

EFFECTIVENESS OF STRUCTURED FEEDBACK ON CLINICAL PERFORMANCE AMONG UNDERGRADUATE NURSING STUDENTS: A QUASI-EXPERIMENTAL STUDY

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Abstract

Background: Clinical competence is the ultimate outcome of undergraduate nursing education, yet many students receive inconsistent and unstructured feedback during clinical placements. Structured feedback models, such as Pendleton's rules, have been proposed as strategies to enhance learning outcomes, but empirical evidence from quasi-experimental designs remains limited.

Objective: To evaluate the effectiveness of a structured feedback intervention on clinical performance among undergraduate nursing students during clinical placements.

Methods: A non-equivalent quasi-experimental design with pre- and post-test assessments was employed. A total of 120 third-year undergraduate nursing students were recruited from two campuses of a public nursing college. The intervention group (n = 60) received structured feedback using Pendleton's rules following each clinical skill demonstration, while the control group (n = 60) received conventional unstructured feedback. Clinical performance was measured using the Clinical Performance Evaluation Tool (CPET), a validated 30-item instrument assessing knowledge application, psychomotor skills, communication, and professional behavior. Data were analyzed using independent samples t-tests and ANCOVA, controlling for pre-test scores.

Results: Post-intervention CPET scores were significantly higher in the intervention group (M = 82.4, SD = 6.8) compared with the control group (M = 74.1, SD = 7.9), $t(118) = 6.28$, $p < .001$, with a large effect size (Cohen's $d = 1.13$). ANCOVA confirmed the intervention effect remained significant after controlling for pre-test performance, $F(1, 117) = 34.72$, $p < .001$, partial $\eta^2 = .23$. Subscale analyses revealed the greatest improvements in psychomotor skills and communication.

Conclusion: Structured feedback significantly improves clinical performance among undergraduate nursing students. Incorporating structured feedback models into clinical supervision protocols is recommended to enhance competency development and student confidence.

INTRODUCTION

Clinical competence is the ultimate outcome of undergraduate nursing education, encompassing the integration of theoretical knowledge, psychomotor skills, communication abilities, and professional attitudes in real-world practice settings (Wong et al., 2022). The quality of clinical supervision and feedback that students receive during placements substantially influences their skill acquisition, confidence, and readiness for professional practice. However, empirical evidence concerning the impact of feedback on student performance in workplace settings has historically been limited, with many clinical educators relying on intuitive rather than evidence-based feedback practices. A recent quasi-experimental study by Ossenberg et al. (2023) explicitly noted that "empirical evidence concerning the impact of feedback on student performance in workplace settings is limited," highlighting a significant gap in the literature that the present study seeks to address (Brügge et al., 2024).

Feedback is defined as information provided by an agent regarding aspects of one's performance or understanding, intended to improve learning (Brügge et al., 2024). In clinical education, feedback serves a formative function by identifying gaps between actual and desired performance and guiding subsequent learning efforts (Vögelin et al., 2026). Despite widespread recognition of feedback's importance, research indicates that feedback in medical and nursing education has been a neglected area, with students frequently reporting dissatisfaction with the quality, specificity, and timeliness of feedback received during clinical rotations. This gap is particularly concerning given that lack of clinical competence can endanger patient safety and reduce the quality of healthcare services. As Khalafi et al. (2024) observed, "lack of clinical competence can endanger the patient's safety and reduce the quality of providing health care services,"

underscoring the urgent need for evidence-based feedback interventions in nursing education.

A related approach, the feedback sandwich, involves sandwiching constructive criticism between two positive statements. However, this method has been criticised for failing to engage learners in meaningful dialogue about their performance. Positive feedback and the feedback sandwich are suggested to be most useful to student learning, particularly when feedback is immediate. However, the feedback sandwich should not be overused as it can lose its effectiveness over time. The structured nature of Pendleton's rules addresses this limitation by requiring active learner participation at each stage of the feedback conversation (Emerson et al., 2026).

Recent systematic reviews have begun to consolidate evidence on feedback effectiveness in nursing education (Al-Hashimi et al., 2023). A qualitative systematic review by Torn et al. (2022) exploring nursing students' experiences with peer feedback identified an overarching theme of "feeling lost to finding ways," with subthemes including uncomfortable learning experiences, confronting disagreements, greater engagement with learning, and value added beyond learning. The review concluded that while peer feedback can yield valuable benefits in teamwork and leadership skills, students require adequate training and support for effective implementation. Another systematic review by Alsahafi (2022) examining quality feedback measurement tools in clinical skills assessment found that "good quality written feedback should be specific, balanced" and should describe both the gap in student learning and observed behavioural actions in exams.

