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Competency and Self-Efficacy Development Through Skills Competition Training in Nursing Education: A Sequential Explanatory Mixed-Methods Study

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Abstract

Background: Skills competition training may provide intensive opportunities for competency development in nursing education, but how nursing competency and self-efficacy develop within such training remains insufficiently understood. This study examined nursing competency and general self-efficacy in relation to skills competition training experience and explored the developmental processes described by competitors and coaches.

Methods: A sequential explanatory mixed-methods design was employed. Quantitative data were collected from 173 nursing students (70 with and 103 without competition training experience) using a 20-item nursing competency measure and the General Self-Efficacy Scale. Group comparisons, Pearson correlation and linear regression analyses were conducted, including multivariable models adjusting for educational characteristics. Semi-structured interviews with 11 competitors and five coaches were subsequently analysed using reflexive thematic analysis. Findings were integrated through a joint display.

Results: Students with competition training experience reported higher nursing competency (3.85 vs. 3.50, $p < 0.001$) and general self-efficacy (2.86 vs. 2.67, $p = 0.024$) in unadjusted comparisons, although these associations were not statistically significant after adjustment for educational characteristics. Nursing competency and self-efficacy were positively correlated ($r = 0.634$, $p < 0.001$). Five qualitative themes described intensive, iterative and nonlinear learning, multidimensional competency development, mastery and self-appraisal, and the influence of coaching and training conditions.

Conclusions: The findings highlight the complex and nonlinear nature of competency and self-efficacy development within skills competition training. Purposeful practice, progressive

challenge, feedback, reflection and adaptive coaching emerged as potentially transferable educational approaches. These insights may inform routine nursing education, although their applicability across broader educational settings requires further evaluation.

Keywords: nursing competency; self-efficacy; skills competition; nursing education; mixed-methods research

Introduction

Background

Competency is a multidimensional and evolving concept that has been widely discussed across multiple professional fields. Although often used interchangeably with “competence” (1), the term “competency” is more commonly associated with observable performance, encompassing the knowledge, behaviours, judgement, and skills required to carry out professional tasks effectively (2, 3).

Within the field of nursing, competency is of particular importance due to the complex and high-risk nature of practice. Nurses are required to maintain a high level of competency, as they are directly involved in delivering care and fulfilling professional responsibilities (3, 4). Evidence suggests that higher levels of nursing competency are associated with improved patient safety outcomes and a reduction in adverse events (5, 6), and are closely linked to the quality of nursing care, enabling nurses to perform clinical tasks effectively and respond appropriately to patient needs (2).

Building on this, recent concept analyses have further clarified the meaning of competency in nursing, aligning with the definition proposed by the International Council of Nurses (7), which emphasizes the integration of knowledge, skills and professional attributes required for effective practice (8). From a theoretical perspective, nursing competency has been interpreted through multiple lenses, including behaviorism, trait theory, and holism (2). Behaviorism conceptualizes competency in terms of observable performance, where the demonstration of specific skills reflects competence (9). In contrast, trait theory emphasizes underlying individual characteristics, such as critical thinking and reflective capacity, that enable effective performance(10). Holistic perspectives integrate these views, describing competency as the dynamic combination of knowledge, skills, attitudes, and values applied in context(2). While these perspectives differ in focus, together they suggest that nursing competency is not a single attribute but a complex and context-dependent construct that involves both observable performance and underlying professional capabilities.

Competency can also be understood as the capability of individuals to perform tasks effectively based on appropriate education and training (1). Given that competency develops through educational processes, nursing students are a critical population for examining how competency is acquired and strengthened in preparation for clinical practice (11).

Existing literature suggests that nursing competency is developed through a combination of educational and practice-based approaches (12-15). Competency-based education (CBE), which

emphasizes the demonstration of knowledge, skills, and professional behaviors, has been widely adopted as a key educational framework to facilitate competency development in nursing (13, 16). However, competency development cannot be understood as the product of curriculum design alone. Clinical practice remains fundamental because it enables nursing students to apply theoretical knowledge in authentic care settings, respond to patient needs, and gradually develop clinical judgement through experience (17). Competency is therefore not only taught but also enacted, evaluated and refined through practice, highlighting the importance of practice-based learning approaches in nursing education.

Building on this, experiential learning provides an important perspective for understanding competency development in nursing education (14). Grounded in Kolb's Experiential Learning Theory, experiential learning conceptualises learning as a process through which experience is transformed through reflection and subsequently informs further action (18). In nursing education, this process provides opportunities for students to translate theoretical knowledge into clinical action and progressively develop clinical judgement and professional competence (14). Accordingly, a range of active and practice-based pedagogical approaches have been used to facilitate experiential learning and competency development. Among these approaches, simulation-based learning has received substantial empirical attention. By providing a safe and controlled environment, simulation enables students to practise clinical skills and decision-making without exposing patients to unnecessary risk (19). Systematic-review evidence suggests that simulation-based education can improve clinical decision-making, judgement and confidence among nursing students and contribute to bridging the theory – practice gap (15).

Other approaches, including case-based learning (CBL) and role-play (RP), similarly engage students in contextualised and interactive learning. Case-based learning uses realistic clinical situations to promote knowledge application, critical thinking, communication and collaborative learning (20-23),while RP enables students to rehearse clinical and interpersonal encounters through taking on specific roles within simulated situations (24, 25). Collectively, these approaches illustrate the value of active engagement, contextualised practice, reflection and interaction in supporting nursing students' competency development.

Furthermore, reflective learning represents another important process through which experiential learning may contribute to competency development (26). By reflecting on simulated and clinical experiences, nursing students can critically evaluate their actions, consolidate learning and identify areas for subsequent improvement (27).However, reflection should not be assumed to produce learning automatically; its effectiveness may depend on the structure, guidance and feedback available to support the reflective process (28).

Together, existing evidence suggests that nursing competency develops through the interaction of structured education, experiential practice, feedback and reflection rather than through any single educational strategy. Within this broader landscape, skills competitions have emerged as an intensive and competency-oriented form of practice-based learning in healthcare education. Competition training shares several characteristics with competency-based education, particularly its emphasis on the integration and demonstration of knowledge, skills and professional

behaviours through observable performance. At the same time, skills competitions may bring together several experiential learning processes within a concentrated training environment, including repeated practice, simulated clinical scenarios, performance-based feedback and reflection (29, 30). Under progressively demanding and evaluative conditions, competitors are required to integrate knowledge, technical skills and professional judgement rather than perform isolated procedures alone (29, 31).

Despite growing interest in skills competitions in healthcare education, existing research has primarily examined training approaches, competition experiences and educational outcomes (29, 30, 32). Less is known about how competency develops through competition training at the individual level, particularly whether students with competition experience differ from those without such experience and what developmental processes may underlie these differences. Skills competition research has also provided limited insight into how repeated practice, progressive challenge, feedback, reflection and the wider training environment interact to shape competency development. Consequently, the mechanisms through which competition training may contribute to competency development remain insufficiently understood.

Self-efficacy represents a particularly relevant psychological construct in this context. Defined as an individual's belief in their capability to organise and execute the actions required to manage prospective situations (33), self-efficacy has been associated with learning, performance and clinical competence in nursing education. Students with stronger self-efficacy may be more willing to engage with challenging learning activities and persist when difficulties arise, whereas

lower self-efficacy may contribute to avoidance of situations perceived as exceeding one's capabilities (33-35). Previous nursing research has also identified positive associations between self-efficacy and academic or clinical outcomes (36, 37).

Therefore, a more comprehensive understanding is needed of how competency and self-efficacy are associated and how they develop within the context of skills competition training. A mixed-methods approach may provide complementary insights into both the measurable patterns and the underlying developmental processes.

The objectives of this study are:

(1) To compare nursing competency and general self-efficacy between students with and without skills competition training experience, and to examine whether these associations persist after adjustment for selected demographic and educational characteristics.

(2) To examine the association between perceived nursing competency and self-efficacy and their differences according to competition- and experience-related characteristics.

(3) To explore competitors' and coaches' perceptions of how nursing competency and self-efficacy develop through skills competition training.

(4) To integrate quantitative and qualitative findings to provide a comprehensive understanding of the patterns and processes underlying competency and self-efficacy development in the context of skills competition training.

Methods

Study Design

A sequential explanatory mixed-methods design was employed, consisting of an initial quantitative phase followed by a qualitative phase. In the quantitative phase, a cross-sectional survey was conducted to compare nursing competency and self-efficacy between students with and without skills competition experience and to examine the relationship between competency and self-efficacy. The subsequent qualitative phase used semi-structured interviews with competitors and coaches to explore how competency and self-efficacy developed through skills competition training and to provide contextual explanations for the quantitative findings. Integration occurred through connecting the two phases, whereby quantitative findings informed qualitative sampling and interview development, and through the interpretation of quantitative and qualitative findings using a joint display.

Setting and participants

The study was conducted from April to June 2026 across multiple nursing schools in China. Nursing students and nursing interns were recruited for the quantitative phase and were classified according to their previous experience of nursing- or healthcare-related skills competition training. Participants in the competition group had received at least one month of competition-related preparation or training, whereas those in the non-competition group had no previous competition-related training experience. Students with less than one month of competition-related exposure were excluded to minimize the inclusion of incidental or very limited training experience.

