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Changes in Attitudes, Occupational Safety Behavior, and Self-Reported Work-Injury-Reduction Scores Following Ergonomics Education Among Nurses

Fanny Cosla Pranata [a] | **Ratna Wardani** [a] | **Indasah** [a]

[a]Graduate Program In Public Health, STRADA Indonesia University, Kediri, Indonesia

Abstract

Background: Nurses perform physically demanding patient-care activities that can expose them to ergonomic hazards. This study evaluated questionnaire-based responses to work-position ergonomics education. Low back pain (LBP) was part of the educational context but was not directly measured. **Methods:** This nonrandomized pretest-posttest study included 132 nurses distributed across lecture, poster, and control groups, with 44 participants in each group. The outcomes were questionnaire-derived scores for attitude, occupational safety behavior, and self-reported work-injury reduction. Wilcoxon signed-rank tests assessed within-group changes, while Kruskal-Wallis tests compared the three groups. **Results:** Baseline characteristics and work-unit distributions differed across groups. All three outcome scores changed within the lecture and poster groups (reported $p < 0.001$) but not within the control group. Between-group differences were not statistically significant for attitude ($p = 0.187$) or occupational safety behavior ($p = 0.180$), whereas the work-injury-reduction score differed significantly among groups ($p < 0.001$). No post-hoc pairwise analysis was available to identify which groups differed. **Conclusion:** The observed patterns support further evaluation of ergonomics education but do not establish the superiority of either educational format or a reduction in LBP risk. Interpretation is constrained by nonrandom allocation, baseline imbalance, incomplete instrument reporting, and the absence of a direct group-by-time analysis.

Keywords: ergonomic education, nurses, occupational safety, safety behavior, work injury

1. Introduction

Nurses frequently lift, transfer, reposition, and mobilize patients while working in constrained spaces and maintaining static or awkward postures. These tasks expose nurses to work-related musculoskeletal hazards, including low back pain (LBP), and make work-position ergonomics relevant to occupational safety practice (Mondoringin et al., 2025; Richardson et al., 2019). Ergonomic practice includes body positioning and patient-handling techniques intended to reduce avoidable physical strain during care activities (Nuraini & Isnaeni, 2023).

Education is one approach to improving recognition of ergonomic hazards and the use of safer work practices. A lecture can present concepts systematically and permit questions, whereas a poster provides repeated visual cues in the clinical environment. These formats may influence questionnaire-based attitudes and reported safety behavior through different learning processes, but an observed pretest-posttest change within either group does not by itself establish that one format is more effective than another (Karwowski et al., 2025; Vigoroso et al., 2020).

The studies cited in this manuscript address ergonomic exposure, LBP complaints, safety practices, or educational activities, but they do not resolve whether lecture-based and poster-based education produce different short-term outcome patterns among nurses in one hospital. A three-group quasi-experimental comparison was therefore used to examine lecture, poster, and no-study-education conditions. The nonrandom design also requires attention to baseline differences in work unit and participant characteristics because these factors may influence ergonomic exposure independently of education.

LBP was the clinical context of the educational material, not a directly measured outcome. The study did not administer a pain-intensity scale, record LBP incidence, measure disability, or use an established observational ergonomic-risk instrument. The outcomes reported here are questionnaire-derived attitude, occupational safety behavior, and self-reported work-injury-reduction scores; they should not be interpreted as direct evidence of reduced LBP risk or occurrence.

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This study examined changes in these three questionnaire-derived outcomes among nurses who received work-position ergonomics education through a lecture or posters and nurses who received no study education. It also compared the outcome distributions among the three groups while recognizing the constraints of nonrandom allocation

2. Materials and Methods

2.1 Study Design and Setting

This quasi-experimental study used a three-group pretest-posttest design (Peat & Barton, 2005). The groups received lecture-based education, poster-based education, or no study education. The design permitted paired comparisons within each group and an unadjusted comparison among groups; it did not use individual randomization.

