TRAINING INTERVENTION STUDIES AS FOUND IN THE LITERATURE ADDRESSING VARIOUS TYPES OF OCCUPATIONAL HAZARDS

A-IV. Control of Ergonomic Hazards

Work Setting Operation (Ref)	Training Objective	Training Plan	Evaluation Method	Extra-Training Factors	Results	Comments
6 health-care staff serving persons with multiple physical handicaps/ambulatory problems in an infirmary unit showing excessive numbers of injuries while transferring clients. (Alavosius & Sulzer-Azaroff, 1985; 1986)	To learn and apply sequence of steps (e.g., prepare patient or surface for transfer, maintain proper body position/posture, lift/place and secure patient on new surface) in reducing stress of patient transfer tasks. Steps based on the manual lifting literature and consulting with physical therapists.	Each caregiver given written instructions in performing steps and verbal feedback from on-the-job checks by trained observers using checklists for rating safe/unsafe components of patient transfers. Observers trained to ensure accuracy in use. Observer checklist data used in weekly verbal feedback to caregivers in efforts to have them learn/comply with proper lifts. Feed-back subsequently withdrawn to assess retention 1 week to 7 months afterwards.	Observer checklist data defined components of safe transfer actions for baseline, feedback, and post feedback periods of data collection. In addition, the caregivers were given a questionnaire asking their opinion of the procedures used in the intervention.	Other than the feedback given individually to the caregivers as to their compliance with safe transfer actions as part of this on-the-job evaluation, no other factors mentioned.	The feedback period was marked by improvement in safe performance for those 10 components that scored lowest during baseline (occurred in less than 75% of the observations) with others remaining at a high level. After feedback, 4 of these components fell back below the 75% observed level. Responses to the questionnaire were positive; all agreed that the feedback improved the safety of their transfers.	Feedback in this application was individual and private as opposed to other studies where it was a group effort, posted for public viewing. Authors suggest that this argues for the generality of the procedure. No effort was made to note any changes in the injury rate. In view of the small sample size, no changes in this measure were expected.

A-IV. Control of Ergonomic Hazards

Work Setting Operation (Ref)	Training Objective	Training Plan	Evaluation Method	Extra-Training Factors	Results	Comments
30 food service workers whose tasks included frequent, fast-paced lifting, lowering, and transfer of trays, other objects of varying weight. (Carlton, 1987)	To teach workers the straight back/bent knee method of lifting and recognition of 4 high-risk workstyle factors (i.e., horizontal displacement, spinal torque, pace/object control, forward/rearward stability).	Workers divided into 2 groups, one (experimental) receiving a 1-hour body mechanics course emphasizing the high-risk work-style factors and the necessity of straight-back, knee bent position in lifting. Videotapes of the workers style of lifting/lowering a 20-lb box assessed by instructor, and kinesiologic models used to demonstrate least stressful techniques. The 2nd group (control) received no such instruction.	The assessment included 1) scoring worker's body mechanics as applied to a novel task of lifting/lowering trays weighing 5 to 30 lb performed 2 weeks after the 1-hour course, and 2) similar scoring for lifting, lowering, and transfer acts as observed in their actual work enviroment 1 week after the above evaluation. The scoring used a 17 point checklist that noted control of the various risk factors and use of straight-back and bent-knee posture.	The workers were told that the researcher's presence in the work environment was to do a job analyses when in fact he was scoring their body mechanics in lifting, lowering, and transfer. [See Comments column for mention of factors in work environment believed of consequence to one set of findings.]	The worker group receiving the body mechanics instruction scored higher on the novel lifting and lowering tasks than did the control group in demonsttrating better risk control actions. On the other hand, no differences were observed between the two groups in scores obtained for their on-the-job behaviors. Thus, although the workers showed knowledge gain from the instruction in a novel test, it was not transferred to the worksite.	Factors the author notes as thwarting transfer included the layout-obstacles in the workplace that made the workers assume awkward positions in handling loads; the pace of work that precluded optimal time for follow-through of acts prescribed for risk reduction. Needs noted for analyzing the work area to establish most practical techniques, effective training time, and practice to overcome habit patterns that are inherently stressful.

