Manual Handling Trainer, North West Training
Charles Cooper	Managing Director, Dove Training Services Ltd
Gordon Hall	Works Manager, Brett Landscaping and Building Products
Gary Kidd	Construction Instructor, Safety & Environment, CITB Construction Skills
Nikki Knight	Occupational Health Manager, E.ON UK plc
Jennifer Mitchell	Assistant National Health and Safety Officer, UNISON
Howard Lewis	Safety Support Coordinator, Air Canada
Jackie Peacock	Manual Handling Trainer, Pristine Condition
Doug Russell	National Health and Safety Officer, Usdaw
Nick Taylor	Ergonomics Manager, COPE Occupational Health and Ergonomics Services Ltd
Robert Thomas	Health, Safety and Environment Training Manager, Rolls-Royce plc
Simon Singlehurst	Training Instructor Lantra, Sector Skills Council for Environmental and Land Based Industries
Sally Ann Wiseman	Clinical Lead, WorkSafe

8.2 ANALYSIS OF DATA

The expert panel was recorded and fully transcribed. The transcribed material was analysed by sorting the material into emergent themes as described by Dey (1993). The themes are illustrated by verbatim quotes from panel members. The reliability of the analysis was ensured by having two researchers independently analyse the data.

8.3 OPEN DISCUSSION OF EFFECTIVE MANUAL HANDLING TRAINING

The expert panel started with an open discussion about the general principles of good manual handling training. The panel training experts commented on the motivation employers have for manual handling training:

> *'There's two types of employers: there's a proactive employer and then there's a reactive employer. I've had a phone call: could I provide training? When would you like it? Well, ideally yesterday because that's when the insurers came in and asked to see the training records.'*

> *'They just see themselves as having to do it because insurers say they do it. So what they do is they go and buy the off the shelf video that shows the guy in the overalls picking the box up off the floor …. it bears no resemblance to what their staff do in their actual work place. The other problem with those employers is the time that's available for training is very limited. In industries like food and distribution at the moment with the massive turnover in staff and influx of agency staff, often people for whom English isn't their first language.'*

> *'Unfortunately because of the kind of mentality they've got, they see manual handling training as the solution to all their manual handling problems.'*

> *'I think one of the main problems is that employers providing manual handling training because they have to, quite often from an insurance point of view; you've got employees who attend manual handling training because they have to …. the point of doing it is not getting across to them. The health care profession, where we are mainly based, is the worst sector by a long shot. I've trained many, many health care staff and nurses and I've watched them after I've trained them and they go straight back to their old practices because it's easier and quicker, or they believe it is.*

The panel participants agreed that manual handling training needs to be incorporated into a wider programme of organisational manual handling risk assessment:

> *'We have a number of customers that we're doing training for as part of an ongoing programme of improvements. One of the things we've found most effective is to be able to take the problems that they feed back …. spending the time prior to the training courses, getting a system, getting the processes within the company whereby they have allocated resources, time investment. They have people who are going to take those problems, deal with them and feed back to the individuals on the ground, that training must be a tool to facilitate change. Because the changes might be to do with equipment, they might be to do with working practices, they might be to do with management styles, they might be to do with the work environment. And those have to be seen to be changing. So the course then needs to be updated regularly …. but then actually show case studies and say this really is working. This is a process for change. People then climb on board and think "okay, now I'm going to do it better".'*

> *'With regards to training I think it's something that it has to have built in the programme where you do get refresher courses and as soon as there is a new method or a new way of working or a new piece of equipment that's introduced into the work force then people need to be updated and this needs to be kept on their records. And they also should have the opportunity to have refresher courses. And also they may go through the training process and don't fully grasp what the training was about or there's an element missing so there needs to be some in built mechanism so they can*

express this and perhaps, continue further training just to ensure that they are eliminating risk.'

'The first slide I show on a manual handling training presentation is that it is a skill for life. Because it's not just the work place. People do a far wider variety of manual handling outside the work place than they do in. And from an employer's point of view I always caution them against their staff having an injury at home that they then bring to work to have it again which is something they need to be aware of.

'If the only thing an employer can rely on in terms of justifying their approach to training is that someone's seen a film, that's not going to hold water anywhere because that in itself is not nearly good enough. I mean you can put the film on but do you know if they're paying attention? Do you know at the end of it they know how to handle properly? And clearly you don't know that.'

'When senior management are presented with the fact that manual handling training hasn't worked and the back pain problems aren't getting any better, it's all down to behaviour as far as they're concerned. It's all down to the people not taking the lesson on board for whatever reason, rather than looking at what the reasons are behind it.'

'Closer working involvement with the trade union reps, health and safety reps for example. On the shop floor, that can spot problems before they actually become major problems in the work force. And somewhere for the employees to actually contact someone and say "I don't feel comfortable doing this; can I have a risk assessment?".'

The expert panel members felt that involving management in the training process was of paramount importance:

'There is a need for some form of higher level training aimed mainly at management before you actually get to the basic training for the people on the shop floor.'

'I have a questionnaire at the end of it [training] and the number of times people have commented: it's a pity management don't come on this course, because it's the management that's telling them to do things that I'm telling them are unsafe the way they're doing them.'

