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Student paramedic experiences of group-based simulation activities used in assessment: a qualitative UK study

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ABSTRACT

Objectives This research aimed to explore student paramedics' experiences of participating in group-based simulation activities used as part of their summative assessment. It sought to understand their perceptions of the effectiveness of group-based simulation in fostering learning and informing future assessment design.
Design A qualitative questionnaire-based study.
Setting A UK higher education institution.
Participants A total of 34 first-year (level 4) student paramedics from the September 2022 to September 2023 cohorts.
Intervention Following the completion of a summative assessment for the introduction to non-technical skills and simulation module, students were invited to reflect on their experiences of group-based simulation through an online questionnaire. The assessment incorporated team-based simulation scenarios intended to evaluate non-technical competencies within a realistic and supportive environment.
Results Four key themes emerged through thematic analysis of the responses: experiential learning; autonomous learning; reflective learning; and support and learning. These themes provide insights into the pedagogical value of group-based simulation, with students identifying both individual and collective benefits in developing non-technical skills within a group assessment framework.
Conclusion Group-based simulation assessments enhance student engagement and promote collaborative decision-making in a context that mimics real paramedic practice. While students often associate realism with increased confidence, their experiences highlight complex interactions between perceived fidelity, assessment pressure and learning. This underscores the need to further investigate how group dynamics and authenticity influence learning outcomes in assessment-focused simulations.

INTRODUCTION

The role of a paramedic is rapidly evolving, demanding innovation and variety in teaching and assessment to meet the challenges of the prehospital setting. Non-technical skills (NTS), defined as the personal, cognitive and social skills that complement technical competence to ensure safe and efficient practice, are crucial. While there is no universally

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STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This study used a qualitative methodology underpinned by a constructivist paradigm to explore student experiences in depth.
⇒ Participants were drawn from two paramedic student cohorts, though the low response rate (17.6%) may have introduced response bias.
⇒ Open-ended questionnaires facilitated detailed data collection but did not allow for probing or clarification of responses.
⇒ Data were analysed using a systematic thematic approach with multiple researchers, although researcher positionality may have influenced interpretation.
⇒ The absence of longitudinal follow-up limits understanding of the longer-term impact of group-based simulation assessments on practice.

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agreed-on list of NTS specific to paramedicine, other healthcare disciplines identify key components such as teamwork, communication, leadership, reflection, briefing and debriefing. These align closely with the competencies outlined in The Health and Care Professions Council (HCPC) standards of proficiency.[1]

Given the inherently team-based nature of paramedic practice, there is a clear need to assess these NTS in realistic, group-based contexts. Although simulation is well established as a method for individual summative assessment, a review of the literature highlights limited evidence on student experiences of group simulation used for assessment purposes. Paramedics must demonstrate NTS in dynamic, high-pressure environments and because these competencies are social and context-dependent, group-based simulation provides an appropriate and authentic means of both development and evaluation. This study explored student paramedics' experiences of participating in group-based simulation activities used as part of their final assessment for the level 4 module 'Introduction to Non-Technical Skills and Simulation',

which includes briefing, clinical scenario management, debriefing and reflection. Findings aim to inform the development of future group-based simulation assessments, support good practice and enhance the educational experience of student paramedics.

Paramedic education in the UK

Paramedic science programmes have been offered at the undergraduate degree level in UK Higher Education Institutes since 2004. This development was influenced by the Paramedic Evidence-Based Education Project report,[2] which recommended increased legislative accountability for paramedics, like that required of professions like nursing. Qualified UK paramedics are regulated by the HCPC,[1] which enforces quality standards for both HEIs and individual registrants. Students aspiring to register as paramedics must graduate from HEI programmes that meet the HCPC's standards of education and training and standards of proficiency (SOPs).[3] The UK Quality Assurance Agency for higher education also provides academic standards and frameworks for teaching, learning and assessment in paramedic science through its benchmark statements.[4]

Consequently, validated programmes must demonstrate robust quality standards. However, the specific methods and modalities employed are not directly regulated by the HCPC, nor are they mandated within institutions. Teaching and assessment strategies in these programmes are evidence-based and implemented through various values-based modalities. For example, students enrolled in the University of Staffordshire Paramedic Programme are initially introduced to theoretical knowledge, followed by practical applications and assessments designed to reflect the dynamic challenges of the practice environment, thus ensuring thorough preparation for real-world scenarios.

