Under Pressure – Rise to the Occasion or Sink to Your Level of Training: Using High-Frequency Simulation to Build Job-Ready Paramedicine Graduates

T. Botha, J. Veronese, N. Jakstas, M. Boyle & P. Lee
Griffith University

Introduction

Clinical competence is essential for paramedicine graduates who are expected to make rapid, high-stakes decisions in unpredictable environments (1-3). To ensure public safety and quality care, students must demonstrate their readiness for unsupervised practice through valid and reliable assessment methods that evidence their proficiency. Ensuring this requires structured, evidence-informed assessment strategies (4, 5).

While there is robust evidence in other healthcare disciplines that simulation enhances knowledge acquisition, skills development, and learner satisfaction (6-12), few studies in the paramedicine sphere have explored how high-frequency simulation combined with structured performance-based assessment (PBA) tracking supports competence development over time.

Aim

To investigate the impact of high-frequency simulation with PBA tracking on the development of clinical competence and summative exam performance in undergraduate paramedicine students.

Methods

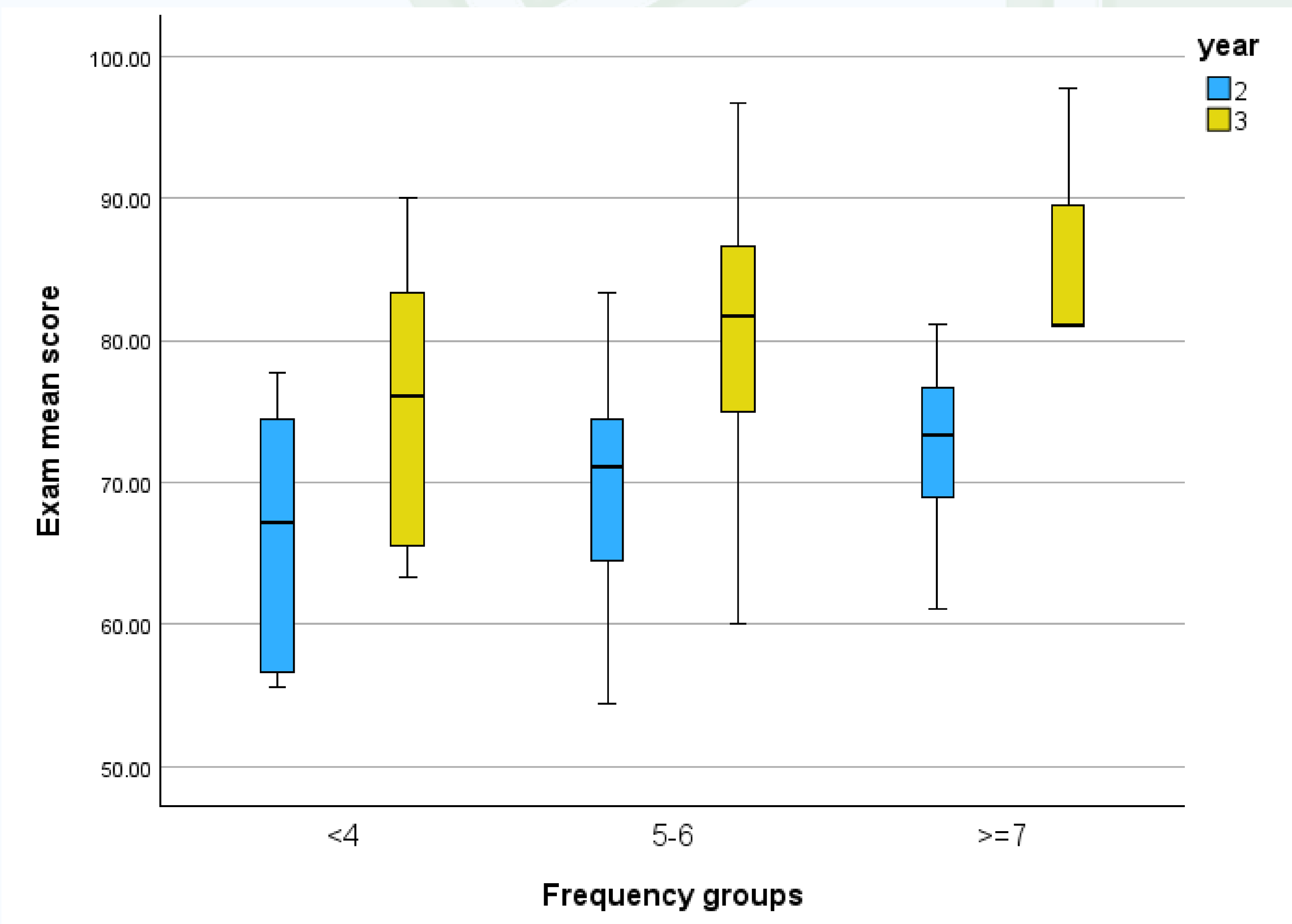
This retrospective analysis examined PBA outcome data from two core paramedicine courses (second- and third-year) in 2024. Students participated in weekly simulation practice scenarios, scored by paramedicine academics using a structured Clinical Competence Assessment Tool (CCAT). CCAT practice scores were grouped into tertiles (early, mid, and late trimester) to examine performance trends over the 12-week trimester and week 13 exam.