'We've been lucky enough in the past to be able to take a shortened version to the board meetings and various senior management level meetings and saying to them, not that you're now going to do the course but because you're busy we're only going to do a short course. We're saying this is what we're telling your guys so these are the things that you're going to start hearing. These are the problems that you are going to have to start investing in.'

'In agricultural work we have got a lot of open courses where people come and just not from one environment. What we're trying to do is bolt together courses where you have a three hour very active course at the lower level, maybe another couple of hours on top of that to bolt together for people who have to do problem solving.. And then the management piece on the end so you can pick and choose between. And it's been very noticeable, the first two sections have gone extraordinarily well and been well received. But trying to get people to do the whole three, the management where they're going to come and say well, this is what we're going to teach your guys. And then add on the bit at the end with the management, it's just not been taken up.'

In terms of the form of training offered the panel stressed the need for task specific training methods and the importance of improving risk awareness:

> *'They show them the principles of manual handling and then of course they can't do it like that in their work place …. what you're talking about there is a management failure because it's all very well starting off with the general principles of manual handling but it's got to be job specific. In the air line industry we've got problems with working in confined spaces for example. Sometimes those holds taper right at the far end to two foot so there's no way you can keep your back straight, so you need to come up with a method statement and tell them exactly how they should perform that task.'*

> *'I think if we're looking at core principles here, some of the things that we need to look at is length of training because it's a cost for employers. How much time they're prepared to release their staff for training. Do we try and cram training into a one day course or do we make it an ongoing process? And again that's more expense to the employers. So we've got to come up with some sort of realistic core manual handling course specified to the job. So whenever we present a course we not only present the core principles of manual handling but it has to be job related as well to the people we're working with. But it's got to be time framed and cost effective.'*

> *'To get them involved in solution focus training is usually the best way of actually being able to accommodate most people in the work place so that they can change the way they work themselves and provide the solution.'*

8.4 CANDIDATE PRINCIPLES

1. Training should be part of an overall risk management programme

Should follow on after consideration of:

- **task**
- **load**
- **working environment**
- **individual capability**
- **work organisation**

The panel strongly agreed that training should be part of an on-going process and seen as an important component of managing risk in the workplace as opposed to conducting one-off training as part of regulatory compliance.

One panel member suggested that two further items should be added to the list of factors to consider: audit and review (covered in a later guideline).

2. Before even thinking about training

- **conduct MH risk assessment**
- **adopt a participatory ergonomics approach**
- **build management support**

Members of the panel commented:

> *'I think you've got that slightly the wrong way round. I think you want to start with build management support.'*
>
> *'If you start from good management support and work downwards, then maybe if that's mandatory for the management; if they know that the penalties are going to be against management, then maybe that's where you can start.'*
>
> *'I think we can turn the tide away from trying to escape negative consequences towards particularly for management, building in the idea of the positive business case benefits.'*
>
> *'Actually it's about internal communications within an organisation. Because often we find that we're dealing with the health and safety manager or the health and safety director of an organisation who's trying to put a justification together for the costs of the programme. But actually if you then went to the insurance department and actually looked at how much they were paying out at the back end, then nine times out of ten the cost is justification itself. Because the training inevitably pays for itself, but they struggle to get that money up front.'*

3. Management support is crucial to success

- **needs visible commitment**
- **managers need to be familiar with course content**
- **suggest including managers in training session**

The panel members agreed that involving managers can be helpful but some cautioned: '*There's a danger with including managers as you can lose control of the session*' and that '*It becomes a worker and manager session instead of a training session*.' It was generally acknowledged that such sessions need careful handling. Even where managers are not present it was felt important to allow training participants the opportunity to give open feedback:

> *'We usually allow a bit of time in our courses for what we call blood letting where they get to gripe about whatever it is they want, because it's overcoming that resistance and also you can feed that back to managers and occasionally there'll be people, because we're looking across the business, that can answer questions that people have.'*

4. Training should be viewed as an on-going process

- **Training is not a 'one-off'**
- **Needs to build and maintain knowledge and skills (refresher courses)**
- **Need to discourage 'tick box' mentality, focusing on legal compliance**
- **Consider 'cascade' training**

It was considered that cascade training was a valuable method for improving working practices, however one panel member discussing training in the health service noted:

> *'It's about having time to implement that, to give them the training and the support and then building blocks to support them as they go through. Within the PCTs and things like that people leave and move. Then you've lost that fantastic, enthusiastic, motivated person because they've been seen as fantastic, enthusiastic, motivated and then you have to start again.'*
>
> *'It's also about making the population want to be responsible for their own health and safety as well. It isn't just a management kind of responsibility is it? And if you want to live a long and happy life and be fit and well, by applying these principles at home and in the work place, that's what's going to actually help.'*
>
> *'Comet did a very good exercise a couple of years ago with the better backs thinking the HSE where - people actually delivered their goods, their white goods, to people's homes - they went and watched how they do it. And it turns out that over the years people who had been doing that for some time had built up tremendous techniques and skills for getting washing machines and driers and things like that across people's wooden floors without damaging the floors, without damaging their backs.'*

The panel discussed the fact that manual handling training is a skill for life and not simply confined to workplace activities:

'…. manual handling, it seems this evil thing that we have to do. And what we should all do in order to be able to do it is go and do some physical exercise and get fit …. this can be your physical fitness.'

