Comparison of Classroom Instruction and Independent Study in Body Mechanics
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ABSTRACT
This study was designed to determine which method of instruction in body mechanics results in the higher subsequent use of the techniques taught. Two groups were formed from nursing personnel at a rural general medical-surgical hospital in the southwestern United States. Subjects from the direct care nursing staff were randomly assigned to one of the two groups. One group attended two hours of classroom instruction in body mechanics, while the other completed an independent study module. Subjects were pre- and posttested using the Work-Related Body Mechanics Evaluation (Carlton, 1987) while performing a standardized lifting task in the clinical setting. Using analysis of covariance, no significant differences were found in the posttest scores of the two groups.

Back injuries to nursing personnel on the job are a very costly occupational hazard. Compared to other professionals, nurses have very high job injury rates. Back pain will prevent more than one in 15 nurses from working (McAbee, 1988). Patient-handling incidents were most frequently cited as the cause of back pain among nursing personnel (Stubbs, Buckie, Hudson, Rivers, & Worringham, 1983).

The purposes of this study were twofold. One was to determine which method of instruction in body mechanics would result in the higher subsequent use of the techniques taught. Classroom instruction was compared to independent study. The establishment of a reliable and valid tool for the evaluation of body mechanics techniques of nursing personnel was another study purpose.

LITERATURE REVIEW
Back pain related to patient-handling incidents is often thought to be an educational problem to be solved by some type of instructional intervention. Many employers have mandatory inservice education requirements for body mechanics in an effort to reduce their employees’ injury rates. Currently, there are no data as to which method of instruction, if any, is the most effective in preventing body mechanics injuries.

Because inservice education is an expensive activity, educators have an obligation to implement the most cost-effective programs possible and still obtain the desired behaviors. There is presently no consensus as to whether instruction in body mechanics results in any on-the-job behavioral change or reduction of nurses’ injury rates.

Schley (1984) and Rogers (1985) both advocate body mechanics training that incorporates supervised practice as a method to decrease nurses’ back injuries. These researchers found decreased incidence of injuries among nurses taught in the straight-back, bent-knee lifting technique. Stubbs et al. (1983) reported no significant differences in the injury rates of subjects who were taught skills and those who were not.

Knowledge is not the critical factor in the incidence of body mechanics injuries. Groups found to have increased knowledge after instruction frequently failed to put these techniques into practice in the work setting (Carlton, 1987; Whitehead, 1984).

Drummond and Walenga (1986) found that nurses
had an increase in scores using a written pretest-posttest design after instruction. However, there were no corresponding differences in injury rates between the instructed and noninstructed groups.

The essential element in any continuing education (CE) offering is the occurrence and the degree of change in practice. The evaluation of most teaching sessions consists of measurement of cognitive knowledge. Evaluation rarely looks at the impact of teaching on work practices. Ferrell (1988) studied the effect of CE on reported behavioral change in nurses. Nurses and their supervisors were asked to specify practice changes observed in the work setting after a learning activity. There was clear evidence of increased knowledge and demonstration of the learned behavior in an educational setting, yet no transference of that behavior into the uncontrolled work setting.

Lifting in the nursing profession is different from lifting in other fields (Owen, 1985). Patients cannot be fitted with handles or depended upon to keep their weight in balance during a lift. Loads cannot always be brought close to the body. Owens’ research should caution educators when generalizing the results of industrial studies to nursing practice. None of the straight-back lifts, the squat lifts, or the kinetic methods offer good ideas for nursing according to Owen. Some methods may, in fact, not even be possible in a clinical setting (Owen).

Mager (1970) described several phases in analyzing performance problems. According to Mager, one of the most important tasks in performance analysis is deciding whether the discrepancy between actual and desired performance is due to a skill deficiency. Instruction would be necessary should a skill deficiency be found. Thus, employee knowledge would need to be increased. On the other hand, management techniques, such as barrier removal, change of the ergonomic setting and incentives for proper performance should correct performance problems not stemming from skill deficiencies (Mager).

Nursing literature is devoid of a tool for the accurate evaluation of body mechanics techniques among nursing personnel. Nursing texts and procedure books have many performance checklists designed to assess nurses’ competency in patient lifting and transfer techniques. These checklists exclusively focus on the positioning of the patient during the procedure and frequently make no reference to the nurse’s body positioning. Nurse educators need to be responsive not only to patient safety issues but also to nurses’ protection.

**INSTRUCTIONAL METHODS**

Classroom instruction in body mechanics was operationalized for this study as a two-hour presentation of the straight-back, bent-knee lifting technique. Emphasis was placed on minimizing the high-risk factors of spinal twist, forward/rearward instability, and horizontal displacement of the load. An instructor conducted the session using both didactic and demonstration teaching methods. Participants were given the opportunity for supervised practice.

Independent study in body mechanics, for this study, consisted of a written, self-paced, learning module covering the same content areas. Sketches of correct body positions were included and employees were encouraged to practice on their own.