To compare mean differences across groups, one-sample t-tests were used to assess performance variations by student year level. Paired sample t-tests and mixed designs (between-within subjects) ANOVA, supported by boxplots, were used to examine changes in mean scores over time across the three tertiles and between student cohorts (different years). Summative exam results were compared with practice scores using Pearson's correlation, paired t-tests, and hierarchical regression. Ethics approval was granted (GUHREC: 2024/073).

Table 1: Descriptive Statistics

	Year 2			Year 3		
	N	Mean	SD	N	Mean	SD
Tertile 1 (Week 3 to 6)	43	54.6	6.6	40	63.2	7.9
Tertile 2 (Week 7 to 9)	46	58.1	8.3	35	65.6	9.9
Tertile 3 (Week 10 to 12)	45	61.3	6.9	35	72.5	10.5
Exam	48	69.7	7.7	41	79.1	9.7

Figure 1: Frequency of Practice on Exam Scores by Year Level



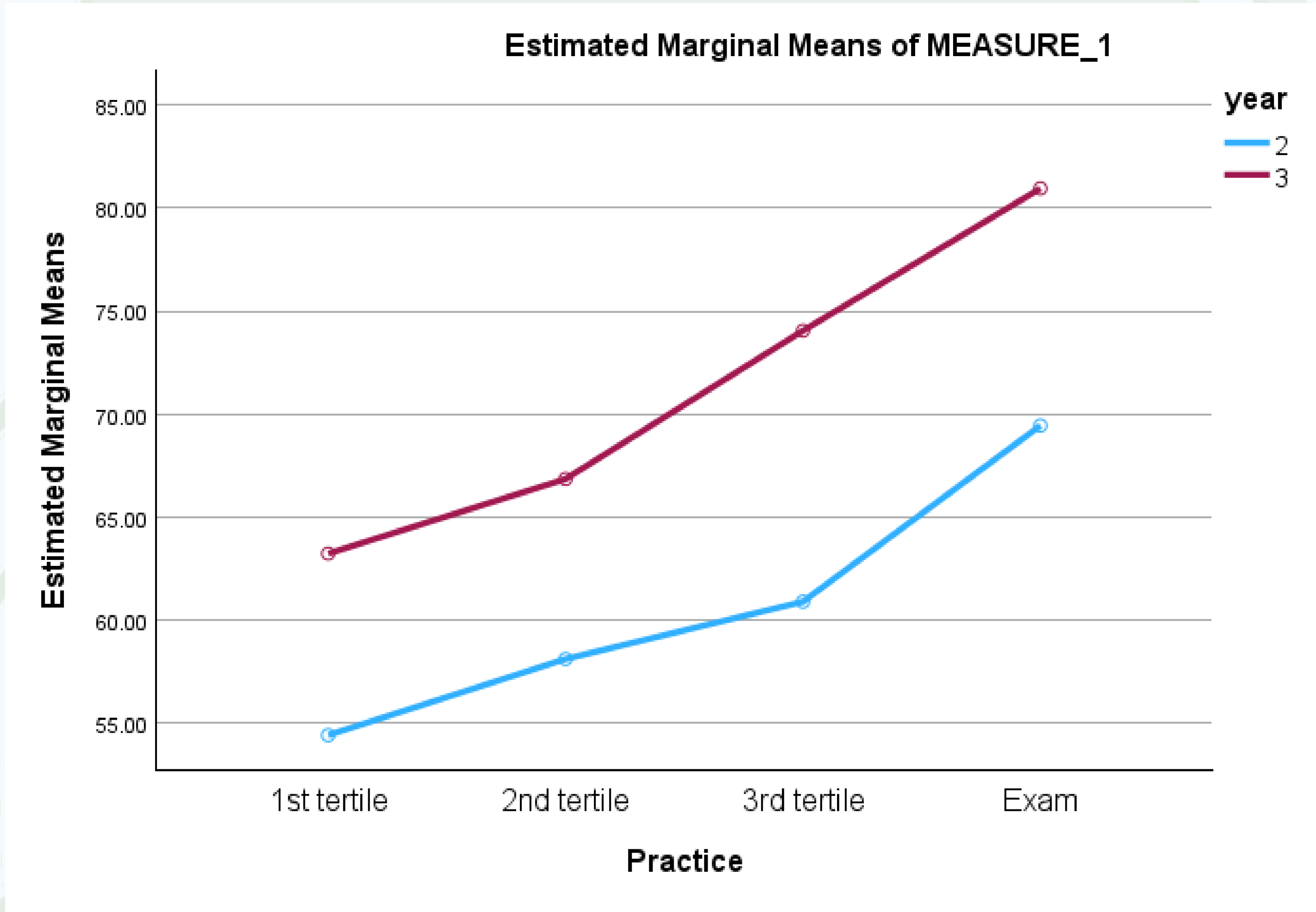
Note: Frequency of scenarios are: ≤4, 5–6, and ≥7.