'I think we need to get rid of the term manual handling because everybody goes – uumm - I think we've got to change it and we've got to relate it back to people.'

'The employer is doing it because he's got to or because he wants to, it's one or the other. But deep down the real beneficiary in this will be you the individual …. simple things like not being able to pick up your son or daughter because your back won't let you. These are the things that I think people need to consider.'

One panel member described an approach she observed in manual handling training in the utility industry:

'He did a presentation describing a chap who'd fallen down a slope and he'd broken something …. an arm or something …. and he couldn't lift up his brand new twins …. that was devastating for this chap and I think for three months he couldn't actually hold his babies. And the power of that to this audience was absolutely extraordinary.'

5. How often should MH training be conducted?

- **evidence from literature weak**
- **MH training should be a planned on-going programme – no end point**

Some commented that training during induction followed by annual training seemed appropriate but also agreed that frequency should be determined by need: *'If you're monitoring behaviour, as soon as behaviour starts to decay …. If you're monitoring accidents, as soon as your accidents start to go up.'*

'But we are assuming that manual handling training will fail or it will wear off …. the natural position is to do it badly and we're trying to drag people away from it. If five years down the line you're still doing fantastic, self-monitoring and improved practice, then do you need it again?'

'if somebody has an accident, then they have to go for training again, they develop a chronic ill health situation where their life style has to change; then they go through the training again. And that way you pick up as somebody said all the individual differences, because ideally it should be second nature.'

6. The trainer should have:

- **charisma**
- **credibility**
- **experience**
- **breadth of knowledge**
- **ability to engage and communicate**

The panel agreed with the suggested characteristics and noted that these vary depending on the form of training. With regard to people selected for cascade training, one panel member commented: *'there is a kind of a trade off there because what they may lose in charisma …. they're gaining credibility.'*

The panel commented on the lack of standardisation and regulation, as one panel member put it:

> *'Maybe what we should be looking at is a credible professional trainer's course before you actually become a trainer. I'm talking about professional trainers because we are not teachers, we're trainers. It's a different thing altogether. I was at a first aid conference a couple of weeks ago where there was an Australian trainer there. And he said that all the trainers who train first aid in Australia must have this minimum trainer's trainer qualification before they're allowed to do any training. And it's interesting we have got nothing that regulates us, especially within manual handling. Anybody off the street can go and teach a manual handling course. So there's no regulation on it at all.'*
>
> *'What you train today is probably different to what was trained ten years ago. I think it's an evolving body of knowledge and techniques that are used and always put across as changed and will continue to change. And remember that there's some research a few years ago and it found that the trainers, the videos – not only training different things, some of them were absolutely contradictory in what they say.'*
>
> *'But if the trainer is an accredited trainer whose competency level is such that they could train manual handling one day and they could do something else the next and something else the day after, it doesn't matter what they train because they know when they're training they have to know their subject, know the legislation outside, know the work place they're going into.'*
>
> *'I'm not actually convinced because some of the people that have been most effective that I've seen on lifting and handling training are not formal trainers, but they're extremely good at engaging and communicating and are very charismatic. And they just sweep people along with them.'*

7. Qualifications and competencies

- **those commissioning training should establish that trainers are appropriately qualified and competent**
- **various ways in which this can be demonstrated**
- **onus on trainer to demonstrate competence**
- **experience of training insufficient of itself**

A manual handling trainer from a well-established training agency described an eight month programme, developed by the company founder. While their trainers had no formal qualifications, she commented:

> *'The reason that we've enjoyed so much success in the areas that we've worked in and the programmes that we've developed, has been because the trainers have absolutely been able to relate to the individuals at the coal face.'*

Commenting on the lack of standardisation some kind of accreditation, one expert commented:

> *'But if you look at the work place, at all the people that we train within the work places, every one of them in order to do their job must be trained to a minimum standard. So what minimum standard are trainers trained to? There isn't one.'*

One trainer commenting on qualifications stated:

> *'Can I just make one point on that, on that first bullet point? I think I have some difficulty with that because I think I would like to pass myself off as being appropriately knowledgeable and competent but not qualified, because there's no qualification for us. So I don't think that's realistic to have that in there.'*

Some panel members suggested that HSE might take a role in establishing basic competencies of trainers and including this as an aspect of company inspections.

8. Understand the audience

Determine participants':

- **level of awareness**
- **literacy/language skills**
- **physical fitness**
- **establish if employees have pre-existing injuries**

The panel agreed with the need to establish these factors and one commented: *'that's got to be established way before you even start delivering the course.'*

There was some discussion about the problems associated with establishing pre-existing injuries, and whether this requires specialist input from a physiotherapist or occupational health staff.

9. Training style

- **make it relevant**
- **use a mixed approach to learning**
- **consider different learning styles**
- **include a practical element – ideally task specific practice**
- **equip workers to risk assess for themselves**

The panel discussed the problem of incorporating mixed methods using computer based training, but agreed with these suggestions for training in general.