Students are required to demonstrate the necessary Knowledge, Skills and Behaviours (KSBs) for HCPC registration. These preparatory KSBs reflect the evolving role of modern paramedics, which has expanded to a more generalist capacity[3] beyond its historical focus on reacting to signs, symptoms and trauma.[5] This shift is reflected in curriculum changes, supported by the 2023 revision to the SOPs, National Health Service safety initiatives and the College of Paramedics curricula.[3 6] Such transitions necessitate an increased focus on areas like Leadership, Self-Awareness, Reflective Practice, Human Factors and Evidence-Based Practice.[7]

Advantages of simulation

Simulation-based education (SBE) has evolved significantly in recent years, offering students the opportunity to practice complex skills within a safe environment without impacting patient safety.[8] The integration of structured, realistic activities enhances the skills, knowledge and decision-making of students, preparing them for the challenges of clinical practice.[9] Multi-professional simulations can prepare clinicians for rare events, reinforcing collaborative working practices and an understanding

across disciplines.[10] Studies report high levels of student satisfaction and increased confidence when engaging with SBE.[11 12] They add that the unpredictability of the clinical environment can result in little or no exposure to certain patients, resulting in apprehension when undertaking certain assessments or treatments. The benefits of a safe learning environment and the provision of formative feedback allow novice clinicians to reflect, learn and grow as autonomous practitioners. For example, the use of high-fidelity mannequins enables the replication of complex scenarios such as cardiac arrest or trauma management, enhancing clinical decision-making and procedural precision.

It is argued that debriefing is an essential component of simulation, which allows students to develop their reflective learning.[13] The iterative process of critical analysis, recognising errors and implementing action plans fosters a culture of continuous professional development that helps to bridge the theory-practice gap.

SBE underpins existing knowledge and skills, thereby promoting personal growth and development. Detail that, for simulation to be successful, facilitators must understand constructivism and experiential and reflective learning.[14] Tutors play a pivotal role in ensuring that simulations are carefully constructed to meet the learning requirements of the students. This is highlighted by studies which detail the importance of maintaining psychological safety and avoiding cognitive overload when undertaking high-fidelity simulations.[15]

Experiential learning is described as a dynamic process where learners acquire knowledge, skills and attitudes through active participation and reflection on experiences. It encourages adaptive thinking, which is essential for navigating complex healthcare environments.[16] When students engage with SBE, they refine their skills, thus improving clinical competence and confidence. Conversely, some authors urge caution, stating that students, particularly novice learners still developing foundational skills, may experience heightened anxiety during simulation-based education, potentially hindering their learning experience.[17] Simulations are resource-intensive; the use of expensive mannequins and the requirement for skilled facilitators can present significant challenges, and designing scenarios that reflect societal complexities requires careful planning and expertise.[18]

Non-technical skills

NTS include teamwork, communication, leadership, decision-making and situational awareness, are reported as crucial in healthcare settings.[19] Their successful integration has been linked to a reduction in medical errors and enhanced patient safety.[20] Current research indicates that communication failures are a leading cause of unintentional patient harm events, stating that in 70% of cases, communication errors were identified as the root cause.[21]

The prehospital environment can be challenging and unpredictable. NTS such as situational awareness and critical thinking enable healthcare professionals

to assess emergencies and make informed decisions in high-pressure situations comprehensively.[22] Additionally, teamwork is essential in complex healthcare settings, facilitating seamless coordination among team members, reducing conflicts and enhancing collective performance.[23] Increasing levels of burnout among healthcare professionals have been reported, with evidence suggesting that skills such as resilience, reflection and emotional intelligence can support stress management, enhance well-being and improve performance.[24] While training programmes specifically focused on NTS have been developed, the assessment of these skills is still evolving. Continued emphasis on their integration into practice and education is essential for improving outcomes and fostering a culture of safety.

Simulation-based assessment

Simulation-based assessments, including Objective Structured Clinical Examinations (OSCEs), have been used in medicine since the late 1990s.[25] Due to their robust and structured format, OSCEs are widely regarded as the gold standard for assessing clinical competence in medical practitioners.[26] Both formative and summative assessments are required throughout a student's course to assess technical progress and final competency before they embark on a clinical career.