Results

Over 2024, 222 simulations were recorded in second year (n=48) and 187 in third year (n=41). Practice frequency averaged 4.6 simulation scenarios per student in both year levels (SD 1.4 and 1.7 respectively). While the third-year students consistently outperformed their second-year counterparts across the four time points (Table 1), significant improvements in mean competency scores were observed across the trimester for both cohorts, with increases in performance from early, mid, and late practice sessions to final exam scores ($p < 0.05$). Across second year, exam scores increased from 66.3, 69.5 to 72.6, and from 75.4, 81.2 to 86.7 in third year, as scenario frequency increased from ≥4, 5-6, and ≥7, respectively (Figure 1).

Moreover, the estimated marginal mean difference in practice score (in the pairwise comparison) between the two student cohorts was 10.54% (95%CI: 7.81, 13.27, $p < 0.001$), evidenced in Figure 2. After adjusting for student year level and mean practice score, practice frequency was found to be a significant predictor of exam outcomes ($B = 3.46$, $p = 0.009$), indicating that students who engaged in more simulation practice achieved higher exam scores. Student year level and mean practice score were also significant predictors ($p = 0.005$ and $p = 0.002$, respectively).

Figure 2: Differences in estimated marginal means between two student cohorts across four time points



Note: Tertile 1/Gp1 = Weeks 3 to 6; Tertile 2/Gp2 = Weeks 7 to 9; Tertile 3/Gp3 = Weeks 10 to 12

Discussion

This study shows that high-frequency simulation with PBA tracking significantly improves clinical competence and summative exam performance. Despite rotating paramedicine staff, escalating scenario complexity, and introducing new clinical content each week – students in both cohorts demonstrated consistent and statistically significant improvements in practice scores. This suggests that embedding a PBA tool during formative simulation sessions can support consistent assessment practices, facilitate learning across different educators and case complexities, and provide scalable evidence of student development in accordance with AHPRA-aligned accreditation standards. These findings align with educational theories supporting scaffolding, deliberate practice, and feedback in the acquisition of complex clinical skills (13-15).

Regression analysis additionally confirmed that students who engaged in more simulation practice scored significantly higher in their summative practical exams, even after controlling for cohort level and average practice scores. Frequency of simulation accounted for an additional 5.2% of the variance in exam outcomes and was a significant independent predictor. This reinforces the principle that more opportunities for hands-on learning – when structured, repeated, and accompanied by meaningful feedback – are associated with better performance outcomes (16, 17).

Hence, incorporating this model not only promotes assessment *for* learning rather than assessment *of* learning, an approach increasingly favoured in health professional education (18, 19), but allows for frequent simulation exposure, consistent documentation of learning outcomes, and a mechanism for students to self-monitor performance – all of which support professional competency and career readiness.

Although originally developed for student use, the CCAT could be adapted for professional development or postgraduate training, extending its relevance beyond undergraduate education. Thus, future research should explore the broader implementation of this educational strategy across universities, year levels, and programs, as well as other healthcare, emergency services, defense, and aviation fields, offering insights into how structured formative assessment supports clinical competence across disciplines.

Griffith UNIVERSITY
Queensland, Australia

References

Please scan the QR code to access the reference list