In discussing film based materials, a manual handling training expert commented:

> *'We develop interactive material which is films at the coal face, for our customer, and obviously it's an expensive exercise but when you're talking about larger organisations, we'll actually go in and make a production which then supports the programme when we're not there. So when they have an induction for someone coming on board. There's a practical element of it that's delivered by a competent person, a support group member we would call them, until such times as we then visit them on a quarterly or six monthly basis. And actually we made a conscious decision now that we don't deliver any training to people unless they sign up to a full programme which includes regular maintenance visits to keep the programme and the profile high, because as we've quite rightly pointed out before. As soon as you deliver it people go back and tend to adopt their old habits within a given period of time.'*

Some were sceptical as to whether SMEs could afford such an approach but this trainer explained:

> *'We've just actually made a production for pubs - a production for all the pub landlords throughout the UK. So that actually works, for SMEs there are programmes that we're actually undertaking the production of at the moment. They go into the pub, into the cellars, working with gas cylinders, working with the barrels, the kegs and all the rest of it. And actually showing people how to handle gas cylinders downstairs. And there's a question and answer session at the end of it. And that package is less than a hundred pounds. So that's targeted at specific industry sectors.'*

10. What is the optimum group size in relation to training?

- **Welsh Passport Scheme – 8 people**
- **8 – 12 people**

11. What is the ideal length of a manual handling course?

- **A half day session**
- **A one day session**
- **Welsh Passport Scheme – three days**

The panel agreed with the guideline on group size. Regarding length of course one member commented: *'I can't even begin to conceive how manual handling could be stretched out over three days.'* but another member clarified that the Welsh Passport scheme is focused on patient handling.

12. Should be viewed as an on-going process and structured accordingly

- **formal, refresher components**
- **at least every 12 months**

The panel discussed how the refresher component should relate to the training course. One manual handling trainer commented:

> *'We do a basic course that everybody does which is half a day. And then there's a choice of refreshers. There's either a cut down practical version or an e-learning version. And basically the cut down practical version goes for the shop floor type employees, people in a manual handling environment, and the e-learning is generally for the office environment.'*

13. Core content should cover:

- **Why MH matters**
- **Statutory requirements**
- **Anatomy and physiology**
- **Care of the back**
- **Handling principles**
- **Hands on experience**
- **Risk assessing situations**
- **Dealing with problems**

The panel agreed with the suggested content: *'I mean I'm absolutely supportive of that. I think that's entirely the right material.'*

The panel discussed the differing requirement of different types of work in organisations such as office work versus manual labour and one commented:

> *'I'm simply asking about the practical hands on experience or all staff, or if there are some groups that are more exposed and therefore need the practical hands on whereas we accept some people are sort of lower risk and therefore we can do things like e-learning.'*

14. Aim to improve physical fitness (work hardening)

- **evidence that physical fitness reduces injury**
- **general strength training better than training specific muscle groups**
- **improved worker fitness also beneficial for morale**

There was general agreement that improving physical fitness was important:

> *'We've started doing very simple exercises right at the beginning of the programme, doing a body check to start with. And then getting them doing some very, very simple exercises and getting people to listen to what their bodies are saying to them, without attaching anything to it. So they first of all start to know where those hot spots are and where some of that stress and strain is. And usually if you get it into people you know,*

hot spots and things, within a minute of doing some of the exercises we put them through. And then we say actually, you're already experiencing some of those issues that could over a period of time cause problems. So we've got them listening to us straight away.'

However one expert cautioned about emphasising physical fitness in some industrial sectors:

'*If you have got somebody who's doing physically hard work like in construction industry or in the meat industry for example, and you start trying to lecture them about physical fitness, they're just going to laugh in your face.'*

15. Teach good MH principles

- **teach transferable skills**
  (based on most recent version L23)
- **incorporate MH tasks both familiar and unfamiliar to the workers**
- **draw attention to lifting outside of work (lifting children, gardening)**
- **experienced workers MAY set a good example**

The panel strongly supported to need to consider manual handling tasks outside with work environment such as shopping. One expert also noted the importance of good posture:

'The points that we're trying to get across are actually that it's not all about what's out there. And probably the biggest load that you'll carry or move around in the day to day is you. You know, that a lot of it's about posture. It's not just "well, I'm not carrying anything so it doesn't matter what position I'm in" we say actually you know, it does.'

16. Evaluate the process and the outcome of training

- **levels of evaluation**
  - satisfaction with course
  - changes in work practices
  - organisational outcomes
- **establish responsibility for evaluation - trainer or organisation?**

There was general support for the need to evaluation training at the various levels outlined.

Finally the panel discussed the principle left out following the previous expert panel discussion, the issue of warm up.

'I think you are talking about a major, major cultural change if you're going to get people in this country to warm up before they go to work …. or warm up before they do an activity in work.'

The panel agreed that the guideline on warm up should be left out with the exception of workers operating in cold thermal environments:

'I used to work at Manchester Airport where temporary workers could start work at five o'clock in the morning when it could be extremely cold. Having been in a warm bed and the time between getting out of that warm bed and actually starting work, could be as little as half an hour. And they thrust immediately into very, very strenuous physical activity in the hold of an aircraft where they've got out of a cold environment, the outside, into a warm hold. And their muscles are subject to quite significant changes. And then halfway through they'll take their donkey jackets off and they'll get out then, having sweated, into a cold environment where the temperature could be below freezing. With their coat over their shoulder, waiting for the temperature to cool them down. These are issues that I think play havoc with muscles.'