TRAINING INTERVENTION STUDIES AS FOUND IN THE LITERATURE ADDRESSING VARIOUS TYPES OF OCCUPATIONAL HAZARDS

A-IV. Control of Ergonomic Hazards

Work Setting Operation (Ref)	Training Objective	Training Plan	Evaluation Method	Extra-Training Factors	Results	Comments
26-33 warehouse workers engaged in lifting/moving boxes from shelves to pallets. (Chaffin, Gallay, Wooley, & Kuciemba, 1986)	To learn 5 specific lifting principles (i.e., keep load close, torso erect, lift smoothly, good grip, don't lift/twist) for minimizing stress in lifting tasks.	1-day supervisor sessions + a 4-hour session with workers using the VISUCOM low-back prevention program to emphasize the 5 practices for minimizing lifting stress.	Lifting posture of workers video-taped before and 35–51 days after training to determine compliance with the safe lifting practices.	Supervisors were supportive of training but instructed not to react to lifting postures during intervention.	Training improved 2 of 5 lifting practices (jerking of loads, and inadequate grips).	Some practices harder to adopt because work station layout factors and package size posed constraints. Question of whether modified behaviors could be maintained or others effected by added reinforcement and instruction.
18 workers who performed hand insertion tasks in electronic assembly work posing a risk of chronic trauma disorders (CTDs). (Dortch III & Trombly, 1990)	To learn 6 principles of joint protection (e.g., avoid joint stresses in positions of deformity and prolonged holding of joints in one position as used by persons with rheumatoid arthritis) to reduce stresses in current jobs.	Workers divided in 3 groups (G-I, G-II and G-III). G-I and II given 30- to 45-minute information session on CTD risk factors plus handouts showing less stressful hand/wrist positions in manual work. G-I left to read/practice concepts on their own. G-II had added 1-hour session for discussing these ideas and practice the positions on a simulated job task. G-III received no such information.	Checklist of 8 diagrammed stress-producing hand/wrist positions was used to sample worker hand use patterns at the end of each 15-second interval of a 15-minute work period. These observations were made before and 1 week after the training session ended.	None noted.	G-I and G-II showed significant pre/post training reductions in frequency of at-risk positions (29% and 34%, respectively). G-III (control) showed no change. Although showing the benefits of training, G-I/G-II differences were insignificant, indicating that the added discussion time and practice did not improve performance.	That workers showed benefits from the brief training sessions is remarkable. Nevertheless, limits on the amount of training time and a 1-time 15-minute evaluation period do not offer convincing evidence for durable changes.

A-IV. Control of Ergonomic Hazards

Work Setting Operation (Ref)	Training Objective	Training Plan	Evaluation Method	Extra-Training Factors	Results	Comments
94 nurses, aides, and orderlies in 2 medical/surgical units at 2 medical centers engaged in patient transfer tasks posing lifting-back injury risk. (Feldstein, Vollmer, & Valanis, 1990; Feldstein, Valanis, Vollmer, Stevens, & Overton, 1993)	To effect use of patient transfer practices that offer options for reducing the incidence of excessive lifting tasks and flexibility exercises as a further safeguard against mild back discomfort from manual handling efforts.	Didactic and practical on-the-job instruction used to explain/demonstrate 1) specific transfer techniques, 2) proper body mechanics for lifts, 3) one-on-one assistance, 4) use of equipment aids, 5) environmental problem-solving, and 6) muscle stretching and strengthening routines. Didactic sessions were 2 hours with handouts for reference. Each session followed by 8 hours on-the-job instruction where trainees given feedback on their transfer techniques.	55 workers in one center served as intervention group; 25 others in 2nd center were controls. Personal histories taken on both groups for baseline data on job service/back injury problems. Monthly back pain/fatigue questionnaire data were collected and ratings made of appropriateness of transfer actions before and after the training intervention. Muscle flexibility and proprioception measures also obtained as possible moderators of the results.	Intervention program took account of several suggestions for maximizing participation, namely, paid worker time for involvement, double staffing during didactic sessions to avoid work accumulation, and program plans that limited interference with usual workflow.	Based on observer ratings, post-training improvement in preparation of transfer, position for transfer, and actual transfer ranged from 15% to 25%, which was statistically significant. The control group showed no such change. The intervention group scores on back pain and fatigue dropped after training but not significantly. The control group showed no change. Those reporting back pain showed less flexibility; proprioception scores were indifferent.	Results based on only a 1-month follow-up that the authors admit is too soon to draw conclusions. Suggest a larger sample size plus a longer follow-up period for evaluation. Even with the paid work time and extra nurse coverage, participation in study was only 59%.