Eligible student participants were required to (1) be currently enrolled in a formal nursing education programme or undertaking a nursing internship; (2) be able to understand and complete

209 the questionnaire independently; and (3) provide informed consent. Questionnaire responses were
210 excluded from analysis if they were incomplete or met predefined criteria for invalid responding.
211 For the qualitative phase, competitors with relevant competition training experience and coaches
212 who had directly coached or supervised students in nursing- or healthcare-related skills
213 competitions were purposively recruited. Coaches were eligible if they had direct experience of
214 competition training and provided informed consent.
215
216 **Nursing competency**
217 Nursing competency was assessed using a 20-item measure adapted from the Nurse Competence
218 Scale (NCS) developed by Meretoja, Isoaho (38). The original NCS comprises 73 items across
219 seven competence categories and uses a 0 – 100 visual analogue scale. For the present study, 20
220 items relevant to the competencies targeted in nursing and healthcare skills competition training
221 were selected and adapted for use with nursing students. The selected items were reviewed by two
222 nursing faculty members for their relevance, clarity, and appropriateness to the target population.
223 The adapted items were translated into Chinese using a forward – backward translation procedure.
224 Two bilingual researchers independently translated the original English items into Chinese and
225 reconciled the translations into a single version. A separate bilingual translator, blinded to the
226 original items, then back-translated the Chinese version into English. The back-translated items
227 were compared with the original items to assess semantic equivalence, and the Chinese version
228 was subsequently reviewed for linguistic and cultural appropriateness.
229 Each item was rated on a 5-point Likert-type scale ranging from 1 (completely unable) to 5
230 (completely able). The mean score across the 20 items was calculated to represent overall

perceived nursing competency, with higher scores indicating higher levels of perceived competency. A pilot study involving 21 nursing students was conducted before the main survey to assess the clarity and comprehensibility of the adapted items. Minor wording revisions were made based on participant feedback. In the main study, the adapted measure demonstrated excellent internal consistency (Cronbach's α = .925). All items demonstrated acceptable corrected item–total correlations (CITC > 0.30), indicating good homogeneity.

Self-efficacy

Self-efficacy was assessed using the 10-item General Self-Efficacy Scale (GSES) developed by Ralf Schwarzer and colleagues (39). Each item is rated on a 4-point Likert scale, with higher scores indicating greater general self-efficacy. The Chinese version of the GSES has previously demonstrated satisfactory reliability and validity Wang (40) with a Cronbach's α of 0.87.

Data collection

Quantitative data were collected from April to June 2026 using a structured questionnaire comprising demographic and educational characteristics, competition-related characteristics, the adapted 20-item competency measure, and the GSES. Participation was voluntary, and informed consent was obtained before questionnaire completion. Responses were screened for completeness and response quality. Questionnaires completed in less than one minute and showing invariant response patterns across items were excluded from the final analysis.

Following the quantitative phase, competitors were purposively selected for qualitative interviews based on their competency and self-efficacy scores. Among participants with competition

253 experience (n = 70), median scores were used to define four sampling profiles: high
254 competency-high self-efficacy (n = 5), high competency-low self-efficacy (n = 3), low
255 competency-low self-efficacy (n = 1), and low competency-high self-efficacy (n = 2). This
256 approach captured both concordant and discordant profiles. Potential interview participants were
257 contacted using the contact information they had voluntarily provided for follow-up recruitment.
258 Semi-structured interviews were conducted with 11 competitors and five coaches. Separate
259 interview guides were developed for competitors and coaches, informed by the study research
260 questions and findings from the quantitative phase. Competitor interviews explored experiences of
261 competition training, perceived changes in competency and self-efficacy, factors influencing these
262 changes, and experiences of challenge, feedback and support. Coach interviews explored observed
263 changes in competitors' competency and confidence, training approaches, individual differences in
264 development, and contextual factors influencing training outcomes. Interviews were conducted in
265 Chinese and audio-recorded with participants' consent. Recordings were transcribed verbatim in
266 Chinese and subsequently translated into English for reporting.
267
268 **Data analysis**
269 Quantitative data were analysed using statistical analysis software (SPSSAU) and Python
270 (statsmodels). Descriptive statistics were used to summarise participant characteristics and study
271 variables. Categorical variables were presented as frequencies and percentages, and continuous
272 variables as means and standard deviations. Independent-samples t tests were used for
273 comparisons involving two groups, while one-way analysis of variance (ANOVA) was used for
274 variables with more than two groups. Analyses of competition level and training duration were

restricted to participants with competition experience. Effect sizes were reported as Cohen's d for two-group comparisons and partial η^2 for ANOVA.To examine the association of skills competition training experience with nursing competency and general self-efficacy, separate ordinary least squares linear regression models were fitted for each outcome. Unadjusted models included competition training experience as the sole predictor. Adjusted models included year of study, educational level, and clinical placement experience (any versus none). Competition training experience was coded as 0 (no experience) and 1 (experience), and categorical covariates were entered as factors. Heteroskedasticity-consistent (HC3) robust standard errors were used to calculate 95% confidence intervals and p values. Sensitivity analyses examined alternative categorisations of clinical placement experience. Pearson's correlation coefficient was used to examine the association between nursing competency and general self-efficacy, followed by simple linear regression with nursing competency as the dependent variable and general self-efficacy as the predictor. All statistical tests were two-tailed, with statistical significance set at $p < 0.05$.

Qualitative data were analysed using Braun and Clarke's six-phase reflexive thematic analysis. Two researchers independently read and re-read the interview transcripts to familiarise themselves with the data and gain an overall understanding of participants' experiences. Initial ideas and meaningful segments relevant to competency development through skills competitions were identified, followed by systematic coding of relevant data. Similar codes were grouped to generate preliminary themes, which were subsequently reviewed against the coded extracts and the full dataset for coherence and distinctiveness. Themes were then refined, defined and named to capture

297 the underlying meanings reflected in participants' experiences. Throughout the analysis, the two
298 researchers met regularly to compare interpretations, discuss coding decisions and refine the
299 developing themes. Representative quotations were selected to illustrate each theme.
300 Integration occurred at both the connecting and interpretation stages of the study. At the
301 connecting stage, quantitative competency and self-efficacy scores informed purposive selection
302 of competitors for the qualitative phase, with sampling designed to represent both concordant and
303 discordant competency – self-efficacy profiles. Quantitative findings also informed development
304 of the semi-structured interview guides. At the interpretation stage, quantitative and qualitative
305 findings were brought together using a joint display. Corresponding findings were compared to
306 identify convergence, expansion and qualification, and integrated interpretations were developed
307 to explain how the qualitative findings contextualised or qualified the quantitative patterns.
308
309 **Rigour and trustworthiness**
310 Several strategies were used to enhance the trustworthiness of the qualitative findings. Analysis
311 remained grounded in the original Chinese-language transcripts, and representative quotations
312 were retained to support the interpretation of each theme. Two researchers engaged in ongoing
313 discussions throughout coding and theme development to examine alternative interpretations and
314 refine the developing analysis. Perspectives from both competitors and coaches were considered
315 across the analytic process, allowing patterns to be examined across participants occupying
316 different roles in skills competition training.
317
318 **Ethical considerations**

Ethical approval was obtained from the Research Ethics Committee of Shanghai University of Medicine & Health Sciences (approval no. 2026H0025). All participants were informed of the study's purpose and procedures and provided informed consent before participation. Participation was voluntary, and participants were informed of their right to withdraw without penalty. The study was conducted in accordance with the principles of the Declaration of Helsinki. Questionnaire data and interview transcripts were anonymised, and identifying information was removed from the research records. Interview participants were identified using study codes (S01–S11 for competitors and C01–C05 for coaches) in all analyses and reporting.

Results

Quantitative Findings

A total of 229 questionnaires were collected. Of these, 15 were excluded because informed consent was not provided, and 41 were excluded because they were completed in less than one minute and showed invariant response patterns across items. 173 questionnaires (75.5% of those collected) were retained for analysis. The mean nursing competency score was 3.64 (SD = 0.66), and the mean self-efficacy score was 2.75 (SD = 0.56). Participant characteristics are presented in Table 1.

Table 1. Participant Characteristics and Descriptive Statistics (N = 173)

Characteristic	Category	n
Gender	Female	147
	Male	26

Characteristic	Category	n
Educational level	Higher vocational	41
	Undergraduate	132
Year of study	Year 1	87
	Year 2	24
	Year 3	26
	Year 4	36
Competition experience	No	103
	Yes	70
Competition level[1]	School level	20
	Municipal level	22
	National level	28
Training duration[1]	Less than 3 months	31
	3–6 months	18
	More than 6 months	21
Clinical placement	No	104
	Less than 3 months	7
	3–6 months	4
	More than 6 months	58
Academic performance	Poor	2

Characteristic	Category	n
	Average	105
	Good	66

Note. [1]Competition level and training duration are reported for participants with competition experience (n = 70). Values are transcribed from the corresponding SPSSAU output tables.

Descriptive statistics for primary study variables

Variable	n	Mean	SD
Nursing competency	173	3.64	0.66
Self-efficacy	173	2.75	0.56

Of the 173 participants, 70 (40.5%) reported previous skills competition experience and 103 (59.5%) reported no competition experience. Participants with competition experience reported significantly higher competency ($p < .001$) and self-efficacy ($p = .024$) than those without such experience. Significant differences in both competency and self-efficacy were also observed across years of study. No significant differences in either outcome were found by gender or educational level.

Among participants with competition experience (n = 70), both competency and self-efficacy differed significantly across competition levels. Competency also differed significantly according to training duration ($p = .001$), whereas self-efficacy did not ($p = .102$). In the overall sample, competency differed significantly across clinical placement experience groups ($p = .021$), while

self-efficacy did not (p = .330). Both outcomes differed significantly across self-reported academic-performance groups (both p < .001). Full group comparisons are presented in Table 2.