The study was conducted among nurses in clinical work units at Universitas Muhammadiyah Malang General Hospital, Indonesia. The exact start and end dates of data collection were not retained in the study report available for this revision.

2.2 Participants and Sampling

The population comprised nurses working at the hospital. Purposive sampling recruited 132 participants who met the eligibility criteria.

No individual random-allocation sequence was documented. Participants were placed in the three study groups through the nonrandom implementation used at the hospital. The resulting allocation was closely associated with work-unit distribution (Table 1), and the specific administrative sequence used to place each participant was not retained. Group allocation must therefore be regarded as susceptible to selection bias and confounding.

a. Lecture group (n = 44): received lecture-based ergonomics education.
b. Poster group (n = 44): received poster-based ergonomics education.
c. Control group (n = 44): received no study educational intervention during the observation period.

Eligible participants were nurses actively working in patient-care units who agreed to participate. Nurses who were on leave or absent during the intervention period were excluded.

2.3 Intervention

a. The educational content addressed principles of work-position ergonomics, correct body posture, posture-related hazards, and safe patient-handling techniques. LBP prevention was discussed as a rationale for ergonomic practice, but LBP was not measured as an outcome.
b. The lecture group received structured education delivered directly by the researcher. The recorded format consisted of oral explanation of ergonomic principles, correct posture, and safe patient handling, with an opportunity for questions and discussion.
c. The poster group received visual materials displayed in the work environment. The posters contained brief ergonomic messages, illustrations of correct working positions, posture-related hazards, and reminders for safer practice. The control group received routine workplace information without study-specific ergonomics education. The surviving study documentation does not specify the lecture duration, frequency, number of sessions, educator credentials, poster placement and exposure duration, or the interval between intervention and post-test; these features cannot be reconstructed retrospectively.

2.4 Instruments and Measures

Data were collected using three structured questionnaires recorded in the original report as measures of attitude toward ergonomic work positions, occupational safety behavior, and work-injury reduction.

a. The attitude score represented participants' self-reported views toward applying ergonomic work positions.
b. The occupational safety behavior score represented self-reported application of safer and more ergonomic practices during work activities.
c. The work-injury-reduction score represented a questionnaire-based self-report construct. It was not a count of verified injuries, an LBP-incidence measure, a pain score, a disability score, or an established ergonomic-risk assessment.

The study report states that content validity was assessed by expert judgment and internal consistency was evaluated before data collection. Instrument names, item counts, response options, scoring procedures, possible score ranges, interpretation thresholds, numeric validity results, and reliability coefficients were not retained in the available records. The instruments therefore cannot be fully characterized or independently reproduced from the surviving documentation.

2.5 Statistical Analysis

Data were analyzed using IBM SPSS Statistics; the software version was not recorded. Frequencies and percentages summarized participant characteristics. Exploratory Pearson chi-square tests were calculated from the counts in Table 1 to describe baseline group imbalance. Results involving sparse expected cell counts were interpreted cautiously. Outcome distributions were assessed with the Shapiro-Wilk test. Because the reported distributions were non-normal, the Wilcoxon signed-rank test evaluated paired pretest-posttest differences within each group, and the Kruskal-Wallis test evaluated unadjusted differences among the three groups. The available analysis did not include between-group change scores, a group-by-time interaction, covariate adjustment, or post-hoc pairwise comparisons. All tests were two-sided and $p < 0.05$ was the threshold for statistical significance; values reported by SPSS as 0.000 are presented in the text as $p < 0.001$. Because individual-level data and the required test statistics were unavailable for reanalysis, effect sizes and confidence intervals could not be calculated.