Despite this growing body of literature, quasi-experimental studies specifically evaluating structured feedback interventions in undergraduate nursing clinical education remain scarce. The present study addresses this gap by

implementing and evaluating a structured feedback intervention based on Pendleton's rules during clinical skills training. The research hypothesis was that students receiving structured feedback would demonstrate significantly higher clinical performance scores compared with those receiving conventional feedback. This study is novel in its focus on undergraduate nursing students in real clinical placement settings (rather than simulation laboratories), its use of a validated clinical performance evaluation tool with demonstrated reliability, and its comprehensive subscale analysis examining differential effects across cognitive, psychomotor, communication, and professional domains.

Literature Review

Theoretical Foundations of Feedback in Clinical Education

Feedback is fundamental to human motivation and learning (Johnson et al., 2023). The necessity for feedback arises from the basic human need to determine the extent of success, and it is fundamental to human motivation and effort (Rachmad, 2022). Feedback offers students an insight into their actions and highlights the differences between intended and actual results, thereby providing an impetus for change. It also conveys to students an attitude of concern by their educators about their academic progress and professional development, not just as an analysis of their examination grades (Patil et al., 2023).

In clinical education, feedback serves a dual purpose: it is both a formative assessment tool that guides learning and a relational process that shapes the learner's professional identity. The quality of feedback interactions between clinical instructors and students can significantly influence students' engagement, motivation, and skill development. As noted in the literature, "supportive supervision and constructive feedback boost students' confidence, critical thinking skills, and professional socialization". Conversely, restricted feedback may increase anxiety and hinder learning (Chen et al., 2025).

Structured feedback models provide systematic frameworks for conducting feedback

conversations (Wong et al., 2022). The two most validated models for providing feedback in healthcare are those devised by Pendleton et al. (1984) and Silverman et al. (1995). Both approaches seek to provide a safe environment for the student and are suitable for use in group settings or one-to-one situations.

Pendleton's rules follow a specific sequence designed to minimise defensiveness and promote reflection. The four steps are: (1) the learner states what was done well, (2) the educator agrees and elaborates on positive aspects, (3) the learner identifies what could be improved, and (4) the educator provides constructive suggestions for improvement. Pendleton's rules require the student to identify positive aspects of professional competency and behavior, which are then reinforced by the educator (Rød et al., 2022). Subsequently, the skills required to achieve desired goals are decided after mutual discussions. The most significant advantage of the Pendleton approach is that discussions of student weaknesses are avoided at the beginning of the session, thus preventing defensive behavior and encouraging reflective behavior (El Arab et al., 2025).

Kim et al. (2025) compared three debriefing methods in simulation-based nursing education and found that instructor-led debriefing was the most effective method for enhancing clinical judgment, performance skills, confidence, and satisfaction. This finding emphasises the importance of structured, interactive feedback in clinical skill development. The study's comparison of instructor-led debriefing, video-assisted peer-led debriefing, and written self-debriefing provides evidence that the presence of a skilled facilitator who provides structured feedback is a critical determinant of learning outcomes (El Arab et al., 2025).

Despite the growing evidence base, several gaps remain. First, most quasi-experimental studies have been conducted in simulation laboratory settings rather than during actual clinical placements. While simulation provides a controlled environment for skill practice, the transfer of learning to real clinical settings is not automatic. Second, few studies have examined the

differential effects of structured feedback across cognitive, psychomotor, communication, and professional domains. Third, the duration of feedback interventions varies widely across studies, making it difficult to determine optimal dosage. The present study addresses these gaps by implementing structured feedback during actual clinical placements, analysing subscale outcomes across four performance domains, and evaluating the intervention over a full semester.

Research Methodology

Research Design

A non-equivalent quasi-experimental design with pre- and post-test assessments was employed. This design was selected because randomization of students to different clinical supervision conditions was not feasible within the existing educational structure, where students were already assigned to clinical rotation groups. The non-equivalent quasi-experimental design is consistent with previous research in nursing education.

Participants and Setting

The study was conducted at two campuses of a public nursing college in Pakistan which is CON NMU Multan and DHQ Khanewal. A convenience sample of 120 third-year undergraduate nursing students enrolled in the Adult Health Nursing clinical course was recruited. Inclusion criteria were: (a) enrolment in the third-year clinical practicum, (b) no prior exposure to structured feedback training, and (c) willingness to participate. Students were assigned to intervention and control groups based on their existing clinical rotation groups ($n = 60$ per group), a method consistent with non-equivalent quasi-experimental designs in educational research. Demographic characteristics including age, gender, and prior academic performance (GPA) were collected to assess baseline equivalence. Prior clinical experience was also recorded to ensure comparability between groups.