Formative assessments are structured tasks that result in learners receiving feedback to allow reflection and academic progress. Formative assessment is considered a critical component of learning, with effective feedback described as a powerful tool for supporting students' ongoing development.[27] Whereas formative assessments focus on support and improvement, in contrast, summative assessments have the high stakes of course progression, registration, continued professional development and recertification attached. Simulation-based learning in higher education helps students deeply understand key concepts and theories. In medical education, it allows the practice of complex technical skills in safe, realistic scenarios.[28] Students then demonstrate competence through performance-based assessments. With evaluators seeking authentic assessment environments, replicating clinical practice.[29] It has been suggested that comprehensive assessments should provide a concise reflection of performance, ideally achieved in realistic situations.[30]

While much research supports individual simulation assessments, there's limited evidence on group-based simulation assessments. Since paramedics often work in teams, especially in challenging situations, assessing their NTS in a team context is crucial.[10] This research explores student paramedic perceptions of group-based simulation assessments to inform future assessment development, promote best practices and improve student learning.

The 60-min simulation was a clinical emergency with two patients, designed for level 4 student paramedics,

reflecting their competence. This 100% weighted module assessment covered four learning outcomes:

► Reflecting on safe and effective care delivery in prehospital or simulated environments.
► Demonstrating knowledge of effective NTS in the simulated environment.
► Demonstrating knowledge of teamwork in the prehospital or simulated environment.
► Demonstrating the ability to identify and manage a patient using basic pathophysiology principles to support a treatment plan.

The assessment had four phases:
1. Pre-briefing, role allocation and planning.
2. Group management and assessment of the simulation, including patient assessment, history taking and team-based management.
3. Group reflection-on-action, identifying areas of safe and effective practice and areas for improvement. Students used university tablets and a Microsoft Form for this phase, submitting it within the 60-min period.
4. Debriefing using the Target, Analysis, Learning points, Key Actions (TALK) debriefing tool.

Students worked in teams of four, demonstrating NTS (teamwork, decision-making, leadership, communication and reflection) and professional standards. Individual contributions were assessed, emphasising NTS. While errors might affect grades, failing to recognise errors, debrief, reflect and discuss action plans could result in failure.

The TALK debriefing tool structures post-event debriefing in healthcare. It is described as suitable for novice clinicians, helping them process challenging events and improve well-being.[31] Additionally, it is noted to promote constructive team conversations. Effective debriefing can depend on facilitator guidance. Students led their debriefings without assessor input. After facilitator-led debriefings earlier in the module, the module lead determined that students could effectively use the TALK tool independently. Students were advised to individually reflect and make notes before the group discussion and personal reflection completion.

METHODOLOGY
Study design

To focus on seeking to understand the experience/value of group-based assessments, via the perspectives of students, a qualitative methodology was adopted. The research was undertaken in May 2023 and June 2024. This centre runs allied health, nursing and midwifery courses.

This research employs a constructivist paradigm that posits that individuals construct their own understanding of the world through experiences and reflection.[32] In the context of this study, the constructivist approach is deemed to be appropriate as it seeks to explore and interpret the subjective experiences and perceptions of student paramedics regarding group-based simulation assessments. The constructivist paradigm aligns with

qualitative methodologies and interpretative data analysis, emphasising the understanding of human perceptions and interactions within educational settings.[33] This approach is well-suited for exploring the complexities inherent in human experiences.

Recruitment and sampling

To participate in this research, individuals were first-year (level 4) paramedic students at a UK Higher Education Institution. They were enrolled on the induction to NTS and simulation module, receiving 8 weeks of theory and practical teaching prior to undertaking their group simulation assessment. No exclusion criteria relating to age, ethnicity or gender were applied as, while this research does not seek to be representative of the student paramedic population, the sample must encompass a variety of student perspectives; the different characteristics of the sample were taken into consideration during analysis.

A total of 187 first-year (level 4) student paramedics across the September 2022 and September 2023 cohorts were invited to participate in this research. 61 students accessed the Qualtrics; of these, 34 responses (17.6%) were completed, with the remaining not progressing past the participation information sheet and consent form. 22 responses were completed by students from the September 2022 cohort and 9 from September 2023. Of these, 76% (n=25) were female and 24% (n=9) were male. This sample reflects the gender disparity that is present in the paramedic science degree programme. Figure 1 summarises participant demographics.

Data collection

Students were asked to complete a qualitative questionnaire hosted on Qualtrics. The first pages presented the information sheet and consent form. Students were asked to complete a series of open-ended questions before the debriefing form was presented. It was anticipated that the questionnaire would take up to 15 min to complete. Data was collected from the completion of the assessment until the day that the results were released, 20 working days later, to ensure that the grades did not skew the students' perspectives.

The decision to use a questionnaire rather than interviews or focus groups was based on the need to gather a broad range of perspectives from a large cohort efficiently, while allowing participants to respond anonymously and candidly about their assessment experience.