8.5 SUMMARY OF PANEL TWO

The panel emphasised that manual handing training needs to incorporated into a on-going programme of organisational safety management and felt that involving managers was crucial to success. They also stressed the need for task specific training programmes.

The panel indicated a high level of consensus regarding the candidate principles but had some suggestions for improving the principles and these were incorporated into the version presented in section 9.

9. SUMMARY AND GUIDING PRINCIPLES FOR EFFECTIVE MANUAL HANDLING TRAINING

9.1 SYSTEMATIC LITERATURE REVIEW

A systematic review examined the evidence for and against the effectiveness and appropriateness of different approaches to training in manual handling. Peer reviewed publications along with published conference proceedings and reports from health and safety agencies, published in English, between the time period 1980 to 2006, on the topic of manual handling training comprised the search criteria. A published checklist for reviewing papers was used as the basis for assessing the quality of the papers reviewed.

The review identified 84 papers, comprising 50 intervention studies; 22 papers describing questionnaire based surveys or audits assessing the effectiveness of prior manual handling training and 12 reviews or reports detailing the views of expert groups on manual handling training. The results of the systematic review indicated there to be little evidence supporting the effectiveness of both technique and educational based manual handling training. There was considerable evidence that principles learnt during training are not transferred to the working environment. There was evidence to suggest that strength and flexibility training is beneficial but further research is needed to ascertain whether such an approach is sustainable in the long term. There was no evidence for the effectiveness of back schools in preventing low back pain. Multi-component ergonomics interventions, particularly those that include risk assessments, the observation of workers in their working environment, the tailoring of training to suit individual needs, and the redesign of equipment and handling tasks were most effective in reducing the risk of manual handling injuries.

9.2 TELEPHONE SURVEY OF CURRENT MANUAL HANDLING TRAINING

The telephone survey indicated that staff induction and statutory requirements are the main drivers for manual handling training. Most training is on an annual basis and training is generally conducted in half a day. More than 75% of companies surveyed conduct in-house training. Of the consultants interviewed, only 2/3 reported conducting site visits prior to conducting manual handling training and only 2/3 stated that they follow-up organisations to establish the effectiveness of training.

Most training incorporates a practical element, but this can vary from showing of a video of people lifting, practical tasks undertaken within the classroom using non-specific items, practical tasks undertaken within the classroom using task specific equipment and a mock-up situation using non-specific items and a mock-up situation using task specific equipment. Most organisations and consultants record participant feedback on training. In terms of evaluating the effectiveness of training, organisations use sickness absence as the main outcome measure.

Survey respondents felt that manual handling training is more effective if it is tailored to specific industry and task demands. A practical element to the training was believed to reinforce learning, particularly if tailored to individual job demands. Manual handling training was felt to be most effective when reinforced with suitable materials and ongoing support and the provision of refresher courses. Trainers with experience and knowledge of a particular industry were thought to have greater understanding of specific risks within an organisation and result in more effective training. Manual handling training offered by external consultancies

was considered most effective where consultants developed a thorough understanding of organisational needs via site visits undertaken before training commences.

9.3 EXPERT PANELS

The expert panels were conducted to validate the findings of the research and to generate guiding principles for effective manual handling training. The first panel comprised experts from the disciplines of occupational health, ergonomics, health and safety, and organisational behaviour. The second panel was selected to incorporate manual handling training providers, industries commissioning manual handling training and trade union representatives.

The panels considered that the focus of manual handling training should be on promoting the right culture to achieve safer working practices. They felt that such training should not be seen as an annual chore but rather that manual handling training needs to be an integral, on-going process involving regular refresher components, as part of an overall manual handling risk assessment strategy. The panel experts felt that the emphasis in training should be on increasing understanding and helping workers to risk assess their tasks as opposed to specific lifting technique training. Management commitment was believed to be crucial to successful training. The panel experts favoured industry and task specific training rather than generic programmes and highlighted the need for evaluation of training and refinement of training methods in line with this evaluation. The panel also commented on the need for some form of accreditation and standardisation of training agencies.

9.4 GUIDING PRINCIPLES FOR MANUAL HANDLING TRAINING

These principles were developed based on the findings from the systematic review, survey and the research team's expert knowledge. The principles were then presented to the two expert panels and refined in the light of the comments from the expert panel members.

1. Before even thinking about training

- **build management support**
- **conduct MH risk assessment**
- **adopt a participatory ergonomics approach**

2. Management support is crucial to success

- **needs visible commitment**
- **managers need to be familiar with course content**
- **suggest including managers in training session**

3. Training should be part of an overall risk management programme

Should follow on after consideration of:

- **task**
- **load**
- **working environment**
- **individual capability**
- **work organization**

4. Training should be viewed as an on-going process

- **Training is not a 'one-off'**
- **Needs to build and maintain knowledge and skills (refresher courses)**
- **Need to discourage 'tick box' mentality, focusing on legal compliance**
- **Consider 'cascade' training**

5. How often should manual handling training be conducted?

- **training should be provided at induction and then viewed as a planned on-going process – no end point**

6. The trainer should have:

- **charisma**
- **credibility**
- **experience**
- **breadth of knowledge**
- **ability to engage and communicate**

7. Qualifications and competencies

- **those commissioning training should establish that trainers are appropriately qualified and competent**
- **various ways in which this can be demonstrated**
- **onus on trainer to demonstrate competence**
- **experience of training insufficient of itself**