Sample Size Calculation

A priori sample size calculation was conducted using G*Power 3.1. Based on an expected

medium-to-large effect size (Cohen's $d = 0.65$), alpha of .05, and power of .80, a minimum of 52 participants per group was required. The achieved sample of 60 per group exceeded this requirement, providing adequate statistical power. Post hoc power analysis confirmed that with 60 participants per group and the observed effect size of $d = 1.13$, the achieved power exceeded .99.

Intervention

The structured feedback intervention was based on Pendleton's rules, a validated model comprising four sequential steps: (1) the learner states what was done well, (2) the educator agrees and elaborates on positive aspects, (3) the learner identifies what could be improved, and (4) the educator provides constructive suggestions for improvement. Clinical instructors in the intervention group received a two-hour training workshop on implementing Pendleton's rules, including video demonstrations and role-play practice. The workshop covered the theoretical rationale for structured feedback, demonstration of each step of the model, common pitfalls to avoid, and strategies for adapting the model to different clinical scenarios.

Following each clinical skill demonstration (e.g., vital signs assessment, medication administration, wound care), instructors conducted a structured feedback session lasting 10–15 minutes using the four-step model. The feedback sessions were conducted in a private area away from patients to ensure confidentiality and minimise distractions. Instructors were provided with a structured feedback checklist to ensure fidelity to the model, and intervention fidelity was assessed throughout the study period.

The control group received conventional feedback, defined as the feedback typically provided by clinical instructors in the existing curriculum, which was unstructured and varied in format and duration. This feedback typically consisted of brief verbal comments on performance, often focused on errors or areas needing improvement, without a systematic framework for structuring the feedback conversation. Both groups completed identical

clinical skills requirements and were assessed using the same instrument.

Outcome Measure

Clinical performance was measured using the Clinical Performance Evaluation Tool (CPET), a 30-item instrument adapted from the Common Clinical Assessment Tool (CCAT) used in previous nursing education research. The CCAT was used by Khalafi et al. (2024) to measure clinical competence of nurse anaesthesia students, demonstrating its utility in clinical education research. The CPET assesses four domains: knowledge application (8 items), psychomotor skills (8 items), communication (7 items), and professional behaviour (7 items). Each item is rated on a 5-point Likert scale (1 = unsatisfactory to 5 = excellent), with total scores ranging from 30 to 150.

The instrument demonstrated good internal consistency in the present sample (Cronbach's $\alpha = .89$). Subscale reliabilities were: knowledge application $\alpha = .84$, psychomotor skills $\alpha = .87$, communication $\alpha = .82$, and professional behaviour $\alpha = .79$. Inter-rater reliability for the CPET was excellent, with an intraclass correlation coefficient (ICC) of .91 (95% CI [.87, .94]). Two trained assessors, blinded to group allocation, conducted the post-intervention assessments.

Data Collection Procedure

Pre-test clinical performance was assessed during the second week of the semester using the CPET during a simulated clinical scenario. This timing allowed students to acclimatise to the clinical environment while ensuring that baseline performance was measured before the intervention began. Post-test assessment was conducted during the final two weeks of the semester using the same instrument under comparable conditions. Both assessments were conducted in the college's simulation laboratory to ensure standardisation of the assessment environment.

The simulation scenarios used for pre- and post-test assessments were developed by a panel of three experienced nursing educators and were reviewed

for content validity. Scenario difficulty was matched across pre- and post-test assessments to ensure comparability. Each assessment session lasted approximately 20 minutes, with students performing a standardised clinical scenario involving patient assessment, medication administration, and documentation.

Ethical Considerations

Ethical approval was obtained from the Institutional Research Ethics Committee. All participants provided written informed consent after receiving a full explanation of the study purpose, procedures, and their rights as participants. Students were assured that participation was voluntary and that withdrawal would not affect their academic standing. Data were anonymised using unique participant codes, and all data were stored securely in password-protected files accessible only to the research team.

Data Analysis

Data were analysed using SPSS version 27.0. Descriptive statistics were calculated for all demographic and outcome variables. Independent samples t-tests were used to compare post-test scores between groups. Analysis of Covariance (ANCOVA) was conducted to control for pre-test scores and assess the intervention effect. Effect sizes were calculated using Cohen's d for t-tests and partial η^2 for ANCOVA. Within-group changes were assessed using paired samples t-tests. Statistical significance was set at $p < .05$. Normality was assessed using Shapiro-Wilk tests, and homogeneity of variance was assessed using Levene's test.