Qualitative data from the questionnaires were analysed using both thematic analysis and deductive reasoning, which, when combined, can enhance the rigour and validity of the findings.[34] The analysis followed the recommended six-step approach:[35]

► Familiarisation.
► Coding.
► Generating themes.
► Reviewing themes.
► Defining and naming themes.
► Writing up.

The data was uploaded onto NVivo V.10,[36] a software package for managing and analysing qualitative research data. This was used to organise and identify themes in the students' responses. The three primary researchers undertook independent analysis in an iterative process. In the group discussion, the coding framework was subsequently devised and emergent themes were identified. A constructionist approach was adopted, allowing themes to emerge from the data and discussing how students' perceptions have been impacted by social and educational influences.

Ethical considerations

It was made clear in the information sheet that participation was optional and that not completing it would have no impact on their studies or grades. Answers to the questionnaires were anonymous.

Patient and public involvement statement

Students were directly involved in this research as participants, sharing their experiences of group-based simulation assessments through qualitative questionnaires. In addition, service users were employed to act in the role of patients during the simulation assessments. Their contribution ensured that the assessments reflected realistic interactions, enhancing the authenticity of the learning experience under study. They were not involved in the study design, analysis or dissemination.

RESULTS

Four key themes emerged from the data, each reflecting a distinct aspect of student paramedics' experiences of participating in group-based simulation used for assessment. These themes illuminate how students engaged with the activity, what they learnt and how the simulation

Characteristic	Category	Count
Ethnicity	White	32
	Asian or Asian British	2
	Total	34
Gender	Female	27
	Male	7
	Total	34
Age Range	18–20	15
	21–25	7
	26–30	3
	31–35	3
	36–40	4
	41–50	2
	Total	34

Figure 1 Participant demographics by ethnicity, gender and age range (N=34).
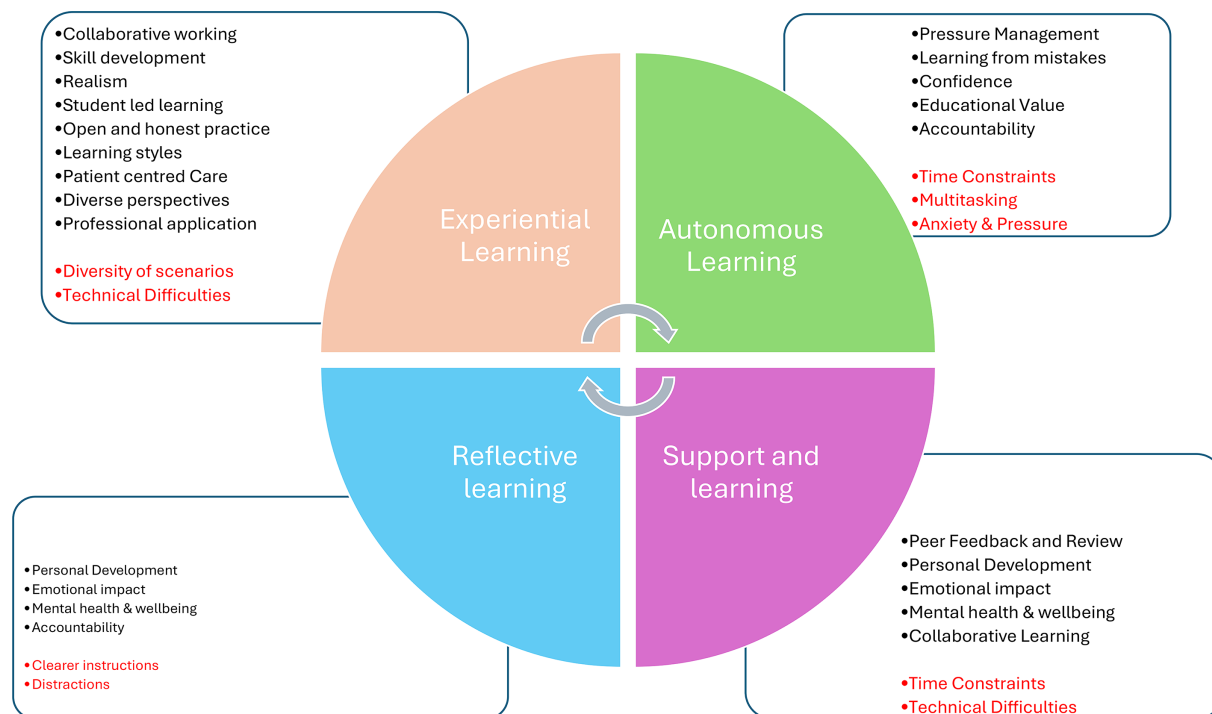
Figure 2 Pictorial representation of the themes.

supported their development as future professionals. An overview of the themes and associated constructions is presented in figure 2.