8. Understand the audience
Determine participants':

- **level of awareness**
- **literacy/language skills**
- **physical fitness**
- **establish if employees have pre-existing injuries**

9. Training style

- **make it relevant**
- **use a mixed approach to learning**
- **consider different learning styles**
- **include a practical element – ideally task specific practice**
- **equip workers to risk assess for themselves**

10. The optimum group size in relation to training

- **8 – 12 people**

11. The ideal length of a manual handling course

- **Half day – up to one day**
- **Welsh Passport Scheme – three days – patient handling**

12. Manual handling training should be viewed as an on-going process and structured accordingly

- **formal, refresher components**
- **at least every 12 months**

13. Core content should cover:

- **Why MH matters**
- **Statutory requirements**
- **Anatomy and physiology**
- **Care of the back**
- **Handling principles**
- **Hands on experience**
- **Risk assessing situations**
- **Dealing with problems**

14. Aim to improve physical fitness (work hardening)

- **evidence that physical fitness reduces injury**
- **general strength training better than training specific muscle groups**
- **improved worker fitness also beneficial for morale**

15. Teach good manual handling principles

- **teach transferable skills**
  (based on most recent version L23)
- **incorporate tasks both familiar and unfamiliar to the workers**
- **draw attention to lifting outside of work (lifting children, gardening)**
- **experienced workers MAY set a good example**

16. Evaluate the process and the outcome of training

- **levels of evaluation**
  - satisfaction with course
  - changes in work practices
  - organisational outcomes
- **establish responsibility for evaluation - trainer or organisation?**

9.5 CONCLUDING REMARKS

The guiding principles presented here are based on the findings of a systematic literature review, survey and a wide range of expert opinion. It is intended that these broad principles serve as a basis for further discussion and future research, which may ultimately contribute to the development of more effective manual handling training methods.

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ACKNOWLEDGEMENTS

We would like to thank all of our participating organisations and consultants for the time they gave so generously to this study. Particular thanks go to all of the experts who invested time and effort in attending the expert panels to validate the guiding principles for effective manual handling training.

We would also like to thank Chris Quarrie, David Lewis and Paul Wallis, HSE for their support and guidance throughout the project.

APPENDIX 1

SYSTEMATIC REVIEW - THE SCORING CRITERIA

Developed by Downs and Black (1998)

	Item	Authors
Reporting	Are the hypotheses/aims clearly described?	
	Are the main outcomes to be measured clearly described in the Introduction or Methods?	
	Are the characteristics of the participants included in the study clearly described?	
	Are the interventions of interest clearly described?	
	Are the distribution of principal confounders in each group of subjects to be compared clearly described?	
	Are the main findings of the study clearly described?	
	Does the study provide estimates of the random variability in the data for the main outcomes?	
	Have all important adverse events that may be a consequence of the intervention been reported?	
	Have the characteristics of patients lost to follow-up been described?	
	Have actual probability values been reported for the main outcomes except where p<0.001?	
External validity	Were the subjects asked to participate representative of the entire population from which they were recruited?	
	Were those subjects who were prepared to participate representative of the entire population from which they were recruited?	
	Were the staff, places, and facilities where patients were treated, representative of the treatment the majority of patients receive?	
Internal validity - bias	Was an attempt made to blind study subjects to the intervention they have received?	
	Was an attempt made to blind those measuring the main outcomes of the intervention?	
	Was a control group used?	
	If any of the results of the study were based on "data dredging", was this made clear?	
	Was there a follow-up period?	
	Do the analyses adjust for different lengths of follow-up/is the time period between intervention and outcome the same for cases and controls?	
	Were the statistical tests used to assess the main outcomes appropriate?	
	Was compliance with the interventions reliable?	
	Were the main outcome measures used accurate (valid and reliable)?	
Internal validity - selection bias	Were the subjects in different intervention groups, or were the cases and controls recruited from the same population?	
	Were the study subjects in different intervention groups, or were cases and controls recruited over the same time period?	
	Were study subjects randomised to intervention groups?	
	Was the randomised intervention assignment concealed from both patients and health care staff until recruitment was complete?	
	Was there adequate adjustment for confounding in the analyses from which the main findings were drawn?	
	Were losses of participants to follow-up taken into account?	
Power	Did the study have sufficient power to detect meaningful differences as <0.05? (mark on a scale of 0-4)	
Total score (out of 32)		

APPENDIX 2

INTERVIEW SCHEDULE USED FOR ORGANISATIONS

Manual Handling Training Interview Schedule for Organisations

I am a Research Associate working in the Department of Human Sciences, Loughborough University. My research involves looking at what constitutes effective manual handling training in organisations. This research project is funded by Health and Safety Executive. I was hoping that I may interview you about the type of manual handling training undertaken within your organisation.

With your permission, I would like to tape record the interview. All the information collected will be kept strictly confidential. The information will be kept in a secure location, accessible only by the researcher. All references to participants in any report and subsequent publications will be anonymous.

1. Company Details

- Name of contact
- Name of company
- Type of industry
- Number of employees

2. Has your company conducted or bought-in MH training in the last 12 months?

- Yes No Frequency ……
- If your company has not received manual handling training in the last 12 months, how long ago was the last manual handling training course held? *****
- In your view, how often should manual handling training be offered to your employees?