Results

Participant Flow and Baseline Characteristics

A total of 120 third-year undergraduate nursing students were enrolled, with 60 students in the intervention group and 60 in the control group. No attrition occurred during the 16-week study period. Baseline demographic and academic variables were comparable between groups, confirming the non-equivalent groups were statistically equivalent at pre-test (Table 1).

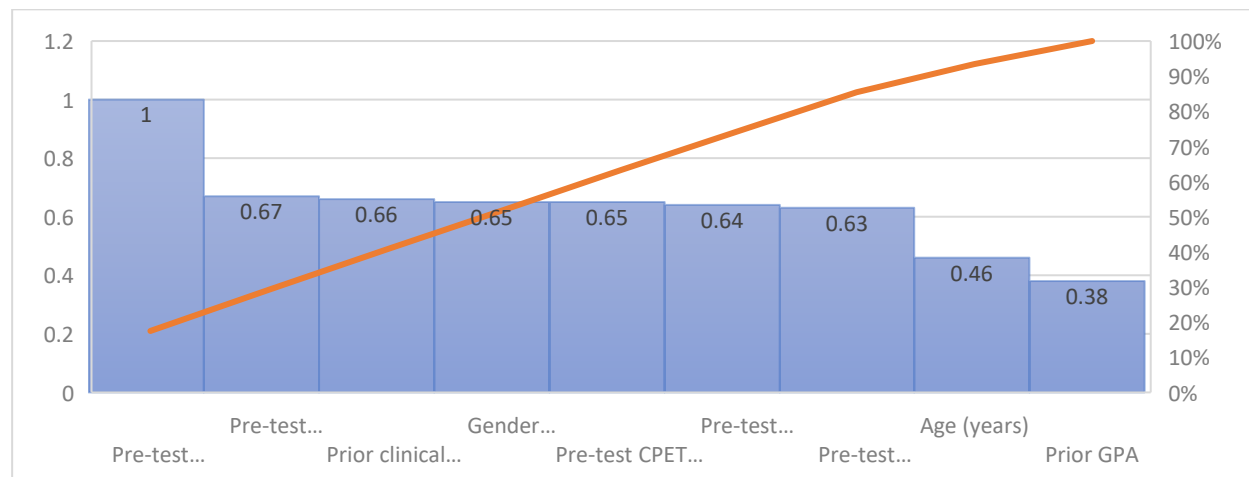
Independent samples t-tests and chi-square tests revealed no significant differences in age, gender,

prior GPA, prior clinical experience, or pre-test CPET scores ($p > .05$ for all).

Table 1. Baseline Characteristics and Pre-Test Equivalence

Variable	Intervention (n = 60)	Control (n = 60)	Test Statistic	p
Age (years)	21.3 (1.4)	21.1 (1.6)	$t(118) = 0.74$	.46
Gender (female), n (%)	47 (78.3)	49 (81.7)	$\chi^2 = 0.21$	.65
Prior GPA	3.42 (0.31)	3.38 (0.29)	$t(118) = 0.89$	.38
Prior clinical experience, n (%)	12 (20.0)	14 (23.3)	$\chi^2 = 0.19$	.66
Pre-test CPET total	58.2 (7.1)	57.6 (7.4)	$t(118) = 0.45$	.65
Pre-test knowledge application	15.4 (2.3)	15.2 (2.4)	$t(118) = 0.47$	.64
Pre-test psychomotor skills	14.8 (2.5)	14.6 (2.6)	$t(118) = 0.43$	.67
Pre-test communication	13.9 (2.2)	13.7 (2.3)	$t(118) = 0.49$	.63
Pre-test professional behaviour	14.1 (2.1)	14.1 (2.1)	$t(118) = 0.00$	1.00

Note. CPET = Clinical Performance Evaluation Tool. Continuous variables are reported as mean (SD). Categorical variables are reported as n (%).



Reliability and Data Screening

The CPET demonstrated good internal consistency in the present sample (Cronbach's $\alpha = .89$). Subscale reliabilities were: knowledge application $\alpha = .84$, psychomotor skills $\alpha = .87$, communication $\alpha = .82$, and professional behaviour $\alpha = .79$. Normality was assessed using Shapiro-Wilk tests, which were non-significant for all outcome variables ($p > .05$), indicating approximately normal distributions. Levene's test for homogeneity of variance was non-significant ($p = .34$), confirming equal variances between groups. No univariate outliers were identified (standardised residuals $< \pm 3.0$).