1. Experiential learning: students described the simulation as highly immersive, noting that the realism of the scenario enhanced their engagement, decision-making and confidence.
2. Reflective learning: the debrief and structured reflection that followed the simulation were seen as beneficial in students' professional development.
3. Autonomous learning: students recognised the value of self-awareness and personal accountability in their learning, linking the simulation experience to a broader understanding of their ongoing professional growth and the need for lifelong learning.
4. Peer-supported learning: learning alongside peers in a group setting helped reduce assessment-related anxiety and fostered collaboration.

DISCUSSION
Experiential learning
Fidelity in simulations aims to achieve a level of authenticity sufficient to engage students and assess competency effectively.[37] Moreover, both authenticity (physical fidelity) and cohesiveness (conceptual fidelity) are critical when designing effective simulated learning environments.[38] To that end, fidelity was achieved by replicating typical scenarios that paramedics work in and employing service users to play the role of patients. This no doubt increased the perception of realism, although the correlation between realistic simulation and competency remains underexplored in literature. That said, student

feedback provides valuable insights into their experience. For instance, one student remarked,

> The realistic nature of the simulations made me feel more prepared and confident in making decisions in real emergencies.

This suggests a beneficial link between realism and decision-making. Further endorsements come from comments such as,

> The simulation was realistic and mirrored everyday situations. and I found the simulation engaging and crucial for our learning.

Supporting the argument that high-fidelity simulation enhances engagement and learning.[39] Students also noted that realism boosted their confidence in decision-making; however, their personal backgrounds and academic performance were not captured in this research, preventing definitive correlation between their perception of realism and accuracy of decision-making.

Despite these positive indicators, the translation of decision-making confidence from simulated settings to clinical practice, where teams are often formed ad hoc, warrants further investigation. Moreover, student feedback highlights potential issues with cognitive overload, illustrated by remarks indicating that 'real-world scenarios were overwhelming'. This feedback presents a significant design challenge for educators, suggesting that high-fidelity simulations may be psychologically taxing for students. This notion is supported by research from Mills *et al*, who investigated physiological responses, such as heart rate and eye movement, in first-year paramedic

students during both high and low-fidelity simulations.[40] They observed that while low-fidelity simulations present less cognitive burden, they are linked to higher anxiety levels due to the assessment process itself.[40] Conversely, high-fidelity simulations, although increasing task-related anxiety, instil a greater sense of urgency and realism. This juxtaposition underscores the need for educators to craft high-fidelity simulations that maximise realism but avoid excessive cognitive overload, thereby keeping students engaged and enhancing their ability to effectively process critical learning experiences. A promising approach to mitigate stress is mental practice, a strategy that involves mentally rehearsing a task after observing a live demonstration. This technique has been effective in reducing stress in simulation-based surgical education.[41] However, implementing this strategy may prove challenging in courses with large student cohorts. Furthermore, introducing stress elements, such as an observer, during practice simulations significantly enhances stress resilience in medical students.[42] Moreover, additional research involving medical students has shown that combining mental practice with relaxation techniques and positive self-talk, within a curriculum centred on experiential learning, not only improves performance but also potentially reduces stress.

While stress is a notable byproduct of these assessments, the primary emphasis was on decision-making, communication, teamwork and situational awareness. Although the importance of these NTS behaviours might not have been immediately apparent to the students, feedback such as,

> I felt that I worked better as a team because I could liaise with other students, and I felt more confident during the process.

and

> I found my teamwork really improved as I had to collaborate closely with my crewmate to act in the best interests of our patient. We listened to each other and found a solution that I think worked well.

Illustrates their reflective impact. However, despite the relevance of these NTS to paramedic practice, as identified by Nakagawa et al,[43] Shields and Flin[44] advise caution. They note that while paramedic behaviours often mirror those found in other healthcare professions, the specific behavioural taxonomies for paramedicine still require extensive research to fully understand.[44]

Reflective learning
Collaborative learning creates a platform for students to exchange ideas and develop skills together. When thoughtfully designed and effectively implemented, it can significantly enhance learning outcomes while preparing students for teamwork.[45] This was identified within this research, one participant noted,

> Working together allowed us to see different perspectives and learn from each other's strengths.