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Work Setting Operation (Ref)	Training Objective	Training Plan	Evaluation Method	Extra-Training Factors	Results	Comments
70 hospital nurse respondents drawn from a population of 750 who completed a manual handling training program. (Foster, 1996)	To promote changes in nursing practices aimed at reducing the risk of musculoskeletal injury from manual handling of patients.	Training program followed Scandinavian Back School principles. Elements were: Principles of correct lifting, body mechanics, fitness, ergonomic design, unacceptable lifting techniques, demonstration, and practice of acceptable manual handling techniques with and without the use of mechanical assist equipment.	Mail questionnaire survey approximately 1 year after course. Items asked on whether work practices had changed, increased awareness of duties regarding 1992 UK regulations on manual handling operations, and use of patient lifting techniques as prescribed with and without mechanized devices.	Authors suggested that limited use of techniques may be because their nursing tasks (primarilly out-patient) did not warrant them. At the same time, more than half of the respondents believed that limited time and staff precluded their compliance. In view of the few occasions that they do arise, is the press of time that significant?	Between 73% and 77% of respondents indicated post-course changes in work practices, improved use of equipment, and greater awareness of legal duties regarding issues of manual handling. Other items on handling techniques revealed, however, that no more than 50% had actually used any of the instructed procedures. Those that did, used them fewer than 5 times the previous week.	Mixed results require explanation as to factors that might be undermining the impact of the instruction. Aside from author's thoughts (see Extra-Training Factors column), conditions needed for positive transfer may not be present. For example, are supervisors supportive and insistent on safe lifting procedures being used?

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Work Setting Operation (Ref)	Training Objective	Training Plan	Evaluation Method	Extra-Training Factors	Results	Comments
50 nurses aides and 10 nurses in a geriatric hospital. Focus of study was on low back problems, primarilly in aide group, and its reputed linkage with patient lifting, patient movement tasks. (Gundewall, Liljeqvist, & Hansson, 1993)	To increase back muscle strength and endurance through an exercise program for purposes of preventing back pain complaints or actual working days lost as a result of work-related back problems.	20 minute workout programs for a group of 28 aides/nurses were developed during work hours. They included special exercises for increasing the dynamic endurance, isometric strength, and functional coordination of the back and trunk muscles. Individual instruction given by physical therapists 5 times during total study period of 13 months.	Training group (n=28) matched with a control group of aides/nurses (n=32) that received no exercise training. Data for both groups to include: 1) before/after measures of isometric back muscle strength, 2) number of complaints of low back pain and its intensity, and 3) number of days absent for low back problems.	None noted.	Training group as compared with controls: 1) increased back muscle strength by 20%; no change for control group, 2) logged fewer complaint days of back pain (53.9 vs. 94.3) and lesser pain scores, and 3) had only one lost-day case for low back problems (lasted 28 days); control group had 17, 4 lasting more than 14 days.	Authors note that every hour spent by physical therapist reduced work absences by 1.3 days, cost/benefit greater than 10. Weaknesses in study also mentioned. One was that psychosocial factors (training group getting more attention) could not be ruled out as affecting results. Second, since physical therapists doing the testing were not blind to the participants in each group, they could have biased the outcomes.