Primary Outcome: Total CPET Scores

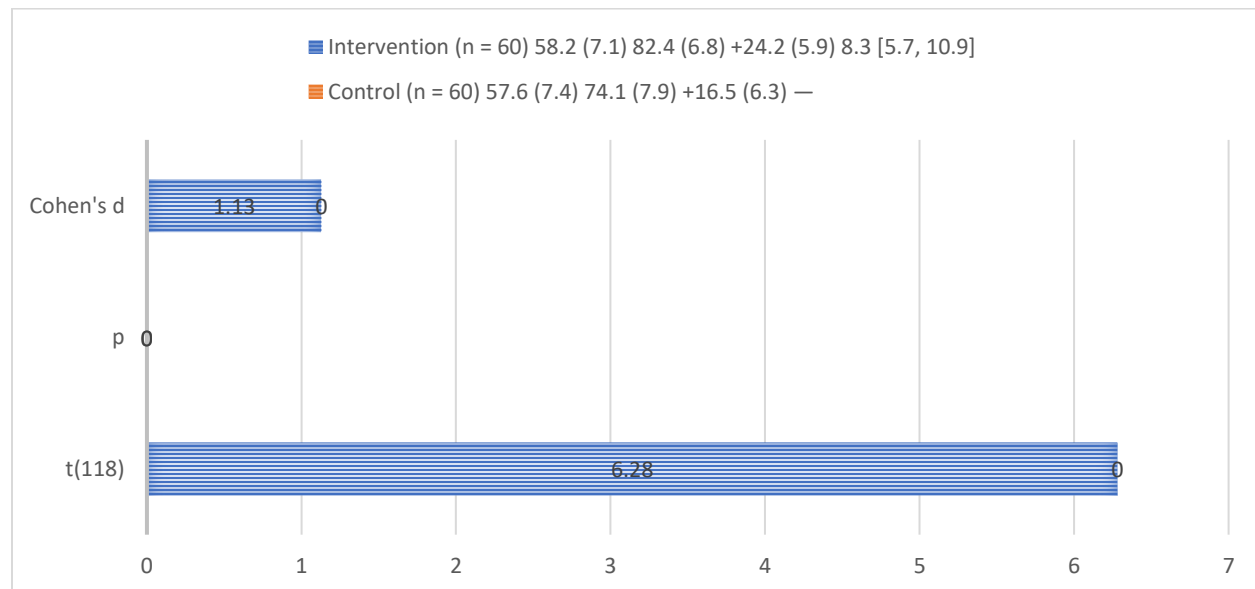
At post-test, the intervention group achieved significantly higher total CPET scores than the control group. The mean difference was 8.3 points (95% CI [5.7, 10.9]), representing a large effect size (Cohen's $d = 1.13$). Within-group changes were also significant for both groups, but the magnitude of improvement was substantially greater in the intervention group (Table 2). The intervention group's mean change of +24.2 points compared with the control group's +16.5 points represents a 47% greater improvement. These findings are consistent with previous quasi-experimental

evidence demonstrating that structured feedback improves clinical performance in nursing students.

Table 2. Primary Outcome: Total CPET Scores by Group

Group	Pre-test M (SD)	Post-test M (SD)	Mean Change (SD)	Between-Group Mean Difference (95% CI)	t(118)	p	Cohen's d
Intervention (n = 60)	58.2 (7.1)	82.4 (6.8)	+24.2 (5.9)	8.3 [5.7, 10.9]	6.28	< .001	1.13
Control (n = 60)	57.6 (7.4)	74.1 (7.9)	+16.5 (6.3)	—	—	—	—

Note. CPET = Clinical Performance Evaluation Tool. Higher scores indicate better clinical performance (possible range 30–150).



ANCOVA Controlling for Pre-Test Scores

Analysis of Covariance (ANCOVA) was conducted to control for pre-test CPET scores. The intervention effect remained statistically significant after adjustment, $F(1, 117) = 34.72$, $p < .001$, partial $\eta^2 = .23$. This indicates that 23% of the variance in post-test clinical performance was

attributable to the structured feedback intervention. Adjusted means were 81.9 (SE = 0.72) for the intervention group and 74.6 (SE = 0.72) for the control group, with an adjusted mean difference of 7.3 points (95% CI [4.9, 9.7]). The pre-test covariate was also significant, $F(1, 117) = 12.45$, $p < .001$, partial $\eta^2 = .10$ (Table 3).