This approach fosters high satisfaction levels and deeper learning, as group tasks promote a multifaceted understanding of complex scenarios. Collaborative learning allows for the exchange of ideas and plays a significant role in developing essential skills among participants, thereby enriching their educational experience. Participants reported significant benefits to their learning, with group tasks enhancing comprehension through peer discussion and shared problem-solving.

> It allowed the group to see where we could've done things differently to aid patient safety and maximise our skills.

This then improved their confidence as they found that working in teams bolsters individual confidence by validating ideas through group consensus, this skill is crucial in high-stakes environments such as prehospital emergency medical settings.[46] The collaborative setting encourages reflection, as students can compare their thoughts and receive constructive feedback when students engage in peer feedback rather than relying solely on teacher corrections, they tend to respond more reflectively and constructively, leading to significant improvements in their writing processes.[47] However, one challenge is the unequal contributions from group members; the emotional and psychological aspects of simulation can hinder reflective practices. Students may experience heightened stress or a sense of urgency during simulations, particularly when realistic moulage is used, which can impact their ability to engage in reflective dialogue post-scenario.[40] Within this study, some students found the pressure to perform can lead to a focus on immediate tasks rather than on collaborative reflection, which is essential for learning from experiences, as noted

> I felt pressured to always talk in order to convey we were working as a team in order to pass some people cannot write and talk at the same time.

In contrast, the study found that interacting with peers helps students identify personal strengths and areas for growth.

> It is an excellent way to learn from your own and peer feedback.

Participants expressed varied opinions on the frequency and timing of debriefing sessions. While most found them beneficial, some highlighted challenges related to preparation and time constraints. One participant shared,

> I felt it difficult to listen at the same time as writing, I felt I ran out of time.

Incorporating structured debriefing sessions into educational practices, including simulations and assessments, provides several advantages that were identified with this study, including improved critical thinking. One respondent emphasised that,

Reflecting effectively improves how we work mentally and is so useful after a hard job.

Reflecting on experiences, particularly after challenging situations, is crucial for paramedics, as it can enhance mental well-being and professional development. The mental health challenges faced by paramedics, including high rates of stress and post-traumatic stress disorder, underscore the importance of preparing for and addressing these issues within the profession.[48] Reflection helps students integrate feedback into their learning and practice, thus promoting their professional growth, this feeds into the HCPC standards as they state that paramedics must understand the value of reflective practice and the need to record the outcome of such reflection to support continuous improvement (10.1).[49] Despite challenges, students appreciate the reflective process, with one noting,

It's a valuable tool for recognising areas for improvement.

There were challenges identified by this study. Several participants felt rushed, expressing concern around time constraints, such as,

We needed more time for writing reflections and possibly 10-15 minutes of silence for individual thinking.

Competency-based assessments (CBAs) have become an integral part of higher education, particularly in professional and vocational courses such as healthcare. These assessments focus on students demonstrating specific skills, knowledge and behaviours essential for professional practice (Health and Care Professions Council, 2024).[49 50] Unlike traditional assessments, which often rely on summative examinations or coursework, CBAs require students to achieve predefined competencies, which can create significant time-related challenges for both learners and educators. Research suggests that students in competency-based programmes often experience anxiety and pressure due to the uncertainty of assessment timelines and the risk of delayed progression.[51] Some students reported feeling underprepared for reflective activities, indicating a need for clearer guidance and expectations. It could be argued that you need to prepare for every assessment; however, some students could hide in group simulation. This was mitigated by encouraging those stronger members of the team to encourage the quieter members of the team to participate and contribute. This was emphasised within the pre-briefing that this would be recognised within the marking. Research shows that how a team interacts can affect how each person contributes. Having a mix of different personalities in a team can influence how openly people communicate and how satisfied they feel working together. For example, when team members have quite different levels of emotional stability, they may communicate less openly, which can lead to lower overall team satisfaction. Conversely, some

participants noted that varying learning styles impacted group dynamics.

With people's learning styles being different, some people used the discussion time to type what people were saying to make sure it was captured, and not take part as much as usual, whereas some people were speaking and may not have captured this on the paperwork.

This highlights the importance of creating an environment where everyone feels comfortable sharing their thoughts.[52] Balancing group discussion and individual writing during debriefs was challenging for many, even though there was a structured debriefing framework, which provided a series of sequential questions to guide the students in their reflective writing. The participants valued the structured method of debriefing, as it provided a clear framework that enabled them to 'analyse actions and decisions effectively'.

Reflection emerged as a critical component of the learning process during simulations. Participants highlighted the importance of group discussions, noting,

Hearing others' perspectives helped me see the scenario differently and improve my approach.