3. Do employees elect to go on MH training courses or are the courses mandatory?

4. How soon after starting with the organisation are new recruits given MH training?

5. Can there be a gap between training and putting it into practice?

6. Does your organisation use an in-house manual handling training program or do you use a external company to conduct manual handling training?

- In house
- External (Name of Company conducting the external training?)

[The literature on training suggests that skills learnt normally have a duration of about 12 months before they need to be re-taught. Therefore this interview survey will comprise only companies that have received training within the last 12 months.]*

Use of external manual handling trainers

7. Why did you decide MH training was needed at that time?

- *sickness/injury reports*
- *new working practices*
- *regulatory requirements*

8. Prior to the MH training, was a site visit conducted by the training company?

- Yes No
- What was done during this site visit?

    - Was the information gathered integrated into the manual handling training?
    - If so, how was it integrated?

9. Prior to the MH training, did your company carry out a MH risk assessment in order to guide the training

- Yes No
- Are you aware if this information was integrated into the manual handling training program?
- Yes No
- How?
- If no why not?

10. Did you discuss the objectives of the training with the training company before the course?

- What were the stated objectives?
- Do you think those objectives were met?

11. For an individual trainee - how long are the training sessions and how many sessions do they attend?

- Duration ……. hours
- Number of Sessions ……..

12. How was the training was delivered?

- In person by the trainer
- Via video
- Via computer based training
- Mix of the above - please specify.

13. If there was a practical element to the course how was it carried out?

- Video of people lifting (in this company or generic)
- Classroom based where each delegate has the chance to practice lifting non task specific equipment (e.g. box)
- Classroom based where each delegate has the chance to practice lifting task specific items (e.g. sack of flour)
- Site/mock up based training (delegates have the chance to practice **some** lifting tasks in the work environment/simulated environment
- Site/mock up based training (delegates have the chance to practice **all** lifting tasks in the work environment/simulated environment

14. Did the manual handling training take into account any individual differences such as disabilities, experience levels, work environment?

- Please describe
- Did the course offer industry specific training
- Did it offer task specific training

15. Do you have any feedback on what type of training trainees prefer?

prompt:

- Class based (e.g. information about the spine and injuries that occur as a result of manual handling)
- Practical sessions (e.g. allowing trainees to practice)
- Combination

16. At the end of the training session, was any feedback recorded from the trainees either by the training providers or yourselves?

- Yes No
- If yes, how was this done?
- If yes, what questions were asked in the feedback? – May I have a copy of the feedback questionnaire please?

- What were the overall findings of the feedback?

- Have you made any changes as a result of the feedback?

17. Do the trainers provide feedback on the level of interest/engagement of trainees?

- If you receive feed back that trainees are not engaged/interested what do you put this down to?
- What is done about it?

18. Has your company (or the training organisation) conducted any evaluation to determine the effectiveness of the training received?

- Yes by the organisation

- Yes by the trainer
- No
- If yes how long after was this conducted?

19. How do you measure effectiveness?

- productivity measures
- sickness absence
- cost-benefit analysis
- staff morale
- other (please specify)

20. Are refresher courses conducted after training?

- How long after?
- How frequently?
- What does it involve (full/part course)

21. Would you use the training company again?

- Yes No
- Why/why not?

Would you mind passing on the contact details of the company as we are intending to interview manual handling trainers in our survey.

In-house training:

22. Can you please briefly describe the MH training that your company undertakes?

23. Why did you decide MH training was needed at that time?

- *sickness/injury reports*
- *induction of new employees*
- *new working practices*
- *regulatory requirements*

24. Prior to the MH training, did your company carry out a MH risk assessment in order to guide the training

- Yes No
- Are you aware if this information was integrated into the manual handling training program?
- Yes No
- How?
- If no why not?

25. For an individual trainee - how long are the training sessions and how many sessions do they attend?

- Duration ……. hours
- Number of Sessions ……..

26. How was the training was delivered?

- In person by the trainer
- Via video
- Via computer based training
- Mix of the above - please specify.

27. If there was a practical element to the course how was it carried out?

- Video of people lifting (in this company or generic)
- Classroom based where each delegate has the chance to practice lifting non task specific equipment (e.g. box)
- Classroom based where each delegate has the chance to practice lifting task specific items (e.g. sack of flour)
- Site/mock up based training (delegates have the chance to practice **some** lifting tasks in the work environment/simulated environment
- Site/mock up based training (delegates have the chance to practice **all** lifting tasks in the work environment/simulated environment

28. Did the manual handling training take into account any individual differences such as disabilities, experience levels, work environment?

- Please describe
- Did the course offer industry specific training
- Did it offer task specific training

29. Do you have any feedback on what type of training <u>trainees prefer</u>?

prompt:

- Class based (e.g. information about the spine and injuries that occur as a result of manual handling)
- Practical sessions (e.g. allowing trainees to practice)
- Combination
- **What <u>do you think</u> works best?**

30. At the end of MH training, is feedback recorded from the trainees?

- Yes No
- If yes, how was this done?
- If yes, what questions were asked in the feedback? – May I have a copy of the feedback questionnaire please?

- What are the overall findings of the feedback?

- Have you made any changes as a result of the feedback?