3. Results

Table 1 Characteristics of general data of research subjects in nurses (n=44)

Characteristics	Lecture Method Group		Poster Method Group		Control Group	
	N	%	N	%	N	%
Age						
21-30 Years Old	22	16,7	4	3,0	8	6,1
31-40 Years Old	22	16,7	38	28,8	33	25,0
41-50 Years Old	0	0,0	2	1,2	3	2,3
> 50 Years Old	0	0,0	0	0,0	0	0,0
Gender						
Male	10	7,5	16	12,1	27	20,5
Female	34	25,8	28	21,2	17	12,9
Length of Work						
< 1 year	8	6,1	4	3,0	0	0,0
1-2 year	8	6,1	2	1,5	1	0,8
3-4 year	10	7,6	1	0,8	4	3,0
> 4 year	18	13,6	37	28,0	39	29,5
Work Unit/ Division						
Emergency Department	0	0,0	0	0,0	12	9,1
ICU	2	1,5	0	0,0	17	12,9
Hospitalization	42	31,8	16	12,1	0	0,0
Others	0	0,0	28	21,2	15	11,4
Have Participated in Occupational Ergonomics Training						
Yes	3	2,3	4	3,0	4	3,0
No	41	31,1	40	30,3	40	30,3

Table 1 shows substantial differences in participant characteristics across the three groups. The lecture group included equal numbers of nurses aged 21–30 and 31–40 years and was predominantly female, with most participants working in inpatient units. The poster group was dominated by nurses aged 31–40 years, female nurses, participants with more than four years of work experience, and nurses from units categorized as "others." The control group was predominantly male and consisted mainly of nurses with more than four years of work experience who worked in the emergency department, intensive care unit, or other units. Most participants in all groups had never received occupational ergonomics training.

Table 2 Differences in attitudes, occupational safety behaviors, and injury reduction before and after interventions in lecture groups, posters, and controls

Variable	Groups	P-Value
Attitude	Lecture	0,000
	Poster	0,000
	Control	0,508
Occupational safety behavior	Lecture	0,000
	Poster	0,000
	Control	0,922
Injury reduction	Lecture	0,000
	Poster	0,000
	Control	0,788

Table 2 presents the within-group pretest-posttest comparisons using the Wilcoxon signed-rank test. Statistically significant changes were detected in attitude, occupational safety behavior, and self-reported work-injury-reduction scores within both the lecture and poster groups (all reported as $p < 0.001$). No statistically significant changes were detected within the control group for attitude ($p = 0.508$), occupational safety behavior ($p = 0.922$), or the work-injury-reduction score ($p = 0.788$). Because the table does not provide pretest and post-test descriptive scores, the direction and magnitude of these changes cannot be determined. These within-group findings also do not establish that the magnitude of change differed between the lecture, poster, and control groups.

Table 3 Differences in attitudes, occupational safety behaviors, and injury reduction between groups

Variable	Groups			p-value
	Lecture	Poster	Control	
Attitude	69,40	71,83	58,27	0,187
Occupational safety behavior	65,34	74,49	59,67	0,180
Injury reduction	82,99	66,10	50,41	0,000

Table 3 presents the unadjusted between-group comparisons using the Kruskal–Wallis test. No statistically significant differences were found among the lecture, poster, and control groups for attitude ($p = 0.187$) or occupational safety behavior ($p = 0.180$). Although the poster group had the highest mean ranks for attitude (71.83) and occupational safety behavior (74.49), these findings are descriptive and do not demonstrate the superiority of the poster method. A statistically significant overall difference was found for the self-reported work-injury-reduction score ($p < 0.001$), with the lecture group having the highest mean rank (82.99), followed by the poster group (66.10) and the control group (50.41). However, because adjusted post-hoc pairwise comparisons were not performed, this result indicates only that at least one group differed and does not establish which specific groups differed or whether the lecture method was superior.

4. Discussion

This study examined changes in questionnaire-derived attitude, occupational safety behavior, and self-reported work-injury-reduction scores following work-position ergonomics education delivered through lectures or posters. The Wilcoxon analyses identified significant pretest-posttest differences in all three outcomes within the lecture and poster groups, whereas no significant changes were detected in the control group. Table 2 reports only p-values without pretest and posttest descriptive scores or the direction of the signed ranks. The findings consequently demonstrate changes in score distributions but do not establish their direction, magnitude, or practical relevance.