Research shows that in clinical practice, narrating work-related stories can critically examine their assumptions, fears and insecurities, leading to a deeper understanding of their professional identity and practice. This reflective process allows them to recognise and transform unhelpful assumptions, thereby improving their decision-making and approach in complex situations.[53]

Autonomy and continuous professional development (CPD) are significant in the data. Students recognised the need to build on their knowledge to be able to work towards becoming autonomous clinicians, highlighted in comments such as,

I believe this will help me develop as an autonomous professional as it encourages me to analyse what occurred in different situations, allowing me to identify weaker areas that need improvement.

And,

This will allow me to improve on any mistakes so I can perform better in the future.

While the students who participated in this study were at the end of their first year of a 3-year degree, it is encouraging that in this short space of time, they are already adopting critical approaches that will benefit them throughout their careers. The CPD of paramedics has undergone significant evolution, reflecting the changes in practice requirements, educational needs and regulatory frameworks. It has been noted that the attitude of paramedics towards CPD has also changed, with the majority expressing the need to maintain their contemporary knowledge and recognising its importance to remain a registered health professional.[54] The interaction

between debriefing, reflection and professional development was noted by the respondents.

> I believe reflecting is a massive part of improving as a professional.

> In the future when you qualify there may be jobs you need to debrief and reflect on, doing this now helps us in the future to think about what went good and bad and how we can improve for next time which will improve patient care.

This feedback reinforces the application of a constructivist pedagogical approach, particularly using high-fidelity simulations and real-world assignments where students can transition from theoretical knowledge to practical application. This approach not only prepares students for the complexities of modern healthcare but also encourages them to take ownership of their learning, thus promoting autonomy.

A blended learning environment has also been identified to positively influence students' perceptions of autonomy.[55] By providing a diverse range of teaching strategies and summative assessments, which encompass the varied learning styles of students, it could be argued that this can cultivate autonomous healthcare professionals.

The respondents recognised the requirement for healthcare professionals to engage in both personal and professional development, highlighted by,

> Everyone sees things from different perspectives so to discuss areas which maybe other people hadn't have thought of is really useful, and something we can take into the next simulation after reflecting on. I also think the individual reflection was good, as it allowed us to jot our own thoughts down for personal improvement.

And

> I wouldn't have analysed my behaviour and practice if I hadn't of taken part. It made the whole group critically analyse the simulation in order to learn from each other's mistakes but also highlighted or strengths and how well we work together as a team.

Reflection is intrinsically linked with self-directed learning; the students recognised areas for development and ownership of their professional development. Self-directed learning positively impacts academic performance and clinical skills, suggesting that when students are more empowered to direct their learning, their motivation increases, enhancing competency.[56] However, it should be noted that the need for tutor support and the variability in the quality of the learning highlight the importance of structured frameworks to facilitate this learning approach.

Debrief and reflection activities are widely regarded as instrumental in fostering autonomy and professionalism. Participants in this research project identified several benefits, including the enhancement of their skills. It was identified that reflecting on scenarios strengthened clinical decision-making and non-clinical skills. As one participant shared,

> Learning from mistakes during debriefs has prepared me for handling complex situations independently.

Effective debriefing is essential for optimising learning outcomes from simulation training, as it allows paramedic students to reflect on their experiences and integrate feedback into their practice.[57] Reflective activities affirmed participants' competencies, boosting confidence in their abilities to make informed decisions. Alongside this, practicing structured, non-blaming debriefs was seen as essential for developing professionalism. Non-blame reflective practices in paramedic training can foster a supportive learning environment that enhances both individual and team performance. The establishment of reflective discussion forums has been shown to encourage practitioners to draw on the experiences of colleagues, thereby promoting critical thinking skills and facilitating a mentoring process. This collaborative approach not only empowers staff but also improves workplace relationships, which is essential in high-stress environments like emergency care.[58] The respondents felt that collaborative reflection broadened perspectives and encouraged collective problem-solving, fostering a supportive learning environment. Schön highlights the importance of reflective practice in developing practitioners who can adapt and respond effectively to complex situations.[59] By drawing on colleagues' experiences, practitioners refine their judgement and problem-solving abilities, which are critical for independent autonomous practice.[60] Thus, enhancing the quality of patient care.

This analysis highlights the importance of debriefing and reflection activities in promoting professional growth, critical thinking and confidence among participants. Although time constraints and the challenge of balancing tasks presented difficulties, the overall consensus emphasised the transformative impact of these practices. To enhance their effectiveness, educational programmes should consider dedicating more time to reflection, offering clearer guidance and preparation and incorporating structured models to support the reflective process.