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Work Setting Operation (Ref)	Training Objective	Training Plan	Evaluation Method	Extra-Training Factors	Results	Comments
439 firefighters in a city department showing excessive days lost/costs from line of duty injuries, mostly musculoskeletal in nature. (Hilyer, Brown, Sirles & Peoples, 1990)	To employ flexibility and stretching exercises for the lower back, hamstrings, and shoulder muscles as a means of reducing musculoskeletal sprains and strain injury among firefighters.	Firefighters in 2 districts received flexibility training; those in 2 others served as a control. Handouts of 12 stretching exercises with instructions issued each firefighter. Each fire station scheduled 30 minutes per day for exercise supervised by exercise leaders previously trained by exercise physiologist in charge of overall program. The intervention period was 6 months.	The study design compared pre/post data on a battery of flexibility tests for firefighters in the training and control districts plus analyzed injury rate/cost data for the two groups in a 2-year period after the intervention. The flexibility battery included tests of sit-reach, trunk rotation, knee flexion/extension, shoulder flexion/ extension.	Letter from Fire Chief"s office used to establish the 30-minute exercise period in the district stations receiving training.	Pre/post battery data found the exercise program to increase the flexibility of the firefighters with sit/reach, shoulder flexion/extension, and knee flexion scores showing significant gains. Injury rate for the training group was 19.1 per 100 compared with 23.9 per 100 for the control group. Lost time dollar costs for the control group was 3× greater than that for the training group.	Authors suggest possible "Hawthorne" motivational influence in the improved flexibility scores of the training group relative to the control group whose post-test battery data showed decreased flexibility. Report does not state whether the exercise program was introduced later in the control districts, considering the apparent positive results.

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Work Setting Operation (Ref)	Training Objective	Training Plan	Evaluation Method	Extra-Training Factors	Results	Comments
6 janitors engaged in extensive mopping tasks with frequent forward bending with increased stress on the trunk. (Hultman, Nordin, & Ortengren, 1984)	To give workers an understanding of simple ergonomic principles focussed on biomechanics of the spine and to practice reducing undue flexion and loading on the lumbar spine through adopting improved work techniques.	Training comprised 3 sessions. The first lasted 45 minutes and dealt with anatomy, muscle physiology, and biomechanics of the spine. The second and third sessions, each lasting 30 minutes, included slides of workers performing tasks in ways that put stress on the low back (through frequent, deep forward bending of the trunk in mopping work). Techniques to relieve this loading were shown, and the workers, while engaged in wet-mopping work, practiced them under supervision of physiotherapists in charge of the training.	Trunk flexion was measured using a portable battery-powered unit placed on the back of each of the 6 workers. The unit recorded angle of trunk bending, amount of time spent in specific angular position, and frequency of changes from one position to another. These measurements, along with worker ratings of perceived workload (Borg Scale) and questions on proper work techniques involving the spine, were taken 3 times, once before and twice after the training. The latter were at 1–4 days and 2–3 months post-training.	There was no feedback in this study nor mention of any other extra-training features.	Time workers spent in normal upright position increased from 42% pre-training to 67% immediately after training, and to 72% 2–3 months later. Workers reduced time in moderate, deep forward flexion positions by nearly 40% in both post-training sessions. The number of deep flexions also dropped significantly. Ratings of perceived workloads were in the mid-range, reflecting moderate to heavy industrial work and showed no change from pre- to post-training. Workers correctly answered all questions about proper work procedures regarding ergonomics at 2–3 month period.	It was not possible to determine which tasks were being performed with improved ergonomic techniques that resulted in less forward bending stress on the trunk. Speculation was it was from placing mop buckets on chairs or on carts so as to relieve bending; also bending knees in mopping rather than the back. Absence of finding ratings of lower perceived loads on the back with changes to less stressful movements believed to result from the short period of the actual testing (1 hour) and lack of scale sensitivity to the exertions involved.