**FIGURE**

<table>
<thead>
<tr>
<th>Work-Related Body Mechanics Evaluation</th>
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<tbody>
<tr>
<td>Age _____ Sex _____ Years of nursing practice _____</td>
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<tr>
<td>Date of last body mechanics instruction _____</td>
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<tr>
<td>Basic education prep _____ Current education prep _____</td>
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<thead>
<tr>
<th>Work-related body mechanics evaluation</th>
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<tbody>
<tr>
<td>Control of spinal torque—lifting</td>
</tr>
<tr>
<td>Bends hips/knees—lifting</td>
</tr>
<tr>
<td>Maintains straight back—lifting</td>
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<tr>
<td>Horizontal displacement of load</td>
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<tr>
<td>Stance—forward/backward—over feet</td>
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<tr>
<td>Pace/object control—lifting</td>
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<tr>
<td>Pace/object control—lowering</td>
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<tr>
<td>Bends hips/knees—lowering</td>
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<tr>
<td>Maintains straight back—lowering</td>
</tr>
<tr>
<td>Control of spinal torque—lowering</td>
</tr>
<tr>
<td>Bends hips/knees—unload</td>
</tr>
<tr>
<td>Maintains straight back—unload</td>
</tr>
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**TOTAL**

**INSTRUMENT**

A modification of the Work-Related Body Mechanics Evaluation (Carlton, 1987) was used to assess the body mechanics techniques of nursing personnel in the clinical setting (Figure). This 12-point rating scale is scored after observing the subject perform a standardized lifting task. The scores range from 0 to 12. A numerical score is assigned each participant by allotting a point when a critical element of the straight-back, bent-knee lifting technique is observed. No point is given if the element is not observed.

A panel of six experts, (two board-certified physiatrists, two registered physical therapists and two experienced nurse educators), established the instrument’s content validity. Test-retest yielded a reliability coefficient of .95. Interrater reliability of the two observers was .99.

**SAMPLE**

The population studied was the direct-care nursing staff of a rural general medical-surgical hospital in the southwestern United States. Two experimental groups were formed, classroom instruction (n = 27) and independent study (n = 22). Participants were assigned to groups using a random number table.
There is presently no consensus as to whether instruction in body mechanics results in any on-the-job behavioral change or reduction of nurses' injury rates.

The mean age of the sample group was 45; 12 were male and 37 were female. Seven men and 20 women with a mean age of 43.37 (SD = 8.94) comprised the classroom instruction study group. Five men and 17 women with a mean age of 44.73 years (SD = 8.99) participated in the independent study group. About 53% of the registered nurses were associate degree (ADN)-prepared and for most this was their initial level of preparation. Diploma-prepared nurses comprised 25.6% and 20.5% were baccalaureate (BSN) graduates. Nurses had worked in the profession on average of 15 years. These sample characteristics fit the national norms for nurses (Roberts, Minnick, Ginzeberg, & Curran, 1989).

METHOD
All participants were pretested using the modified Work-Related Body Mechanics Evaluation (Carlton, 1987). Subjects were asked to perform a full-assist, bed-to-wheelchair transfer. Both instructional treatments were performed during the next month at the work facility. Subjects were then posttested during the following month, in the clinical setting, using the same instrument and lifting task.

RESULTS
Analysis of covariance was used to control statistically for any initial differences in subjects' age, gender, years of nursing practice, initial and current educational preparation, and date of last body mechanics inservice program. Significant correlation was found between the age of the subject and years of nursing practice ($r = .39, p = .007$). This is to be expected with nurses who work consistently in the nursing profession. Pretest scores were found to be positively correlated to years of nursing practice, ($r = .35, p = .01$), initial nursing educational preparation, ($r = .35, p = .01$), and current nursing preparation, ($r = .45, p = .001$) for both groups. No interaction effects were found between pretest scores and the method used.

The mean adjusted posttest score for the classroom instruction group was 9.70 out of a possible 12 ($SD = 1.84$). The independent study group's mean adjusted posttest score was 10.22 ($SD = 1.54$). This difference was not found to be significant at the .05 level using analysis of covariance.

SUMMARY AND IMPLICATIONS
No significant difference was found between the adjusted mean posttest score of the classroom instruction group and that of the independent study group. While not statistically significant, the mean posttest score of the independent study group was higher than that of the classroom instruction group. This finding suggests that with a larger, more homogeneous sample, independent study may be shown to be stronger of the two teaching methods in effecting change in the work environment with experienced learners. This idea would warrant further study to substantiate.

The on-the-job body mechanics behavior of nurse participants was not changed significantly by either of these instructional methods. This would suggest that educational efforts be directed toward the least expensive, most convenient, and preferred instructional method to further the employee's or employer's occupational goals. A more efficient use of time and money would be to develop self-paced instructional modules rather than to use traditional teaching methods.

The Work-Related Body Mechanics Evaluation is an accurate and functional instrument to evaluate nurses' body mechanics in the clinical setting. Increasing use of this tool in different settings is needed to further validate its usefulness in evaluating nursing practice.

The results of this study may have been influenced by factors other than skill deficiencies. Performance discrepancy may have been influenced by the employees' usual work habits. The ergonomics of the physical surroundings, for example space, equipment, and on-the-job pace requirements, may also contribute. There is also a possibility that the straight-back, bent-knee lifting method is impractical for nurses in the clinical setting. This research brings the appropriateness of the straight-back, bent-knee lifting technique for nurses into question. There was no significant difference in the performance levels of nurses in the work setting after instruction. Is this indicative of strong habit patterning or the impracticality of the lifting method taught?

Evaluation of educators' methods should be based on the change in clinician practice affected by the teaching. Further research is needed to determine the most cost-effective method for CE of nurse employees. Investigational efforts should also be directed at other areas of the body mechanics injury problem, such as ergonomics, proper lifting technique, and habit patterning.
REFERENCES