The interpretation of these changes must consider the substantial baseline differences among the groups. The lecture group consisted almost entirely of inpatient nurses, whereas emergency department and intensive care unit nurses were concentrated in the control group. Gender and length-of-work distributions also differed. These characteristics may influence physical workload, patient-handling frequency, exposure to awkward postures, previous occupational experience, and responses to educational materials. Ergonomic risk factors have been associated with musculoskeletal complaints among hospital nurses, while ergonomic practices may also vary according to sex and duration of employment (Kgakge et al., 2025; Lataoso et al., 2024). Because allocation was nonrandomized and no adjusted analysis was reported, baseline imbalance may have contributed to the observed outcome differences independently of the educational intervention.

Significant pretest-posttest differences in attitude were detected within the lecture and poster groups, but the between-group comparison was not statistically significant ($p = 0.187$). The poster group had the highest mean rank, followed by the lecture and control groups. This ordering is descriptive and does not demonstrate that posters produced greater changes in attitude. Ergonomics education has previously been used to increase nurses' knowledge of musculoskeletal risk prevention, although evidence from community education activities cannot establish a causal effect on attitudes or behavior (Detroja et al., 2025; Sousa et al., 2023). Studies in other occupational populations also suggest that audiovisual and visual materials can facilitate information delivery and increase engagement with safety messages (Galmarini et al., 2024; Hall et al., 2026). Differences in population, intervention content, and measured outcomes limit direct comparison with the present study.

Lectures and posters may operate through different educational mechanisms. Lectures allow structured explanations, direct interaction, and opportunities for clarification, whereas posters provide repeated exposure to concise messages in the work environment. Visual occupational safety materials may improve the comprehensibility and acceptability of training information, particularly when their design is adapted to the intended users (Vigoroso et al., 2020). The present results do not demonstrate that repeated poster exposure was more effective than lecture-based education because the difference in attitude among the three groups did not reach statistical significance.

Occupational safety behavior followed a similar pattern. Significant pretest-posttest differences were observed within both intervention groups, but no statistically significant difference was found among the lecture, poster, and control groups ($p = 0.180$). Although the poster group had the highest mean rank, this value cannot be interpreted as evidence of greater effectiveness. Mean ranks describe the relative ordering of score distributions and do not indicate the magnitude of behavioral change.

The absence of a between-group difference may reflect the complexity of translating educational exposure into workplace practice. Ergonomic behavior is influenced by individual awareness as well as workload, staffing, availability of patient-handling equipment, supervisory support, safety culture, and routines within each clinical unit. Research among nurses has shown that familiarity with ergonomic principles does not necessarily correspond with good ergonomic practice (Kgakge et al., 2025). Occupational safety has also been associated with nurses' work performance, while self-awareness has been examined in relation to the implementation of patient safety practices(Kocatepe et al., 2025). These findings support the view that education is only one component of workplace safety behavior. The marked differences in clinical-unit distribution among the groups may therefore have influenced the reported behavior scores.

The self-reported work-injury-reduction score was the only outcome with a statistically significant overall difference among the groups ($p < 0.001$). The lecture group had the highest mean rank, followed by the poster and control groups. The Kruskal-Wallis test is an omnibus procedure and establishes only that at least one group distribution differed. Because no multiplicity-adjusted post-hoc pairwise comparisons were performed, the analysis cannot determine whether the difference occurred between the lecture and control groups, poster and control groups, lecture and poster groups, or more than one pair. The higher mean rank in the lecture group consequently does not establish that lecture-based education was superior to poster education.

The outcome must also be interpreted according to its measurement. The variable represented a questionnaire-derived self-reported work-injury-reduction score rather than objectively documented occupational injury events. Previous nurse education programs have demonstrated the feasibility of providing workplace instruction on occupational disease and injury prevention, but such programs do not establish that educational exposure alone reduces actual injury incidence (Rohmani et al., 2023). In the present study, the reported score should not be interpreted as a confirmed reduction in injuries, musculoskeletal disorders, or clinical symptoms. The absence of medians, interquartile ranges, effect sizes, and confidence intervals also prevents assessment of the magnitude and practical relevance of the between-group difference.