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Work Setting Operation (Ref)	Training Objective	Training Plan	Evaluation Method	Extra-Training Factors	Results	Comments
1000 employees in select departments of an Air/Space company showing disproportionate costs and frequency of the firm's back injury problems. (Lepore,Olson, & Tomer, 1984; also reported in Tomer, Olson, & Lepore, 1984)	To enhance awareness of back injury problems, of both on- and off-the-job risk factors in their occurrence, and of ways to reduce the incidence of back injury through ergonomic work practices and lifestyle changes.	Physical therapist and safety engineer with line employees developed training materials based on worksite analyses targeting high problem areas. Separate training programs for specific departments were framed and reviewed with management and supervisors who were instructed in back injury prevention practices. Ergonomic and environmental ideas generated were shared with management at that time. Groups of 20–25 workers attended 1-hour classes in their work areas. Content covered anatomy, posture, physical fitness, and work and nonwork risk factors. 7 months later, the workers attended a 2nd 1-hour class with same instructor. Classes here ranged from 35–50; two had 150 in attendance.	Compare costs for back injury cases/prevention training before and after the two training sessions in terms of total expenditures, cost per claim, percent of lost time cases, and frequency of new cases.	Coincident with the back injury prevention training, the company's safety department also took steps to motivate increased supervsior involvement in the investigation and to report actual worker injury incidents or near misses.	Based on annual expenditures, costs of the back problems plus training costs post training were 67.5% less than pre-training. The cost per claim also dropped after the training by 76%. The % of back injury cases losing time after training was 19% as compared with 63% before training. The actual frequency of cases showed a slight increase that probably reflected the supervisor's new efforts to report injury mishaps.	Without more specifics, it is difficult to ascribe benefits to training program per se. Lacking is information on specific work practices, ergonomic measures that were developed and presented during training, how well were they implemented, and causal tie with the outcome measures. It is also unclear whether the reductions in injury cases/costs were in the original problem departments or for the company as a whole.

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Work Setting Operation (Ref)	Training Objective	Training Plan	Evaluation Method	Extra-Training Factors	Results	Comments
6600 workers in a telecommunications plant involved in product assembly operations where excess chronic trauma disorders are apparent. (McKenzie, Storment, Van Hook,& Armstrong, 1985)	To inform plant supervisors and engineers of risk factors underlying chronic trauma disorders (CTDs) and how best to control them through engineering (i.e., job/tool/work station redesign), training, and medical management approaches.	Groups of 50 supervisors & engineers given lecture, slide presentations, and lab demonstrations to highlight CTD etiology/control measures plus in-plant observations of select problem operations. This was one element in a total program; others were engineering (job/tool/work station redsign), medical records review, and management of cases.	Comparisons of OSHA reportable injury rates for repetitive motion disorders for periods before and after the implementation of a task-force directed program.	Overall program was directed by a task force composed of members of the plant management, medical, industrial hygiene, and human factors groups.	Implementation of program coincided with a reduction in CTD cases. Before, OSHA reportable injury rate was 2.2 cases per 200,000 work hours and 1001 lost days; after establishment, there were 0.53 cases per 200,000 work hours and 129 lost workdays. Improved tool design/work layouts were noted as were earlier actions to prevent debilitating cases.	Training seen as influential to the outcome of the intervention, but the results, as presented, do not tie a particular program element to an outcome. Work provides an example of supervisor-professional level staff training in support of a programmatic-type effort.

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Work Setting Operation (Ref)	Training Objective	Training Plan	Evaluation Method	Extra-Training Factors	Results	Comments
33 newly hired and 60 experienced assembly line workers engaged in repetitive tasks (cycles of 5–6 minutes repeated 60–80 times per day) involving use of upper extemities. (Parenmark, Engvall, & Malmkvist, 1988)	To instruct workers in adjusting heights of work-benches, layout, and use of new tools in order to reduce biomechanical loading on the arm/neck-shoulder area, on the occasion of installing new ergonomically designed workstations and equipment.	New and experienced workers divided into a training and control group. Training consisted of 5–6 weeks of learning working techniques that would keep musculo-skeletal loads on the upper extremities below 10% of the maximum voluntary contraction level. Workers' level of effort monitored with EMG and adjusted until the the load fell below the 10% level. Control group had usual foremen instruction in job tasks.	Separate comparisons made between the trained vs. control groups of new and experienced workers on measures of number of sick leave days as reported over a 48-week period post-training.	None elaborated	For new workers, mean number of days of sick leave absence for upper extremity problems was more than 50% lower in the trained group than the control group and was statistically significant. Trained experienced workers also showed fewer sick leave days than did the controls, but the difference was insignificant.	Study shows that it is not enough to introduce ergonomically designed workstations for relieving problems, but it is important to ensure worker use of such equipment to maximize the benefit. Question of whether the positive results for the trained groups reflect greater interest in them (e.g., Hawthorne effect). The sick absence rate for all diagnosed problems among experienced workers in the trained and control groups was the same; this suggests that the Hawthorne effect was not a dominant one.