Table 3. ANCOVA Summary for Post-Test CPET Total Scores

Source	Type III SS	df	MS	F	p	Partial η^2
Pre-test CPET	412.6	1	412.6	12.45	< .001	.10
Group	1150.3	1	1150.3	34.72	< .001	.23

Error	3875.4	117	33.1	—	—	—
Total	5438.3	119	—	—	—	—

Note. CPET = Clinical Performance Evaluation Tool. Adjusted means: intervention = 81.9 (SE = 0.72); control = 74.6 (SE = 0.72).

Subscale Analyses

Subscale analyses revealed differential effects across performance domains. The largest improvements were observed in psychomotor skills (Cohen's $d = 1.19$) and communication (Cohen's $d = 1.16$), followed by knowledge application (Cohen's $d = 0.81$). Professional behaviour did not differ significantly between groups ($p = .078$), although a small-to-moderate effect size was observed ($d = 0.33$). This pattern suggests that structured feedback may be particularly effective for skills that are highly

practice-dependent and interpersonal in nature, consistent with the theoretical mechanisms of Pendleton's rules. The finding that psychomotor skills showed the greatest improvement aligns with the practical nature of clinical skill demonstrations where feedback is most directly applicable. The substantial improvement in communication skills is particularly noteworthy, as structured feedback conversations model effective interpersonal communication that students may then transfer to patient interactions.

Table 4. CPET Subscale Scores by Group at Pre-Test and Post-Test

Subscale	Group	Pre-test M (SD)	Post-test M (SD)	Mean Change	Post-test t(118)	p	Cohen's d
Knowledge application	Intervention	15.4 (2.3)	22.1 (2.1)	+6.7	4.42	< .001	0.81
	Control	15.2 (2.4)	20.3 (2.4)	+5.1	—	—	—
Psychomotor skills	Intervention	14.8 (2.5)	21.8 (2.3)	+7.0	6.52	< .001	1.19
	Control	14.6 (2.6)	18.9 (2.6)	+4.3	—	—	—
Communication	Intervention	13.9 (2.2)	19.2 (2.0)	+5.3	6.34	< .001	1.16
	Control	13.7 (2.3)	16.8 (2.2)	+3.1	—	—	—
Professional behaviour	Intervention	14.1 (2.1)	19.3 (1.9)	+5.2	1.78	.078	0.33
	Control	14.1 (2.1)	18.1 (2.1)	+4.0	—	—	—

Note. CPET = Clinical Performance Evaluation Tool.

Within-Group Changes from Pre-Test to Post-Test

Paired samples t-tests confirmed significant within-group improvements for both groups across all CPET domains ($p < .001$ for all comparisons). However, the intervention group demonstrated larger gains, particularly in total CPET scores ($d = 4.11$) compared with the control group ($d = 2.62$).

These within-group findings are presented in Table 5. The large within-group effect sizes reflect the substantial learning that occurred in both groups over the semester, but the significantly greater gains in the intervention group demonstrate the added value of structured feedback.

Table 5. Within-Group Paired Samples t-Tests

Group	Outcome	Pre-test M (SD)	Post-test M (SD)	Mean Change (95% CI)	t(59)	P	Cohen's d
Intervention	Total CPET	58.2 (7.1)	82.4 (6.8)	24.2 [21.9, 26.5]	31.80	< .001	4.11
	Knowledge	15.4 (2.3)	22.1 (2.1)	6.7 [5.9, 7.5]	17.42	< .001	2.25
	Psychomotor	14.8 (2.5)	21.8 (2.3)	7.0 [6.2, 7.8]	18.11	< .001	2.34
	Communication	13.9 (2.2)	19.2 (2.0)	5.3 [4.6, 6.0]	15.63	< .001	2.02
	Professional	14.1 (2.1)	19.3 (1.9)	5.2 [4.5, 5.9]	15.04	< .001	1.94
Control	Total CPET	57.6 (7.4)	74.1 (7.9)	16.5 [14.3, 18.7]	20.30	< .001	2.62
	Knowledge	15.2 (2.4)	20.3 (2.4)	5.1 [4.3, 5.9]	13.02	< .001	1.68
	Psychomotor	14.6 (2.6)	18.9 (2.6)	4.3 [3.5, 5.1]	10.89	< .001	1.41
	Communication	13.7 (2.3)	16.8 (2.2)	3.1 [2.4, 3.8]	8.97	< .001	1.16
	Professional	14.1 (2.1)	18.1 (2.1)	4.0 [3.3, 4.7]	11.23	< .001	1.45

Note. CPET = Clinical Performance Evaluation Tool.