Table 2. Comparisons of Nursing Competency and Self-Efficacy Across Participant Characteristics

Characteristic	Outcome	Group	n	Mean (SD)	t/F	p	Effect size
Gender	Competency	Female	147	3.66 (0.65)	0.553	.581	d = .118
		Male	26	3.58 (0.69)			
	Self-efficacy	Female	147	2.76 (0.56)	0.608	.544	d = .129
		Male	26	2.68 (0.62)			
Educational level	Competency	Higher vocational	41	3.75 (0.60)	1.228	.221	d = .220
		Undergraduate	132	3.61 (0.67)			
	Self-efficacy	Higher vocational	41	2.71 (0.60)	-0.512	.610	d = .091
		Undergraduate	132	2.76 (0.56)			
Year of study	Competency	Year 1	87	3.43 (0.67)	7.445	< .001	partial η^2 = .117
		Year 2	24	3.72 (0.66)			
		Year 3	26	3.90 (0.54)			
		Year 4	36	3.93 (0.55)			
	Self-efficacy	Year 1	87	2.61 (0.54)	4.654	.004	partial η^2 = .076
		Year 2	24	2.75 (0.63)			
		Year 3	26	2.97 (0.52)			

Characteristic	Outcome	Group	n	Mean (SD)	t/F	p	Effect size
		Year 4	36	2.93 (0.53)			
Competition experience	Competency	No	103	3.50 (0.67)	-3.581	< .001	d = .555
		Yes	70	3.85 (0.59)			
	Self-efficacy	No	103	2.67 (0.57)	-2.282	.024	d = .353
		Yes	70	2.86 (0.54)			
Competition level[1]	Competency	School level	20	3.99 (0.41)	13.335	< .001	partial η^2 = .285
		Municipal level	22	3.40 (0.55)			
		National level	28	4.11 (0.52)			
	Self-efficacy	School level	20	3.02 (0.42)	4.865	.011	partial η^2 = .127
		Municipal level	22	2.59 (0.51)			
		National level	28	2.97 (0.56)			
Training duration[1]	Competency	Less than 3 months	31	3.59 (0.63)	7.468	.001	partial η^2 = .182
		3–6 months	18	3.97 (0.41)			
		More than 6 months	21	4.15 (0.48)			
	Self-efficacy	Less than 3 months	31	2.72 (0.55)	2.360	.102	partial η^2 = .066
		3–6 months	18	2.92 (0.36)			
		More than 6 months	21	3.03 (0.61)			
Clinical placement	Competency	No	104	3.52 (0.71)	3.336	.021	partial η^2 = .056

Characteristic	Outcome	Group	n	Mean (SD)	t/F	p	Effect size
		Less than 3 months	7	3.67 (0.59)			
		3–6 months	4	4.06 (0.25)			
		More than 6 months	58	3.83 (0.54)			
	Self-efficacy	No	104	2.69 (0.57)	1.151	.330	partial η^2 = .020
		Less than 3 months	7	2.74 (0.69)			
		3–6 months	4	3.10 (0.18)			
		More than 6 months	58	2.82 (0.56)			
Academic performance	Competency	Poor	2	2.85 (0.07)	13.438	< .001	partial η^2 = .137
		Average	105	3.47 (0.70)			
		Good	66	3.94 (0.46)			
	Self-efficacy	Poor	2	1.85 (0.49)	13.437	< .001	partial η^2 = .137
		Average	105	2.61 (0.54)			
		Good	66	2.99 (0.51)			

Note. Values are mean (SD). d = Cohen's d; partial η^2 = partial eta squared. [1]Analyses were restricted to participants with competition experience (n = 70). p values reported as 0.000 in SPSSAU are presented as p < .001. No post-hoc pairwise comparisons are included in this table.

In the unadjusted regression models, skills competition training experience was positively associated with nursing competency (B = 0.353, 95% CI 0.163 to 0.543, p < 0.001) and general self-efficacy (B = 0.197, 95% CI 0.029 to 0.366, p = 0.022). After adjustment for year of study,

educational level, and clinical placement experience, these associations were attenuated and were no longer statistically significant for either nursing competency (B = 0.121, 95% CI −0.099 to 0.342, p = 0.282) or general self-efficacy (B = −0.001, 95% CI −0.220 to 0.219, p = 0.996) (Table 3).

Table 3. Associations of skills competition training experience with nursing competency and general self-efficacy

Outcome	Model	B	95% CI	p-value
Nursing competency	Unadjusted	0.353	0.163 to 0.543	＜0.001
	Adjusted	0.121	−0.099 to 0.342	0.282
General self-efficacy	Unadjusted	0.197	0.029 to 0.366	0.022
	Adjusted	−0.001	−0.220 to 0.219	0.996

Note. B, unstandardized regression coefficient; CI, confidence interval. The adjusted models included year of study, educational level, and clinical placement experience (any versus none). Competition training experience was coded as 0 = no experience and 1 = experience. Estimates were obtained using ordinary least squares regression with HC3 robust standard errors.

Competency was positively correlated with self-efficacy ($r = .634$, $p < .001$, $n = 173$). Simple linear regression further showed that self-efficacy was positively associated with competency ($\beta = .634$, $p < .001$), accounting for 40.2% of the variance in competency scores ($R^2 = .402$). Full correlation and regression results are presented in Table 4.

Table 4. Correlation and Simple Linear Regression Analysis of Nursing Competency and

Self-Efficacy

Variables	n	r	p
Self-efficacy and nursing competency	173	.634	< .001

Panel A. Pearson correlation

Panel B. Simple linear regression predicting nursing competency

Predictor	B	SE	β	t	p	95% CI for B
Self-efficacy	0.739	0.069	.634	10.723	< .001	[0.603, 0.875]

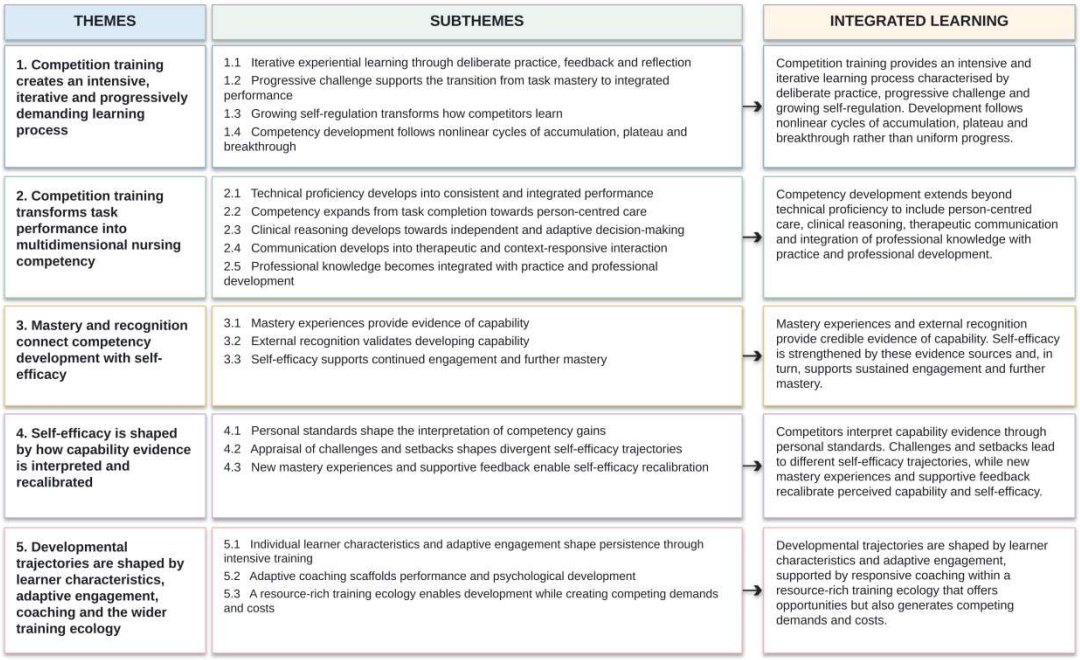
Model summary: $F(1, 171) = 114.987$, $p < .001$; $R^2 = .402$; adjusted $R^2 = .399$.

Note. B = unstandardized regression coefficient; SE = standard error; β = standardized regression coefficient; CI = confidence interval.

Qualitative Findings

The thematic analysis generated five interrelated themes describing competency and self-efficacy development through skills competition training from competitors' and coaches' perspectives. Competency development was intensive, iterative and nonlinear, progressing from technical task performance towards multidimensional nursing competency through periods of accumulation, plateau and adjustment. Mastery experiences and recognition were associated with greater self-efficacy, although individual responses to progress, setbacks, pressure and comparison varied. Development was further shaped by learner characteristics, coaching support and the wider training environment. The five themes and associated subthemes are presented in Figure 1.

Figure 1：Overview of themes,subthemes, and integrated learning



Theme 1. Competition training creates an intensive, iterative and progressively demanding learning process

Competitors and coaches characterised competition training as an intensive, evolving process involving repeated practice, simulation, feedback, reflection, progressive challenge and increasing learner autonomy. Development was nonlinear, with periods of accumulation, plateau and renewed progress. Four subthemes captured these processes.

1.1 Iterative experiential learning through deliberate practice, feedback and reflection

Repeated practice enabled competitors to develop procedural familiarity and refine performance, but repetition alone was insufficient. Feedback and reflection helped identify weaknesses and guide purposeful adjustments.

"I think repeated practice contributed the most." [S10, competitor]

"Although coaches and teachers provide valuable feedback, their suggestions do not automatically become part of your own practice. Real improvement comes from reflecting on your own performance and repeatedly refining it through practice." [S03, competitor]

Simulation further exposed students to varied clinical situations and patient responses that were difficult to encounter in conventional teaching.

"I believe the most important factor is simulation-based learning. For nursing students, simulation-based learning provides valuable opportunities to experience realistic clinical situations that they would not normally encounter. Through these simulated scenarios, students are exposed to a wide variety of patients and clinical situations. These experiences help them develop their competencies much more effectively than conventional classroom teaching alone." [C01, coach]

Taken together, the accounts portrayed learning as a recurring cycle of practice, feedback, reflection, correction and further practice, through which experience accumulated and performance was progressively refined.