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Work Setting Operation (Ref)	Training Objective	Training Plan	Evaluation Method	Extra-Training Factors	Results	Comments
110 workers in a grocery distribution center reporting excess back injury cases (Schwartz, 1989)	To have supervisors and workers learn concepts of work simplification and energy conservation in materials handling tasks to reduce back injuries in their job operations.	Supervisors oriented in back injury prevention in job tasks followed by on-the-job instruction of workers in ways to reduce back stress in their work. Small group sessions held, special ones for those returning to work after a back problem.	Compare lost-time cases and costs for back injuries 6 months before and after the program was established.	Recommendations made to management dealing with operational changes and tool redesign to relieve back stress after the intervention.	Before/after 6-month comparisons showed a 39.4% reduction in lost-time injury cases.	Evaluation data lack specificity tying worker actions, as effected by the training, to the apparent decrease in back injury reports. Intervention stresses need for management involvment.
2 nurses from 2 wards requiring frequent patient transfer-movement tasks. (Scholey, 1983)	To make nurses aware of patient handling movements that cause peak stress on the back and ways to alleviate it through various actions (e.g., have patient move to edge of chair or bed to facilitate move).	Instruction focussed on 3 tasks identified as posing most severe stress in patient handling. Nurse trainees task behaviors in pre-training contrasted with other demonstrated techniques posing less back stress. A radio pill was swallowed to monitor intra-abdominal pressures in showing the differences in truncal stress. Training conducted over a 3-week period where nurse trainees were told to practice the prescribed behaviors.	Pre- and post-training measurements were made of intra-abdominal pressures while trainees (working in pairs) performed the 3 targeted tasks on select patients in each of the 2 wards.	Patients in the two wards differed in their willingness to cooperate in the transfers or turning tasks; this was a factor in the nurses ability to apply the instruction.	Intra-abdominal pressures for nurse trainees in one ward went down after training, reflecting a positive effect, but went up for nurses in the second ward—a negative result. 3 of the 4 nurses showed some reduction in pressures after training.	Authors indicate that only 3 weeks of training and lack of supervised practice may underly inconsistency in results. Also that patient conditions and level of their cooperation can complicate proper lifting techniques.

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Work Setting Operation (Ref)	Training Objective	Training Plan	Evaluation Method	Extra-Training Factors	Results	Comments
32 orderlies in four units of a geriatric hospital (St. Vincent, Tellier, & Lortie, 1989)	To demonstrate application of training given orderlies in lifting principles for patient transfer tasks.	12 hours of classroom and workplace courses covering theory and practice in proper lifting/handling. 6 major principles taught (e.g., back straight, knees bent, feet apart, pointed in direction of movement, etc.).	Observational grid developed to have independent raters score different elements in the task and method of handling a patient as performed by orderlies. Major operations observed included taking up and putting down patients plus 3 other in-place operations.	Physical constraints noted as precluding use of learned practices, especially those dealing with horizontal handling movements.	Majority of orderlies who were observed 12–18 months after training had 10 years experience. Grid showed that adherence to taught principles in ward units varied from 11-33%. Actual movements deviated as much as 89% from recommended postures.	Authors stress the inappropriateness of biomechanical principles as applied to patient lifting setting; see the bed as a problem location for handling; do not see the value of laboratory studies of lifting boxes as being related to patient lifting tasks. Question emphasis on use of legs in lifting (at least in this application) as opposed to distributing loads across different limbs.
8 nurses whose ward routines involved frequent lifting, transfer of patients. (Stubbs, Buckle, Hudson, & Rivers, 1983)	To determine which of 4 lifting methods is least stressful and its trainability/use in a ward setting.	4 methods compared were: shoulder lift, orthodox lift, through-arm lift, under arm drag. 8 nurses performed these lifts under supervision of trainer. Susequently, two nurses had one-on-one instruction with trainer in applying the lifts to 8 different patient-handling tasks in 4 sessions.	Intra-abdominal pressures (IAP) measured (via a radio pill) in rating back loads for the 4 lifting methods along with comfort scores. IAP pressures also measured for 2 nurses who performed 6 of the 8 patient handling tasks per instruction.	None elaborated.	Shoulder lift for moving patients produced significantly lower IAPs, with remaining 3 methods showing little difference. Shoulder and orthodox techniques also had higher comfort ratings. As measured 15 weeks after training, the 2 nurses IAP scores showed little difference from those taken early in training. In fact some had shown increase in jobsite tests.	Authors suggest that training to reduce lifting problems in patient hospital settings is ineffective. A broader ergonomic approach should be stressed.