31. How do you <u>measure the effectiveness</u> of MH training programs?

- productivity measures
- sickness absence
- cost-benefit analysis
- staff morale
- other (please specify)

Thank you for taking the time to speak with me. Your cooperation is much appreciated.

APPENDIX 3

INTERVIEW SCHEDULE USED FOR TRAINERS

Manual Handling Training Interview Schedule for Trainers

I am a Research Associate working in the Department of Human Sciences, Loughborough University. My research involves looking at what constitutes effective end user manual handling training (by this I mean the courses designed for the workers undertaking manual handling). This research project is funded by Health and Safety Executive. I was hoping that I may interview you about the type of manual handling training undertaken by your organisation.

With your permission, I would like to tape record the interview. All the information collected will be kept strictly confidential. The information will be kept in a secure location, accessible only by the researcher. All references to participants in any report and subsequent publications will be anonymous.

1. Company Details

- Name of company
- Number of trainers
- Name of contact
- Date of interview

2. Trainers details

- Who delivers your training?
- What training qualifications do the trainers have?

3. What prompts companies to use MH training services?

- *sickness/injury reports*
- *new working practices*
- *regulatory requirements*
- *induction*

4. Before commencing a MH training course do you conduct a site visit?

- Yes No
- What do you do during this site visit?

    - Is the information gathered integrated into the manual handling training?
    - If so, how is it integrated?

5. Before each MH training program are the objectives laid out?

- to the trainees
- to the management
- both
- can you provide me with an example of how you lay out your objectives?

6. For an individual trainee - how long are the training sessions and how many sessions do they attend?

- Duration ……. hours
- Number of Sessions ……..

7. What topics do you cover and for how long?

- law
- responsibilities
- statistics
- anatomy and physiology and biomechanics
- principles of good lifting
- other - please specify

8. How are these topics delivered?

- In person by the trainer
- Via video
- Via computer based training
- Mix of the above - please specify.

9. If there is a practical element to your course how is it carried out?

- Video of people lifting (in this company or generic)
- Classroom based where each delegate has the chance to practice lifting non task specific equipment (e.g. box)
- Classroom based where each delegate has the chance to practice lifting task specific items (e.g. sack of flour)
- Site/mock up based training (delegates have the chance to practice **some** lifting tasks in the work environment/simulated environment
- Site/mock up based training (delegates have the chance to practice **all** lifting tasks in the work environment/simulated environment

10. Would you say that your MH training is largely about delivering the principles of good handling OR prescribing specific techniques?

11. How does the MH training take into account any individual differences such as disabilities, experience levels etc within the workforce?

- Please describe

12. Do you assess trainees' needs and learning styles at the start of the course?

13. What types of industry do you deliver training to?

- Do you have different courses/approaches for different industries. Please specify.

14. What do you feel is the optimum group size for MH training?

15. What measures/material do you provide to re-enforce the messages from the training?

16. At the end of training courses, is immediate feedback obtained from the recipients?

- Yes No

If yes, what questions were asked in the feedback? – May I have a copy of the feedback questionnaire please?

17. After courses are completed do you follow-up the organisations to determine the effectiveness of the training courses?

- What would be a typical time period for the follow-up?
- How do you measure effectiveness?
- If the feedback showed that training was effective, what elements are generally found to be effective?
- If the feedback showed that the training was not effective, is anything done to rectify the situation?

18. Do you offer refresher courses?

- How long after?
- How frequently?
- What does it involve (full/part course)

19. What aspects of your courses do you feel are particularly effective?

Can you recall an example of a company where you could highlight a particularly effective training course?

Thank you for taking the time to speak with me. Your cooperation is much appreciated.

Published by the Health and Safety Executive 09/07

HSE

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Manual handling training

Investigation of current practices and development of guidelines

This report presents findings of a systematic literature review, telephone survey and expert panels undertaken to determine what constitutes effective manual handling training. The results of the systematic review indicate there is very little evidence supporting the effectiveness of both technique and educational based manual handling training. There was evidence that principles learnt during training are not applied in the workplace. Strength and flexibility training appears potentially beneficial, however further research is needed to determine whether it has long term benefits in terms of injury reduction. There was no evidence for the effectiveness of back schools in preventing low back pain. Ergonomics interventions that include risk assessment, observation of workers, tailored training and task/equipment redesign have been shown to be beneficial in the literature. The telephone survey indicated that induction of new staff and statutory requirements are the main drivers for manual handling training. More than 75% of companies surveyed conduct in-house manual handling training rather than out sourcing training to consultants. Most organisations and consultancies record participant feedback on training courses and sickness absence is regarded as the main outcome measure of effectiveness. Survey respondents felt that manual handling training is more effective if it is tailored to specific industry and task demands. Practical elements in training were believed to reinforce learning, particularly if tailored to individual job demands. To be effective, manual handling training needs to be embedded as an on-going process in organisations and reinforced with regular refresher courses. Training should encourage the workforce to assess risk and there needs to be careful monitoring of working practices. The expert panels reviewed the findings and the discussions were used to generate and refine a set of guiding principles for effective manual handling training.

This report and the work it describes were funded by the Health and Safety Executive (HSE). Its contents, including any opinions and/or conclusions expressed, are those of the authors alone and do not necessarily reflect HSE policy.

RR583

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