1.2 Progressive challenge supports the transition from task mastery to integrated performance

Competitors and coaches described increasing case complexity, more detailed standards and broader competency expectations at higher competition levels.

"At the national level, the cases became much more comprehensive, and the standards became far more refined and detailed." [S08, competitor]

"The higher the competition level, the more demanding the training becomes." [C03, coach]

Coaches emphasised that progression towards municipal and national levels shifted expectations beyond technical accuracy towards integrated, person-centred care.

"Once students progress to the municipal and national levels, they already possess a solid foundation of knowledge and practical skills. At this stage, our expectations shift....The focus is no longer limited to performing procedures accurately and smoothly; instead, students are expected to integrate technical skills with compassionate, holistic care." [C01, coach]

This progression was accompanied by an emphasis on aligning training activities with competency goals.

"If any part of this process becomes disconnected from the intended objectives, students' overall competency development may be affected." [C05, coach]

Overall, both datasets portrayed higher competition levels as qualitatively more demanding learning environments, involving greater complexity, more explicit standards and broader integration of competencies.

1.3 Growing self-regulation transforms how competitors learn

Competition training encouraged greater learner autonomy, including independent preparation, active knowledge seeking and systematic use of feedback.

"Regarding professional competence, competition training differed greatly from ordinary classroom learning. Simply learning theoretical knowledge or practising procedures in class did not leave a particularly deep impression on me. During competition preparation, however, I became much more proactive in seeking knowledge independently."[S05, competitor]

"After training, I carefully recorded all the feedback provided by my teachers. When I returned to my dormitory, I would review and reflect on everything in detail." [S11, competitor]

Coaches similarly described competitor-centred approaches involving discussion, inquiry and collaborative learning, although students differed in their initiative to seek guidance. Over time, these practices appeared to foster transferable learning strategies.

"As they continue questioning, reflecting, and making connections between different concepts, they become much more efficient learners. Many students describe this experience as finally "understanding how to learn." [C05, coach]

Across competitor and coach accounts, competition training therefore appeared to foster greater independent thinking, self-directed learning, active feedback use and development of learning strategies, indicating a broader transformation in how competitors managed their own learning.

1.4 Competency development follows nonlinear cycles of accumulation, plateau and breakthrough

Although competition training was intensive, participants did not describe competency development as a continuously increasing process. Competitors and coaches both identified periods in which further practice produced little visible improvement, despite sustained effort.

"Repeatedly practising the same scenarios every day made it easy to reach a plateau and begin doubting myself." [S09, competitor]

Coaches viewed plateaus as common during prolonged training and as signals for reassessing underlying difficulties rather than simply as failure.

"Every plateau reflects an underlying issue that needs to be identified and addressed." [C05, coach]

Coaches described adjusting training strategies and short-term goals to restore momentum, while accumulated experience sometimes preceded noticeable improvements.

"The coaching team can adjust the training strategy, redefine short-term goals, and help students regain momentum." [C05, coach]

"Students often experience a noticeable improvement after they have accumulated sufficient training and experience." [C01, coach]

"At the beginning, students usually make rapid progress... once they successfully overcome this plateau, they usually experience another noticeable improvement." [C04, coach]

Thus, development involved accumulation, plateau, reassessment and renewed improvement rather than continuous linear growth.

Theme 2. Competition training transforms task performance into multidimensional nursing competency

Competitors and coaches described competency development as extending beyond improvements in isolated nursing procedures. Although greater technical proficiency was a prominent outcome of training, participants also reported changes in person-centred care, clinical reasoning, communication and the integration of professional knowledge with practice. Across the accounts, development was characterised by a movement from completing prescribed tasks towards more integrated nursing performance, in which technical, cognitive and interpersonal competencies were increasingly combined.

2.1 Technical proficiency develops into consistent and integrated performance

Technical development was the most immediately visible dimension of competency change, providing an early foundation for broader performance development.

"The most obvious improvement has been in my practical skills....After that period of intensive practice, whenever I performed procedures such as cardiopulmonary resuscitation（CPR） or intravenous infusion, the feeling was completely different from procedures that I had not trained repeatedly." [S11, competitor]

"The most noticeable improvements are in communication skills and the precision of nursing skills." [C03, coach]

However, technical performance increasingly involved communication and responses to unexpected situations.

"Through these simulations, I repeatedly practised not only clinical procedures but also communication with patients and responses to unexpected events. I believe this aspect of the training had the greatest influence on my development." [S05, competitor]

Coaches similarly described the development of broader capabilities alongside technical performance:

"Students who participate in skills competition training demonstrate stronger communication skills, critical thinking, self-directed learning, and the ability to respond to unexpected situations..." [C01, coach]

Technical proficiency was therefore embedded within broader performance rather than representing an independent endpoint. Across the two datasets, practical skill development was accompanied by increasing precision and fluency, while technical performance became increasingly integrated with other dimensions of competency.

2.2 Competency expands from task completion towards person-centred care

518 Competitors described shifting from completing prescribed tasks towards recognising individual
519 patient needs. One competitor recalled overlooking emotional distress while concentrating on
520 procedures:
521 *"As soon as I entered the room, my only thought was to complete every required task... The*
522 *patient was clearly displaying signs of emotional distress and reluctance to cooperate, but I*
523 *completely overlooked those cues because I was focused entirely on completing the procedures... It*
524 *was at that moment that I truly understood what patient-centred care meant." [S06, competitor]*
525 This shift involved broader assessments of patients' psychological status, family caregiving
526 environment and medication adherence when planning individualised care.
527 However, competitors and coaches identified tensions between standardised competition
528 requirements and individual needs.
529 *"Another challenge was balancing standardised procedures with individual patient needs."[S07,*
530 *competitor]*
531 Coaches emphasised that developing person-centred care required responding to patients while
532 completing required tasks efficiently within time constraints.
533 *"The students who develop most successfully are usually those who are able to find an*
534 *appropriate balance. They learn how to respond efficiently to patients' needs while completing all*
535 *the required tasks within the allotted time. In my experience, these students tend to achieve the*
536 *greatest overall competency development throughout the competition training process."[C01,*
537 *coach]*
538 Overall, both datasets described a movement beyond task completion towards broader assessment,
539 individualised care, emotional responsiveness and greater attention to the person receiving care.

2.3 Clinical reasoning develops towards independent and adaptive decision-making

Competition training appeared to shift competitors from rule-following towards greater ownership of clinical decisions.

"This kind of training taught me how to prioritize and make clinical decisions rather than simply following instructions." [S09, competitor]

Repeated exposure to different scenarios appeared to support the development of more structured approaches to decision-making:

"In different scenarios, I gradually developed my own mental framework for deciding what should be done and when it should be done." [S11, competitor]

At the same time, this development was not portrayed as simply acquiring fixed decision rules, such frameworks could restrict flexibility when circumstances differed from what had been anticipated:

"However, having such mental frameworks can sometimes also limit flexibility when responding to unexpected situations." [S11, competitor]

Coaches similarly emphasised the need for ongoing assessment and adaptation rather than rigid task execution.

"Competitors must continuously assess each situation, make their own clinical judgements, and adjust their decisions according to the patient's condition." [C02, coach]

Critical thinking was also identified by coaches as an area of substantial improvement. Taken together, competitor and coach accounts described clinical reasoning as developing towards greater independence in assessment, prioritisation and judgement, while also requiring flexibility in response to changing or unexpected situations.

2.4 Communication develops into therapeutic and context-responsive interaction

Communication developed from standardised expressions towards interactions adapted to individual patients.

"At first, I repeated the same expressions to everyone. Later, I learned to adjust my communication according to each patient's situation. I realised that different patients require different conversations." [S08, competitor]

Competitors also described prioritising emotional support and trust before assessment or intervention.

"Instead, I would first comfort the patient, help them settle emotionally, and establish trust before proceeding with the assessment and nursing interventions." [S03, competitor]

Coaches observed similar changes following systematic competition training.

"After receiving systematic competition training... they make substantial progress in building rapport with patients and communicating professionally." [C03, coach]

Across both perspectives, communication therefore developed from a more mechanical component of task performance towards interaction that was increasingly adaptive, emotionally responsive and oriented towards rapport and therapeutic trust.

2.5 Professional knowledge becomes integrated with practice and professional development

Competitors described integrating professional knowledge with clinical practice and developing a clearer understanding of the rationale underlying care.

"I finally understood why patients with dementia should be cared for in a particular way and how I should approach the interaction." [S10, competitor]

583 Coaches similarly emphasised that advanced performance required understanding the evidence
584 underpinning practice rather than merely reproducing procedures.
585 *"Students are expected not only to perform procedures correctly but also to understand the*
586 *evidence underpinning every aspect of their practice." [C03, coach]*
587 The broader professional effects described by participants also extended to teamwork, professional
588 standards and professional identity. Coaches noted that some competition events required close
589 collaboration between competitors, while higher-level experiences could strengthen students'
590 perceptions of professional identity and value.
591 *"Some competition events require close collaboration between team members, which also helps*
592 *students develop stronger teamwork skills." [C02, coach]*
593 *"These experiences strengthen their sense of professional identity and professional value." [C05,*
594 *coach]*
595 Overall, professional development was described as extending beyond the acquisition of
596 additional knowledge. Competitor and coach accounts indicated increasing integration between
597 knowledge and practice, greater attention to clinical rationale and evidence, and broader
598 development in professional standards, teamwork and professional orientation.
599
600 **Theme 3. Mastery and recognition connect competency development with self-efficacy**
601 Competitors and coaches described self-efficacy as closely connected with evidence of developing
602 capability during competition training. Confidence was strengthened when competitors became
603 more proficient, familiar with demanding situations and increasingly able to rely on their own
604 knowledge and clinical judgement. Recognition and encouragement from coaches, teachers and

peers provided additional validation of this developing capability. In turn, greater confidence was described as supporting continued effort, motivation and further learning. These relationships were captured in three subthemes.