The analytical strategy did not directly test whether changes over time differed among the three groups. Significant within-group changes in the lecture and poster groups combined with nonsignificant changes in the control group are insufficient to establish a differential intervention effect. Similarly, a Kruskal-Wallis comparison that does not explicitly analyze change scores cannot replace a group-by-time analysis. The results should therefore be described as patterns of change following educational exposure rather than definitive evidence of intervention effectiveness.

Low back pain provided the clinical and ergonomic context for the educational materials but was not measured as a study outcome. Occupational ergonomic exposure has been linked to the burden of LBP in Indonesian workers, and ergonomic risk factors have been investigated in relation to musculoskeletal complaints among nurses (Dilek Kart & Meydanlioglu, 2025; Lataoso et al., 2024). Evidence concerning the relationship between posture and LBP among nurses is not uniform. For example, Mondoringin et al. (2025) found no statistically significant association between work posture and LBP complaints among surgical nurses despite a high prevalence of reported complaints. These findings reinforce the need to measure LBP directly rather than infer it from attitudes or safety-related questionnaire scores.

The present study did not assess LBP incidence, pain intensity, disability, functional limitation, or an established ergonomic risk measure such as the Rapid Entire Body Assessment. Changes in attitude, occupational safety behavior, and self-reported work-injury-reduction scores cannot be treated as substitutes for these outcomes. The study therefore provides no direct evidence that lecture or poster education reduced LBP risk.

Lectures and posters may remain feasible components of hospital ergonomics education. Lecture sessions can provide detailed explanations, while posters can reinforce selected messages within clinical areas. The current study neither tested a combined intervention nor demonstrated the superiority of one educational format. Future evaluations should integrate educational activities with organizational measures, including workload assessment, access to patient-handling equipment, supervision, and unit-specific ergonomic procedures.

Study Limitations

This study has several limitations. Purposive sampling, nonrandom allocation, and recruitment from one hospital increase the potential for selection bias and restrict generalizability. Baseline differences in gender, length of work, and clinical-unit distribution may have confounded the comparisons because nurses in different units experience different ergonomic demands. All outcomes were measured using questionnaires and may have been affected by recall bias, social-desirability bias, and changes in participants' awareness after receiving education.

The self-reported work-injury-reduction score did not represent verified occupational injury events, and LBP was not directly assessed. Contamination may have occurred because participants worked in the same hospital and could have shared information or encountered materials intended for another group. No longer-term follow-up was reported, so the persistence of the observed score changes remains unknown. Incomplete reporting of the instruments limits assessment of their validity, reliability, scoring interpretation, and responsiveness to change.

The absence of descriptive outcome statistics, effect sizes, confidence intervals, a direct group-by-time analysis, and adjusted post-hoc comparisons further limits interpretation. These findings should be regarded as preliminary evidence of changes in questionnaire-derived outcomes following ergonomics education, rather than proof that either educational format reduced occupational injuries or the risk of low back pain.

5. Conclusions

Work-position ergonomics education delivered through lectures or posters was followed by changes in nurses' questionnaire-derived attitude, occupational safety behavior, and self-reported work-injury-reduction scores. Between-group comparisons did not demonstrate differences in attitude or occupational safety behavior. An overall group difference was found for the self-reported work-injury-reduction score, but the absence of post-hoc pairwise comparisons prevents identification of the specific groups that differed or determination of whether either educational format was superior. Given the nonrandom allocation, baseline imbalances, reliance on self-reported outcomes, and absence of a direct group-by-time analysis, these findings should be interpreted cautiously. The study does not establish a reduction in objectively verified occupational injuries or LBP risk because these outcomes were not directly measured.

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Ethical considerations

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Conflict of Interest

There is no conflict of interes.

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