A-IV. Control of Ergonomic Hazards

Work Setting Operation (Ref)	Training Objective	Training Plan	Evaluation Method	Extra-Training Factors	Results	Comments
106 coal miners and 27 others deemed "experts" in coal mining tasks by reason of long-term work and instructional experience. (Symes, Graveling, & Campbell, 1992)	To determine if current training in handling heavy, awkward loads is correcting miner misperceptions of risks connected with these activities, and if not, where course changes are needed to cover shortcomings.	Miners and experts attended 1-week courses emphasizing safe ways to handle heavy, awkward loads. Few details given about the nature of the instruction. Indication that discussion is on mechanical factors of transport, i.e., use of slings and lifts. Training focussed on risk of musculoskeletal disorders and other hazards in handling heavy, awkward loads in coal mining.	Miners and experts each rated the risks presented by 13 heavy, awkward load situations at pre-training, at the end of the 1-week course, and in a follow-on session 10 weeks later. In addition, tests designed to measure locus of control of one's action (internal vs. external) and tendencies toward absentmindedness (cognitive failures) were administered.	None elaborated.	Miners, and experts' ratings were similar for 3 actions rated highest in risk. For 10 others, the miners' post-course ratings showed shifts to increased riskiness akin to or greater than expert ratings. However, follow-on ratings revealed some reversals. Shifts to more internal control of actions correlated with upward shifts in riskiness and a decrease in mishaps and error tendencies.	The report includes a similar approach for using risk ratings for miners vs. experts as a means of assessing the effect of training for other manual materials handling tasks. However, no data were supplied to demonstrate its use in this case.

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Work Setting Operation (Ref)	Training Objective	Training Plan	Evaluation Method	Extra-Training Factors	Results	Comments
199 student nurses receiving instruction in patient handling techniques for reducing risk of back injury problems. (Troup & Rauhala, 1987)	To increase skill levels of nurses undertaking patient transfer tasks through special ergonomic instruction addressing factors such as the size/shape of patient, their level of dependency, availability of assist devices, and strengths of the nurse doing the transfer.	106 student nurses in 2 groups received 40 hours of theory and practical teaching in ergonomics in patient handling over a 5-semester period. Instruction included self-evaluation by students of videotapes of their patient handling skills, practice in teaching the skills they had learned, and keeping a diary of their patient-handling activities. 93 other nurses, in 2 groups, received traditional training in patient handling, with less emphasis on ergonomic factors.	Skill training assessed via student performance in two patient transfers that were uniform in terms of bed features, lay-out, handling aids, etc. Course instructor, an independent expert, and students rated each student in 1) preparation for the lift, i.e., selection of technique, choice of handgrip, posture at outset, 2) timing, loading of back and smoothness of lift in the actual move, and 3) completion of transfer, lowering patient, and relaxation.	See Comments column regarding potential extra-training concerns.	The three types of raters each gave significantly higher skill marks for the students receiving the ergonomics instruction than for those having the traditional training.	Results tempered by the following points: 1) performance based on an examination and may not reflect patient-handling practices as adopted by nurses under more routine conditions; 2) because senior nurses in charge of wards may lack similar instruction, the skills taught may not be reinforced or properly supervised. Argues for beginning the training programs with the more senior staff.