3.1 Mastery experiences provide evidence of capability

Competitors often grounded confidence in perceived evidence of their own developing capability, suggesting that confidence was anchored in what they had become able to do rather than emerging independently of performance.

"I think improvement in competence came first." [S11, competitor]

Repeated practice contributed to this process by allowing competitors to experience increasing mastery and recognise their own developing capability.

"So I believe my confidence was built upon repeated practice and the development of my competence." [S10, competitor]

Familiarity with previously practised situations also reduced uncertainty when competitors encountered similar situations during competition. One account described how prior experience changed the way such situations were approached:

"During the actual competition, I often en*countered situations that were similar to those I had already practised. Because they felt familiar, I was much less nervous and could handle them more confidently." [S09, competitor]*

Coaches observed a similar relationship between growing proficiency and confidence，described increasing familiarity with procedures as accompanying greater confidence in completing nursing tasks:

"As students become more familiar with these procedures, their confidence in completing nursing tasks gradually increases." [C01, coach]

This relationship extended beyond procedural performance. Coaches also observed greater confidence in competitors' professional knowledge and clinical judgement as their capabilities developed.

"They develop greater confidence in their own professional knowledge and clinical judgement." [C02, coach]

Across both perspectives, mastery experiences provided competitors with increasingly concrete evidence of what they were capable of doing. Familiarity, repeated successful performance, stronger knowledge and skills, and preparedness for different situations were all described alongside increasing confidence.

3.2 External recognition validates developing capability

Although mastery provided internal evidence of capability, participants also described recognition from others as an important source of confidence. Coach feedback provided an external reference against which competitors could reassess their developing capability.

"Receiving positive feedback from my coach gradually strengthened my confidence." [S10, competitor]

Recognition appeared to make developing capability socially visible, adding external validation to competitors' own perceptions of progress.

"When other people recognized my progress and praised my performance, the resulting sense of achievement greatly increased my confidence." [S10, competitor]

Teacher encouragement was also described as an important source of confidence:

“Encouragement is an important source of confidence, especially when it comes from teachers.” *[S11, competitor]*

Coaches similarly viewed encouragement as contributing not only to confidence but also to competitors' willingness to persist through training difficulties.

“Positive encouragement from coaches is also extremely important. It strengthens students' confidence and motivates them to continue despite the challenges they encounter during training.” *[C02, coach]*

Recognition could also extend beyond the coach–competitor relationship. C02 described acknowledgement from classmates as contributing to confidence, pride and professional identity, while one coach identified opportunities to experience success, receive positive feedback and gain recognition as features of competition participation.

“Competition provides opportunities for students to experience success, receive positive feedback, and gain recognition from others.” [C05, coach]

Thus, external recognition complemented competitors' own mastery experiences by providing additional affirmation of developing capability. Across both datasets, feedback, encouragement, achievement and recognition were consistently associated with greater confidence and motivation.

3.3 Self-efficacy supports continued engagement and further mastery

The relationship between competency development and self-efficacy did not end once greater confidence had been established. Competitors and coaches also described confidence and encouragement as supporting continued effort and engagement in training.

Encouragement could also generate a sense of obligation to sustain or increase effort:

"That actually made me feel a little embarrassed, because I wanted to live up to their encouragement, so it motivated me to work even harder." [S08, competitor]

Support could also help sustain confidence across the training process. One competitor attributed the relative stability of their confidence partly to continuing encouragement from teachers:

"My confidence remained relatively stable throughout the process. I think that was partly because our teachers continuously encouraged and supported us." [S11, competitor]

From the coaching perspective, competency and confidence were not viewed as entirely separate developmental outcomes. Coaches explicitly described an ongoing relationship between them, they further linked increasing intrinsic motivation with willingness to continue learning and improving:

"Competency development and confidence reinforce one another in a continuous, cyclical process." [C04, coach]

"Once this intrinsic motivation has been activated, they become more willing to continue learning, improve themselves, and pursue higher levels of professional excellence." [C05, coach]

Taken together, the accounts suggest that self-efficacy was connected not only with competitors' perceptions of their existing capability but also with their subsequent engagement in development. Mastery and recognition could strengthen confidence, while greater confidence and motivation could support continued effort, persistence and further learning. The qualitative data therefore portrayed competency and self-efficacy as interconnected within an ongoing developmental process, rather than as two entirely independent outcomes

Theme 4. Self-efficacy is shaped by how capability evidence is interpreted and recalibrated

691 Self-efficacy did not develop uniformly across competitors. Although mastery and recognition
692 often strengthened confidence, competitors differed in how they interpreted their own progress,
693 setbacks, comparison with others and competitive pressure. Personal standards influenced whether
694 improvements were recognised as meaningful, while similar challenges could be interpreted as
695 motivating by some competitors but as evidence of inadequacy by others. Confidence could also
696 be recalibrated after renewed mastery or supportive feedback.

697 **4.1 Personal standards shape the interpretation of competency gains**

698 Competitors' perceptions of their own capability were influenced by the standards against which
699 they evaluated themselves. For some, personal expectations exceeded the formal standards of the
700 competition.

701 *"In many cases, I realise that the standard I expect of myself is even higher than the standard*
702 *required in the competition." [S01, competitor]*

703 High personal standards could create an asymmetry in self-appraisal, with shortcomings becoming
704 more salient than evidence of progress:

705 *"I always found it much harder to identify my strengths than my weaknesses." [S05, competitor]*

706 At the same time, external experiences could make changes in performance more visible and
707 contribute to greater self-recognition. One competitor described moments in which comparison
708 with previous performance helped reveal that development had occurred.

709 Coaches similarly observed that training could increase competitors' awareness of their own
710 strengths and weaknesses.

711 *"Throughout the process, students develop a much clearer understanding of themselves. They*
712 *gain a better awareness of their strengths and weaknesses." [C02, coach]*

These accounts indicated that increases in competency did not automatically translate into equivalent increases in perceived capability. How competitors judged their own performance—and the standards they used in doing so—shaped whether progress was recognised and incorporated into their sense of competence.

4.2 Appraisal of challenges and setbacks shapes divergent self-efficacy trajectories

Competitors responded differently to pressure, setbacks, plateaus and comparison with others. Social comparison introduced an external reference point that could shift competitors' appraisal of their own capability downward:

"Comparing myself with other competitors also made me feel that I wasn't good enough and that I would never reach the level I hoped to achieve." [S10, competitor]

Plateau experiences created a different form of negative capability evidence: continued effort was no longer accompanied by visible progress.

"Repeatedly practising the same scenarios every day made it easy to reach a plateau and begin doubting myself." [S09, competitor]

For some competitors, feedback initially lowered confidence by making previously unrecognised limitations more visible, before subsequent improvement supported renewed confidence:

"Before entering the competition, I was very confident... Once training began, however, I received feedback from my coaches and realized that many aspects of my performance still needed improvement. During that period, my confidence declined. As I continued practising, improving my skills, and gradually overcoming those difficulties, my confidence increased again." [S02, competitor]

However, these responses were not universal. Other competitors described confidence as remaining relatively stable across training:

"My confidence remained relatively stable throughout the process." [S11, competitor]

Pressure could also have different effects depending on its intensity. S10 recognised that challenge could become difficult to manage when it exceeded their capacity to cope:

"However, if the pressure becomes excessive, it can become overwhelming, and I may no longer be able to cope effectively." [S10, competitor]

Coaches likewise described markedly different responses to setbacks. For some competitors, difficulty became a reason to invest more effort, while for others, repeated difficulties could undermine persistence:

"For some students, setbacks become a source of motivation." [C02, coach]

"For others, however, repeated setbacks may lead them to conclude that they are simply not suited to skills competitions." [C02, coach]

Another coach similarly observed that pressure could be mobilised positively by some competitors while becoming overwhelming for others.

"Some students are able to transform this pressure into motivation, whereas others become overwhelmed by it." [C05, coach]

Thus, similar experiences did not produce uniform changes in self-efficacy. Across the two datasets, pressure, setbacks, plateau experiences and social comparison were interpreted in different ways and were associated with divergent responses, including motivation, self-doubt, stable confidence and reduced persistence.

4.3 New mastery experiences and supportive feedback enable self-efficacy recalibration

Despite these challenges, self-efficacy was not fixed. Competitors described experiences in which improved performance or supportive feedback enabled them to reassess their capability more positively. For some, this recalibration involved a change in how mistakes and setbacks were interpreted:

"At the beginning, every mistake made me feel frustrated and even made me doubt myself... Instead of seeing mistakes as failures, I gradually began to view them as opportunities to identify my weaknesses... Every mistake that I corrected made me a little more confident." [S06, competitor]

As weaknesses were identified and corrected through further practice, experiences of improvement provided new evidence of capability.

Supportive feedback provided another source of capability evidence, particularly when competitors' own appraisals remained uncertain:

"Receiving positive feedback from my coach gradually strengthened my confidence." [S10, competitor]

Coaches also described situations in which students possessed the necessary capability but underestimated themselves. In these circumstances, targeted coaching could help rebuild confidence.

"If students have the necessary ability but underestimate themselves, coaches can often intervene successfully... rebuild their confidence." [C04, coach]

Across both perspectives, confidence could therefore be reassessed and strengthened after renewed improvement, targeted practice or supportive feedback. Self-efficacy was not portrayed

as fixed, but as something that could be recalibrated as competitors encountered new evidence about their own capability.