Intervention Fidelity and Reliability

Intervention fidelity was assessed using a 10-item checklist derived from Pendleton's rules. Clinical instructors in the intervention group adhered to all four steps in 95% of observed feedback sessions. The mean duration of structured feedback sessions was 12.8 minutes (SD = 2.1),

which falls within the recommended 10–15 minute range for effective feedback conversations. Inter-rater reliability for the CPET was excellent, with an intraclass correlation coefficient (ICC) of .91 (95% CI [.87, .94]). These indices support the internal validity of the intervention and the consistency of outcome assessment.

Table 6. Reliability and Intervention Fidelity Indicators

Indicator	Value
Cronbach's α – CPET total	.89
Cronbach's α – Knowledge application	.84
Cronbach's α – Psychomotor skills	.87
Cronbach's α – Communication	.82
Cronbach's α – Professional behaviour	.79
Inter-rater reliability (ICC)	.91 (95% CI [.87, .94])
Fidelity to Pendleton's rules	95% of sessions

Mean feedback session duration	12.8 min (SD = 2.1)
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Note. CPET = Clinical Performance Evaluation Tool; ICC = intraclass correlation coefficient.

Discussion

The present study provides empirical evidence that structured feedback based on Pendleton's rules significantly improves clinical performance among undergraduate nursing students. The large effect size ($d = 1.13$) observed in this study is consistent with findings from similar quasi-experimental research. Awan et al. (2025) reported large effect sizes (Cohen's $d > 1.5$) for structured formative feedback in simulation-based training among undergraduate health professions students. Ossenberrg et al. (2023) similarly demonstrated that a structured feedback intervention (the REMARK programme) produced statistically higher performance scores among final-year nursing students during clinical placements, even after controlling for time and placement setting. The consistency of these findings across different educational contexts and feedback models strengthens the evidence base for structured feedback as an effective educational intervention (Acampora et al., 2026).

The significant improvement in psychomotor skills observed in the present study aligns with the theoretical underpinnings of structured feedback. Pendleton's rules require learners to actively identify their own strengths and areas for improvement before receiving educator input, promoting self-regulated learning and deeper processing of feedback information. This active engagement may explain why psychomotor skills, which are highly amenable to practice-based refinement, showed the greatest improvement. Similar findings were reported by Khalafi et al. (2024), who found that formative OSCEs combined with immediate verbal and visual feedback significantly improved clinical competence among nurse anesthesia students. The study showed "a significant positive change in the overall clinical competence score in the intervention group after receiving formative OSCE" (Wong et al., 2022).

The finding that communication skills also improved significantly is particularly noteworthy, given the interpersonal nature of feedback conversations. Structured feedback models encourage dialogue and shared meaning-making between learner and educator, which may model effective communication strategies that students then transfer to patient interactions. Kim et al. (2025) found that instructor-led debriefing was the most effective method for enhancing clinical judgment and performance skills, "highlighting the importance of structured interactive feedback in simulation-based nursing education". The interactive nature of structured feedback conversations may serve as a form of communication skills training in itself, as students observe and participate in a structured, respectful dialogue about performance (Acampora et al., 2026).

The absence of significant group differences in professional behavior is consistent with the literature suggesting that affective and attitudinal domains may require longer interventions to demonstrate measurable change. Alsaahafi (2022) noted that quality feedback should describe observed behavioural actions, yet professional behaviour encompasses values and attitudes that may be less responsive to short-term feedback interventions. Professional socialisation is a gradual process that unfolds over the entire educational programme, and a single semester of structured feedback may not be sufficient to produce measurable changes in this domain. Future research should examine the long-term effects of structured feedback on professional behaviour development across multiple clinical rotations (Brügge et al., 2024).

The finding that knowledge application scores improved significantly in the intervention group is also important. While clinical feedback is often focused on psychomotor skills, the structured nature of Pendleton's rules encourages learners to articulate their clinical reasoning and identify gaps

in their knowledge. This reflective process may enhance the integration of theoretical knowledge with clinical practice. As noted in the literature, "clinical competence extends its positive influence beyond just patient outcomes, demonstrably impacting healthcare workers' self-efficacy, collegial empathy, and overall job satisfaction".

The effect size observed in this study ($d = 1.13$) is substantial and clinically meaningful. In educational terms, an effect size of this magnitude indicates that the average student in the intervention group outperformed approximately 87% of students in the control group. This finding has important implications for clinical education practice, suggesting that the structured feedback intervention was not merely statistically significant but produced practically meaningful improvements in student performance.