Theme 5. Developmental trajectories are shaped by learner characteristics, adaptive engagement, coaching and the wider training ecology

Competency and self-efficacy development were not described as uniform across competitors. Participants and coaches identified differences in motivation, perseverance, resilience, self-management and learning needs, while coaching was described as continuous, individualised and responsive to competitors' performance and psychological states. Development also occurred within a wider training ecology that provided substantial learning resources and support but could simultaneously generate academic conflict, fatigue and other competing demands. These influences were captured in three subthemes.

5.1 Individual learner characteristics and adaptive engagement shape persistence through intensive training

Competitors drew motivation from different reference points within the training process. For some, motivation was externally anchored in an approaching competition:

"It also gives me stronger motivation because I know there is a competition ahead that I am preparing for." [S08, competitor]

Others focused less on the eventual outcome and more on whether they were continuing to learn and improve.

"As long as I felt that I was learning and continuing to improve, I was already satisfied." [S11, competitor]

Intensive training also required competitors to manage difficulty over time. Sustaining engagement through difficulty could itself become a developmental experience:

"However, I also think this experience strengthened my resilience and perseverance." [S09, competitor]

Adaptive engagement therefore involved not only persistence, but active management of the conditions needed to sustain participation:

"During this period, I learned how to organise my schedule more effectively, adjust my mindset, and communicate regularly with my coaches and teammates for support." [S07, competitor]

Coaches similarly regarded learner motivation and perseverance as important influences on developmental outcomes.

"Whether they genuinely want to succeed has a major influence on how much they develop during training." [C05, coach]

"The greatest challenge is perseverance." [C03, coach]

Motivation itself could also change across competition stages. One of the coaches observed that students at lower levels were often driven by relatively short-term goals, while motivation gradually shifted as they progressed towards higher levels.

Across both datasets, developmental trajectories were therefore associated with how competitors engaged with intensive training: their motivation, perseverance, resilience, self-management and changing goals influenced whether they were able to sustain participation and continue developing.

5.2 Adaptive coaching scaffolds performance and psychological development

Coaching was described as a sustained influence throughout competition training rather than a series of isolated technical corrections. Its value appeared to lie partly in the continuity of support across the developmental process:

"For me, having my coach accompany me throughout the training was the most effective approach." [S10, competitor]

The form of support could also change according to the competitor's condition. S08 described coaches reducing criticism and providing encouragement when they recognised that pressure had become excessive:

"When my coach realised I was under too much pressure, they would stop criticising me for a while and instead give me encouragement and praise." [S08, competitor]

At the same time, competitors experienced different coaching styles. Some coaches were described as more direct and demanding, illustrating that support did not always take the same form.

"Later, when I entered different training environments, some coaches were much more direct and demanding." [S11, competitor]

From the coaching perspective, responsiveness required training demands to be calibrated to individual competitors rather than applied uniformly:

"Training programmes therefore need to be individualised." [C05, coach]

Individualisation was operationalised through diagnosis of specific learning needs:

"This allows coaches to identify each student's specific weaknesses and provide highly targeted guidance." [C02, coach]

Coaching also extended beyond procedural instruction. C02 described coaches as supporting the development of competitors' ways of thinking:

"Coaches do much more than teach students how to perform nursing procedures correctly. More importantly, they help students develop their way of thinking." [C02, coach]

The demands placed on coaches also increased at higher competition levels, where more advanced and specialised expertise was required.

Competitors further recognised that development was supported by a broader team rather than by the individual alone:

"Competition is never something that one person achieves alone; it is truly a team effort." [S08, competitor]

Across both perspectives, coaching was therefore described as continuous, individualised and adaptive, incorporating targeted technical feedback, support for clinical thinking, psychological encouragement and different levels of challenge according to competitors' needs.

5.3 A resource-rich training ecology enables development while creating competing demands and costs

Competition training expanded the range and intensity of learning opportunities available beyond routine education:

"Compared with regular classroom learning, it provides far more resources and opportunities to repeatedly practise different scenarios independently." [S11, competitor]

Coaches similarly described development as arising from a broader training system rather than from any single method.

"It is the comprehensive training system rather than any single training method." [C04, coach]

Institutional commitment also influenced access to developmental opportunities.

"The extent to which schools value skills competitions and invest resources in competition training has a significant impact on students' opportunities for development." [C02, coach]

However, this resource-rich environment also created competing demands. Training could conflict with academic responsibilities:

"Our period of closed training coincided with the final examination period." [S11, competitor]

Prolonged intensive training could also generate physical and psychological costs. One coach noted:

"As training continues over an extended period, students inevitably experience physical and mental fatigue." [C02, coach]

Recovery therefore formed part of the wider developmental context. S11 described returning to intensive training after a period of rest:

"After the break, I recovered and returned to the high-intensity training schedule." [S11, competitor]

Participants also recognised limits in the authenticity of simulated learning. Some competitors described difficulty anticipating all possible clinical situations without sufficient real-world exposure:

"However, without extensive exposure to real clinical practice, it was difficult to anticipate all the situations that might actually occur." [S05, competitor]

Finally, coaches cautioned against assuming that more training time would necessarily produce better outcomes:

"This does not mean that simply extending the duration of training will always produce better outcomes. Excessive training may lead to fatigue, which can negatively affect students' performance and learning." [C01, coach]

Taken together, development occurred within a training ecology that simultaneously enabled and constrained learning. Institutional resources, simulation and clinical exposure, professional exchange and concentrated coaching created opportunities for development, while academic conflict, workload, fatigue, limited authenticity and prolonged training could impose costs. The wider environment therefore shaped not only what opportunities were available, but also whether competitors could sustain and benefit from intensive training over time.

Integration of quantitative and qualitative findings

Quantitative and qualitative findings were integrated to examine how the qualitative accounts expanded and qualified the patterns identified in the quantitative analysis. Although students with skills competition training experience reported higher nursing competency and general self-efficacy in unadjusted comparisons, these associations were attenuated and were no longer statistically significant after adjustment for selected educational characteristics. The qualitative findings provided insight into participants' experiences of learning, competency development, self-efficacy and the wider training environment. Together, the two strands offered complementary perspectives on developmental processes and contextual influences, while highlighting the limitations of attributing observed differences to competition training alone. The integrated findings are presented in Table 5.

906 **Table 5. Joint display integrating quantitative and qualitative findings**

Quantitative findings	Qualitative findings	Integration	Integrated interpretation / meta-inference
Competitors reported higher nursing competency than non-competitors in unadjusted comparisons (3.85 ± 0.59 vs. 3.50 ± 0.67, $p < .001$). However, the association was no longer statistically significant after adjustment for year of study, educational level and clinical placement experience (B = 0.121, 95% CI −0.099 to 0.342, $p = .282$).	Themes 1 and 2 described competition training as involving repeated practice, simulation, feedback and reflection, together with development from technical task performance towards broader clinical reasoning, communication and person-centred care.	Expansion + qualification	Qualitative accounts described intensive and iterative learning processes involving repeated practice, feedback and reflection, alongside progression towards multidimensional nursing competency. However, the attenuation of the quantitative association after adjustment suggests that the unadjusted group difference may partly reflect educational characteristics. The qualitative findings illuminate participants' experiences of competency development but do not establish an independent effect of competition training.
Competency differed significantly across competition levels ($F = 13.335$, $p < .001$). Self-efficacy also differed significantly across competition levels ($F = 4.865$, $p = .011$).	Theme 1.2 described competition stages as differing in complexity, performance demands, authenticity and expectations for increasingly independent and integrated performance.	Expansion	The qualitative findings contextualised the quantitative differences across competition levels by showing that participants experienced competition stages as differing in complexity, performance demands and expectations for integrated performance. The integrated findings do not imply a uniform increase in competency or self-efficacy across competition levels.

Quantitative findings	Qualitative findings	Integration	Integrated interpretation / meta-inference
Competency differed significantly across training-duration groups ($F = 7.468$, $p = .001$), whereas self-efficacy did not ($F = 2.360$, $p = .102$).	Theme 1.4 and Theme 5.3 described accumulation of experience alongside plateau, breakthrough, fatigue and recovery. Theme 5.3 also included the focused codes “Training quality over duration alone” and “Limits of prolonged training.”	Expansion + qualification	The qualitative findings qualified the quantitative pattern by showing that development was described as nonlinear and that participants and coaches emphasised training quality, adjustment and recovery rather than training duration alone. The absence of a significant difference in self-efficacy across training-duration groups also indicates that self-efficacy did not vary in the same way as competency.
Competitors reported higher general self-efficacy than non-competitors in unadjusted comparisons (2.86 ± 0.54 vs. 2.67 ± 0.57, $p = .024$). However, this association was no longer statistically significant after adjustment for year of study, educational level and clinical placement experience ($B = -0.001$, 95% CI −0.220 to 0.219, $p = .996$).	Theme 3 described mastery experiences, successful performance, familiarity, positive feedback, recognition and a sense of achievement as being linked with greater confidence.	Expansion + qualification	Qualitative accounts linked mastery experiences, successful performance, positive feedback and recognition with greater confidence during competition training. However, the adjusted quantitative analysis did not identify a statistically significant association between competition training experience and general self-efficacy. These findings suggest that participants perceived opportunities for self-efficacy development within training, but they do not demonstrate that competition experience independently accounted for differences in self-efficacy between groups.

Quantitative findings	Qualitative findings	Integration	Integrated interpretation / meta-inference
Self-efficacy was positively correlated with competency ($r = .634$, $p < .001$). In simple linear regression, self-efficacy was positively associated with competency ($\beta = .634$, $p < .001$), with the model accounting for 40.2% of the variance in competency ($R^2 = .402$).	Theme 3.1 described competence as frequently perceived to precede confidence, whereas Theme 3.3 described confidence as supporting continued effort, motivation and further learning. Coach data also described competency and confidence as mutually reinforcing.	Expansion	Both strands indicated a close relationship between competency and self-efficacy. The qualitative findings expanded this statistical association by showing how participants and coaches described mastery, perceived capability and confidence as interconnected within ongoing development. The integrated findings do not establish causal direction or statistical mediation.
Competency differed significantly across clinical placement experience groups ($F = 3.336$, $p = .021$), whereas self-efficacy did not ($F = 1.151$, $p = .330$).	Theme 5.3 included limited authentic clinical exposure, difficulty creating fully authentic simulation scenarios and authentic clinical immersion beyond simulation. Competitors and coaches described real clinical exposure as an important component of the wider training ecology.	Convergence + expansion	The quantitative difference in competency across clinical placement groups was consistent with qualitative accounts emphasising the value of authentic clinical exposure and the limitations of reproducing some clinical experiences fully through simulation. The absence of a corresponding self-efficacy difference indicates that self-efficacy did not vary significantly across clinical placement groups.

Note. Integration statements are limited to patterns directly supported by the quantitative results and the final qualitative themes/subthemes/focused codes. No causal mechanism, mediation effect, uniform increase across competition levels, or unverified post-hoc comparison is inferred.

The unadjusted quantitative comparisons showed higher nursing competency and general self-efficacy among students with skills competition training experience. However, these

associations were substantially attenuated and were no longer statistically significant after adjustment for year of study, educational level and clinical placement experience. The qualitative findings expanded these results by describing competition training as an intensive and iterative learning process involving repeated practice, simulation, feedback, reflection and progressive challenge. Competitors and coaches described a progression from technical task performance towards more integrated clinical reasoning, communication and person-centred care. These accounts provided insight into how participants experienced competency development within competition training, but did not establish that competition training independently accounted for the observed differences between groups. Furthermore, differences across competition levels were consistent with qualitative accounts of varying levels of challenge and performance expectations. However, the quantitative findings did not indicate a uniform increase in competency or self-efficacy across competition levels.

Training duration provided an important point of qualification. Although competency differed significantly across training-duration groups, self-efficacy did not. Qualitative findings similarly portrayed development as nonlinear rather than as a simple function of accumulated training time. Competitors and coaches described periods of accumulation, plateau, breakthrough, fatigue and recovery, and emphasised the importance of training quality and adjustment. Thus, greater exposure to training may provide additional opportunities for competency development, but longer training alone does not necessarily translate into uniformly greater developmental gains.

Integration also clarified the relationship between competency and self-efficacy. Quantitatively,

competitors reported higher self-efficacy than non-competitors, and self-efficacy was positively correlated with competency. Qualitative accounts expanded this relationship by describing mastery experiences, successful performance, feedback and recognition as important sources of confidence. At the same time, competitors differed in how they interpreted their own progress, setbacks, personal standards and social comparison. These findings suggest that competency and self-efficacy are closely interconnected within an ongoing developmental process, while self-efficacy is not simply determined by the amount of training received. The integrated findings therefore support an association between the two constructs but do not establish causal direction or statistical mediation.

Finally, the quantitative difference in competency across clinical placement experience groups converged with qualitative accounts emphasising the value of authentic clinical exposure. Participants described aspects of real clinical practice that were difficult to reproduce fully through simulation, suggesting that authentic clinical experience may complement competition-based learning by providing additional opportunities to apply competency in complex and less predictable contexts. However, the absence of a corresponding difference in self-efficacy across clinical placement groups further indicates that confidence may depend not only on exposure itself, but also on how experiences and evidence of capability are interpreted.

Discussion

This mixed-methods study found that students with skills competition training experience reported higher nursing competency and self-efficacy in unadjusted comparisons, but these associations

were no longer statistically significant after adjustment for educational characteristics. Competency and self-efficacy were positively correlated. Qualitative findings revealed intensive, iterative and nonlinear learning processes involving practice, feedback, reflection and progressive challenge, alongside the development of multidimensional nursing competency. Together, these findings highlight the importance of considering educational backgrounds, individual engagement, coaching and contextual conditions when interpreting competency and self-efficacy development within competition training.

From repeated skills practice to multidimensional competency development

Although the adjusted association between competition training experience and nursing competency was not statistically significant, qualitative accounts of competency development were consistent with emerging evidence on nursing skills competitions. Liang, Liu (41) described a competition framework encompassing theoretical knowledge, clinical skills, clinical thinking, humanistic care and teamwork. Similarly, Feng, Wang (42) found that challenge-based learning in competition settings encouraged knowledge construction through comprehensive cases, reverse reasoning and responses to uncertainty. These findings align with our qualitative results, which indicated that competition preparation progressively required the integration of technical, cognitive and interpersonal competencies rather than isolated procedural proficiency.

Broader simulation research provides indirect support for these mechanisms. Systematic reviews and meta-analyses have reported improvements in nursing students' knowledge, clinical skills, decision-making and self-confidence following scenario-based or high-fidelity simulation (43-45). However, simulation represents only one component of competition preparation, which may also

involve selection, intensive coaching, performance pressure and repeated assessment. These findings therefore support the plausibility of simulation-related learning mechanisms without establishing the effectiveness of competition participation itself.

Our qualitative findings further indicated that repetition alone was insufficient. Competitors described cycles of practice, feedback, reflection and correction resembling deliberate practice, in which improvement depends on purposeful efforts to address specific performance gaps (46, 47).. Importantly, the nature of practice appeared to evolve. Early training emphasised procedural accuracy and task completion, whereas advanced preparation required prioritisation, clinical reasoning, communication, adaptability and person-centred care. This distinction matters because technical proficiency does not necessarily constitute integrated nursing competency (2, 8). Consistent with Feng, Wang (42), increasingly complex and uncertain scenarios appeared to encourage learners to connect knowledge and adapt their responses rather than reproduce familiar procedures. Competition training may therefore be most educationally valuable when it moves beyond standardised task repetition and progressively approximates the complexity, uncertainty and interpersonal demands of nursing practice (30).

Nevertheless, educational gains should not be assumed to increase uniformly with simulation exposure. Vangone, Arrigoni (45) reported substantial heterogeneity in the effects of high-fidelity simulation, highlighting the importance of intervention design and context. Our findings similarly suggest that learning may depend on the quality of feedback, calibration of challenge and opportunities to integrate performance, rather than practice volume alone.

These associations also require caution because competitors may represent a selected group. The cross-sectional design cannot determine whether training contributed to higher competency or

whether students with stronger prior abilities, motivation or educational support were more likely to participate. Feng, Wang (42) similarly acknowledged the selection of high-achieving students in their competition study. Thus, competition may operate as both a developmental opportunity and a selection process. Although our qualitative findings identify plausible developmental mechanisms, longitudinal or experimental studies are needed to distinguish training-related change from pre-existing differences.

Competency development is nonlinear and cannot be explained by training exposure alone

The findings challenge a simple dose–response interpretation of competition training. Longer training duration was associated with higher perceived competency, but qualitative accounts described accumulation, plateau, adjustment and renewed improvement rather than continuous progress. Competency also differed across competition levels without a monotonic increase in group means. Duration and competition level may therefore reflect aspects of training exposure without adequately representing its quality or developmental trajectory.

This interpretation is compatible with research on nursing skill acquisition and retention. Vanderzwan, Schroers (48) reported improvement following deliberate practice in nursing handoffs, followed by a temporary decline and subsequent recovery. Other multisite studies documented improvements in medication administration, hand hygiene and patient identification through repeated deliberate practice while emphasising continued reinforcement (49, 50). Although these studies examined specific skills rather than multidimensional competency, they suggest that improvement may fluctuate and requires sustained, purposeful practice.

The Challenge Point Framework offers a complementary explanation. It proposes that learning depends on the relationship between task difficulty, learner capability and practice conditions,

rather than increasing indefinitely with greater challenge (51). Its application to simulation-based medical education highlights the potential value of progressively adjusting task difficulty (52), although evidence concerning practical implementation remains incomplete (53). While this framework did not guide the original study design, it helps interpret why increasing demands may support development at some stages but become less productive when they exceed learners' readiness.

Training intensity also carries potential costs. (30) identified excessive workloads, inadequate recovery, fatigue, psychological strain and academic–training conflict among nursing interns preparing for a national skills competition. These challenges closely resemble our participants' experiences of competing demands, accumulated fatigue and the need for recovery. Extended preparation may create more learning opportunities, but insufficient adjustment or recovery may undermine productive engagement.

Furthermore, the association between training duration and competency may partly reflect learner selection. Students with stronger performance, greater persistence or access to support may remain in training longer or advance to higher levels. Similarly, differences between competition tiers may reflect selection, coaching resources and training intensity rather than the independent influence of competition level. Neither association can establish a causal effect.

Overall, competency development appeared to depend on the interaction between accumulated experience, purposeful practice, appropriately calibrated challenge, feedback and recovery. Plateaus should not necessarily be interpreted as failure; they may indicate a need to reassess training strategies or learner readiness. This interpretation shifts attention from maximising training hours towards maintaining the quality, adaptability and sustainability of practice.

Competency and self-efficacy are interconnected but do not necessarily develop in parallel

The positive association between perceived competency and self-efficacy is consistent with previous nursing education research (54-56). In a multicentre study of 552 Chinese nursing interns, Pu, Xie (57) reported a correlation of .597 between general self-efficacy and core nursing competence, comparable to the association observed in our study. These findings indicate that perceptions of competency and capability are closely related.