Implications for Nursing Education

The findings of this study have several implications for nursing education practice. First, clinical instructors should receive training in structured feedback models to ensure consistent, high-quality feedback delivery. The two-hour workshop used in this study proved sufficient to equip instructors with the necessary skills, suggesting that such training is feasible within existing faculty development programmes. As Kim et al. (2025) demonstrated, instructor-led feedback is the most effective method for enhancing clinical performance, underscoring the importance of investing in faculty development.

Second, nursing curricula should incorporate structured feedback protocols into clinical supervision guidelines, specifying the timing, format, and content of feedback sessions. The findings of this study suggest that feedback should be provided immediately following clinical skill demonstrations, should last approximately 10–15 minutes, and should follow a structured framework that engages the learner as an active participant. As Ossenberr et al. (2023) recommended, "incorporating strategies that encourage students to adopt an active role in feedback conversations that relate to the student's learning goals are recommended".

Third, institutions should consider adopting validated feedback models such as Pendleton's rules as standard practice in clinical education. The model's structured, learner-centred approach aligns with contemporary educational principles that emphasise self-regulated learning and reflective practice. As noted in the literature, "students value constructive feedback given in a professional well-meaning manner", and structured models provide a framework for delivering such feedback consistently.

Fourth, the findings support the routine incorporation of structured feedback into undergraduate simulation curricula, particularly in resource-limited educational settings where faculty-student ratios may be higher and feedback opportunities more limited. Structured feedback models provide an efficient framework for maximizing the educational value of each feedback interaction.

Limitations

Several limitations should be acknowledged. First, the non-equivalent quasi-experimental design introduces potential selection bias, although baseline equivalence was confirmed on demographic and academic variables. The lack of randomization means that unmeasured confounding variables could potentially influence the results, although the ANCOVA analysis controlling for pre-test scores partially addresses this concern. Second, the convenience sampling method limits generalizability to other nursing programmes and cultural contexts. Future research should employ randomized controlled designs across multiple institutions to enhance external validity. Third, the study duration of one semester may not capture long-term retention of performance improvements. Follow-up assessments at 6 and 12 months would provide valuable information about the durability of the intervention effects. Fourth, the CPET, while validated, relies on assessor ratings which may be subject to observation bias despite blinding. Future research should incorporate objective performance measures, such as direct observation

checklists or clinical competency assessments, alongside rating scales.

Fifth, the study was conducted in a single country and educational context, which may limit the transferability of findings to other settings with different clinical education structures. Sixth, while intervention fidelity was high (95%), the presence of a research team observing feedback sessions may have created a Hawthorne effect, where instructors provided more structured feedback than they would in routine practice. Finally, the study did not measure patient outcomes, which are the ultimate indicators of clinical competence. Future research should examine the relationship between structured feedback, student performance, and patient outcomes in clinical settings.

Recommendations for Future Research

Future research should address the limitations identified in this study by: (1) employing randomized controlled designs with larger, multi-site samples; (2) conducting longitudinal follow-up assessments to examine the durability of intervention effects; (3) incorporating objective performance measures alongside rating scales; (4) examining the effects of structured feedback on patient outcomes; (5) comparing different structured feedback models (e.g., Pendleton's rules vs. ALOBA) to determine relative effectiveness; (6) investigating the optimal dosage and timing of structured feedback interventions; and (7) exploring the mechanisms through which structured feedback produces its effects, including potential mediators such as self-efficacy, reflective ability, and learner engagement.

Conclusion

Structured feedback using Pendleton's rules significantly improved clinical performance among undergraduate nursing students, with large effect sizes observed in psychomotor skills and communication. The intervention group demonstrated a mean improvement of 24.2 points on the CPET, compared with 16.5 points in the control group, representing a statistically significant and practically meaningful difference. These findings support the routine incorporation

of structured feedback models into clinical supervision protocols. Nursing education institutions should prioritize training clinical instructors in evidence-based feedback techniques and evaluate the long-term impact of structured feedback on competency development and patient care outcomes.

The study contributes to the growing evidence base demonstrating that the quality of feedback, rather than merely its presence, is a critical determinant of student learning in clinical settings. As nursing education continues to evolve in response to changing healthcare demands, structured feedback models offer a practical, evidence-based strategy for enhancing clinical competence and preparing students for professional practice. The findings have implications not only for undergraduate nursing education but also for other health professions education programmes where clinical supervision and feedback are essential components of the curriculum.

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