Our qualitative findings, however, revealed substantial variation in how competitors interpreted their performance. Successful task completion, visible improvement and recognition from coaches often strengthened confidence. This pattern is consistent with Bandura (33)‘s self-efficacy theory, which identifies mastery experiences as an important source of efficacy beliefs alongside vicarious experiences, social persuasion and interpretations of physiological and affective states. Competition training may provide repeated opportunities for mastery, while feedback and recognition reinforce learners' perceptions of progress.

Nevertheless, improved competency did not automatically correspond to greater self-efficacy. Some competitors became more confident through successful performance, whereas others developed higher personal standards, compared themselves with stronger peers or became more aware of remaining limitations. Such findings highlight the distinction between capability and its subjective appraisal. A systematic review by Brocker and Scafide (58) similarly found weak or absent associations between self-efficacy and objectively assessed skill performance in most included studies. Although objective performance differs from the perceived competency measured here, this evidence reinforces the need to distinguish the constructs.

The discordant competency–self-efficacy profiles in our qualitative sample further illustrate this

complexity. Relatively high competency accompanied by lower self-efficacy may reflect demanding internal standards, comparison, setbacks or pressure. Conversely, relatively high self-efficacy despite lower competency may reflect previous success, encouragement or different interpretations of challenge. Neither profile necessarily indicates inappropriate confidence. Rather, they demonstrate that self-efficacy represents an appraisal influenced by multiple sources of information, helping explain why a strong overall association can coexist with divergent individual experiences.

Educational exposure may also influence competency and self-efficacy differently. Abusubhiah, Walshe (59), reviewing 47 experimental studies, found insufficient evidence to identify a definitively effective educational approach for improving nursing students' self-efficacy. Saragih, Tarihoran (43) reported improvements in self-confidence alongside knowledge and clinical skills following scenario-based simulation, although the effects differed in magnitude. These findings help contextualise our observation that training duration was associated with competency but not significantly with self-efficacy. Additional practice may provide opportunities to improve performance without necessarily producing equivalent changes in confidence.

The relationship may also be reciprocal. Self-efficacy theory suggests that mastery experiences inform efficacy beliefs, while these beliefs influence effort, persistence and responses to difficulty (33). Recent nursing studies have reported statistical mediation involving self-efficacy and clinical competence (57, 60). However, their cross-sectional designs do not establish temporal causation. Similarly, the regression association in our study cannot determine whether competency strengthens self-efficacy, self-efficacy promotes competency, or both processes interact over time.

These findings suggest that educational support should focus on well-calibrated self-appraisal rather than simply increasing confidence. Coaches can help learners recognise genuine progress while identifying limitations and interpreting setbacks constructively. Temporary reductions in confidence may accompany greater awareness of complex performance standards, while confidence alone does not establish clinical capability. Repeated longitudinal assessments would help clarify how competency, mastery experiences and efficacy beliefs influence one another throughout competition preparation.

Development is shaped by the interaction between learners, coaching and the wider training ecology

Competitors' varied developmental trajectories suggest that training outcomes depend on interactions between learner characteristics, coaching and environmental conditions. Participants differed in self-regulation, persistence, responses to pressure and willingness to seek support. Coaches adapted their approaches to individual needs, while institutional resources and professional exchange expanded learning opportunities. Conversely, competing demands, fatigue and limited authentic clinical exposure constrained development. Competency development therefore emerged within a broader learning ecology rather than directly from competition participation alone.

Within this ecology, coaching involved more than technical instruction. Competitors valued targeted feedback, correction and encouragement, while coaches described adjusting training content and intensity according to progress. Systematic reviews in health professions education have associated feedback with improvements in procedural and communication performance, although feedback approaches and study methods vary considerably (61, 62). These findings

suggest that feedback quality and learners' ability to apply it may be more important than its frequency alone.

Our findings also indicate that coaching requirements evolve. Early training may require explicit procedural guidance, whereas advanced preparation increasingly involves complex scenarios, questioning of clinical reasoning and greater learner independence. This adaptive approach is consistent with the Challenge Point Framework, which emphasises matching task demands to current capability (51). Coaching may therefore support development by continually adjusting both the demands of practice and the degree of learner responsibility.

However, intensive support creates a potential tension between guidance and autonomy. Concentrated expert coaching and repeated correction can facilitate improvement, but excessive reliance on familiar prompts or routines may limit independent adaptation beyond competition settings. This concern is particularly relevant to clinical transfer, where situations cannot be completely predetermined. Although simulation-based nursing education can improve knowledge and skills, evidence regarding longer-term retention remains limited and inconsistent (63). Variation in simulation design also complicates identification of the elements responsible for learning outcomes (64). Coaching should therefore progressively encourage independent assessment, judgement and decision-making rather than procedural reproduction alone.

The wider training environment presents similar opportunities and limitations. Participants described concentrated coaching resources, institutional support, learning materials and professional exchange that were not always available in routine education. Nevertheless, they also identified limited authentic clinical exposure and difficulties reproducing real patient complexity within simulation. Consequently, improved performance in structured competition scenarios

should not automatically be equated with demonstrated competency in clinical practice. Evidence of heterogeneous simulation outcomes and uncertain longer-term retention reinforces this distinction (45, 63).

Resource-intensive preparation also involves competing demands. Our participants reported academic–competition conflict, excessive workloads, fatigue and the need for recovery, paralleling the findings of Luo, Wang (30). Concentrated coaching and frequent assessment may create valuable learning opportunities while simultaneously increasing strain when poorly calibrated. Recovery and temporary adjustment of training demands may therefore support sustained engagement rather than simply interrupting development.

Importantly, individual differences should not be interpreted as fixed determinants of success. Persistence, motivation, self-regulation and help-seeking were shaped by interactions with coaching, peers, workload and institutional conditions. Difficulties maintaining engagement may reflect not only learner characteristics but also inadequate recovery, excessive demands or insufficient support. This interactional perspective avoids attributing developmental outcomes solely to individual competitors.

Taken together, the findings conceptualise competition preparation as a learning ecology in which learner agency, coaching and environmental resources jointly shape development. Educational opportunities must be considered alongside workload, learner autonomy and the limitations of simulation. Balancing intensive practice with recovery, structured guidance with independent judgement, and simulated preparation with authentic clinical exposure may help create more sustainable conditions for competency development.

Limitations

Several limitations should be acknowledged. First, the cross-sectional design precludes causal inference. The competition and non-competition groups differed substantially in year of study, and the associations with nursing competency and self-efficacy were no longer statistically significant after adjustment for selected educational characteristics. Nevertheless, residual confounding and selection bias cannot be excluded, and the absence of statistically significant adjusted associations does not establish that competition training has no effect. Second, competency and self-efficacy were assessed through self-report measures, which may be subject to response bias and do not necessarily reflect objectively demonstrated clinical performance. Although the adapted 20-item competency measure showed high internal consistency, its broader psychometric properties require further evaluation. Third, the qualitative findings were based on interviews with 11 competitors and five coaches, whose experiences may not represent those of students and coaches in other educational or competition contexts. Finally, differences in competition exposure, training environments, and individual characteristics may not have been fully accounted for. Future longitudinal studies incorporating objective performance assessments and more diverse samples are needed to examine developmental trajectories and clarify the contribution of competition-related training.

Implications for Nursing Education

The findings suggest that nursing education may benefit from incorporating selected features of skills competition training into routine curricula rather than replicating intensive competition programmes. Purposeful practice, progressively challenging scenarios, structured feedback, and

guided reflection may provide opportunities for students to develop integrated clinical reasoning, communication, and person-centred care. The finding that competency and self-efficacy did not always develop in parallel also highlights the importance of attending to students' confidence and self-appraisal alongside their perceived competency. Individualized coaching may help educators respond to differences in learning progress and support needs. At the same time, training demands should be balanced with adequate recovery and authentic clinical exposure to avoid excessive workload and limitations associated with simulation-based learning. These implications remain tentative and warrant evaluation in broader nursing education settings.

Conclusion

This sequential explanatory mixed-methods study found that nursing students with skills competition training experience reported higher nursing competency and general self-efficacy in unadjusted comparisons, but these associations were no longer statistically significant after adjustment for selected educational characteristics. Qualitative findings described intensive, iterative and nonlinear learning processes involving purposeful practice, progressive challenge, feedback, reflection and adaptive coaching. Competency and self-efficacy were positively associated but did not necessarily develop in parallel. These findings highlight potentially transferable learning processes within competition training, although its independent contribution to competency and self-efficacy remains uncertain. Future longitudinal research incorporating objective competency assessments is needed.

List of abbreviations

ANOVA — Analysis of variance

CBE — Competency-based education

CBL — Case-based learning

CI — Confidence interval

CITC — Corrected item-total correlation

CPR — Cardiopulmonary resuscitation

GSES — General Self-Efficacy Scale

HC3 — Heteroskedasticity-consistent covariance estimator, type 3

NCS — Nurse Competence Scale

RP — Role-play

SD — Standard deviation

SE — Standard error

SPSSAU — Statistical analysis software (SPSSAU)

Declarations

Ethics approval and consent to participate

Ethical approval was obtained from the Research Ethics Committee of Shanghai University of Medicine & Health Sciences (approval no. 2026H0025). All participants were informed of the study's purpose and procedures and provided informed consent before participation. Participation was voluntary, and participants were informed of their right to withdraw without penalty.

Consent for publication

Not applicable.

Availability of data and materials

The de-identified quantitative dataset is available from the corresponding author on reasonable request, subject to applicable ethical and institutional requirements. The qualitative interview transcripts are not publicly available due to participant confidentiality and the potential risk of identification.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

Yixin Wu: Conceptualization, Methodology, Investigation, Data curation, Formal analysis, Project administration, Visualization, Writing-original draft, Writing-review and editing.

Xiaoan Zeng: Investigation, Data curation, Formal analysis, Validation.

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