Support and learning

The value of peer-assisted learning is a recurring theme throughout the responses. Participants noted the merit of considering outcomes from diverse perspectives, enabling them to gain a greater insight into the team's performance. One participant noted that,

> It is an excellent way to learn from your own and peer feedback.

Peer-assisted learning describes how students work collaboratively in a symbiotic fashion to aid the understanding of a topic.[61] Peer review in paramedic education is an evolving area that encompasses various methods of

assessment, including peer assessment and simulation-based education. By fostering a culture of constructive feedback, self-reflection and collaboration, a peer review can be used to evaluate professional competence, additionally enhancing students' 'learning by teaching'.[62]

One of the key benefits is that peer review develops critical appraisal and communication skills, which are vital in clinical practice.[63] Additionally, it enhances engagement by making students active participants in the learning process. This is reflected in the feedback, with respondents stating that

> I liked being able to bounce off of each other when looking for ways to improve.

and

> Everyone sees things from different perspectives so to discuss areas which maybe other people hadn't thought of is really useful.

There is varying evidence to support the use of peer reviews in assessments. Falchikov and Goldfinch highlight that it can help them gain a deeper understanding of learning objectives and evaluation standards, contributing to improved academic performance.[64] Conversely, Speyer *et al* urge caution stating that reviewers may be reluctant to critique their peers and there is the potential for inconsistencies.[65] This is directly in contrast to the views of the students with one stating that

> I thought the debrief and reflection activity was a very good way of getting everyone involved to share their opinions.

> It promoted potentially the more quieter people to talk more, and also promoted us to share our ideas.

It could be argued that, by fostering an open culture at an early stage of a clinician's education, students become more comfortable with giving and receiving constructive feedback, which is a crucial skill in professional practice. Encouraging an environment where peer review is normalised may help mitigate concerns about reluctance to critique others, as students gain confidence in their ability to provide objective and supportive evaluations.

Simulation-based education which incorporates peer interactions, can play a significant role in alleviating anxiety and stress among participants.[66] Additionally, it can influence task efficiency and learning engagement, which are critical factors in high-pressure educational environments such as paramedicine. Moreover, it is illustrated that the presence of peers can foster a supportive environment where individuals feel more comfortable practicing their skills.[67] This is particularly relevant in high-fidelity simulation, such as managing critically ill patients, where anxieties can be mitigated through collaborative learning experiences, resulting in improved confidence and a reduction in feelings of isolation.

Additionally, simulation-based assessments, while potentially anxiety-inducing due to the presence of assessors,

also provide the opportunity for peer support.[68] However, it should be noted that the presence of peers can either exacerbate or alleviate stress, depending on the nature of the interactions. This conflict is reflected in the feedback, while many felt that the format of the assessment reduced anxiety, one participant stated that,

> I found that the group assessment was much less stressful than an assessment on my own. I think that having some of my peers around while completing the assessment helped to ease the usual exam nerves I get.

others still felt overwhelmed

> It was a good experience although it seemed overwhelming at times.

It could be argued that, even though there is evidence to support reduced assessment stress when undertaking a group-based OSCE, it could never truly eliminate the pressures that a summative examination invokes.

One identified theme from the data reinforces the link between peer review, collaborative working and patient-centred care. One participant noted that,

> It will help me develop as it will encourage me to be more confident in my decisions, and acknowledge no two scenarios are the same, and what I consider to be the patient's best interests, my crew member could provide a better solution, holding discussions enables person-centred care.

This directly aligns with Eng *et al*, who recognised that peer review plays a crucial role in fostering effective teamwork within collaborative learning environments.[69] Adding that, it can significantly contribute to the development of professional behaviour and autonomy. Furthermore, the skills developed through peer feedback in group simulations can enhance overall academic outcomes.[70] Collaborative working is intricately linked to patient-centred care,[71] highlighting the importance of teamwork to facilitate the coordination and decision-making necessary for enhanced patient care. This, in turn, leads to improved patient satisfaction and outcomes. It could be argued that this reinforces the importance of teamwork in medical education and the formal assessment of NTS.

Limitations

This study has several limitations. First, positionality and confirmation bias may have influenced findings, as the researchers are involved in teaching the participants and have an existing belief in the value of simulation. This could have led to potential bias in how responses were analysed and understood; however, it is noted that not all assessors had previously taught the students, and the analysis was carried out systematically.

Second, the study is subject to the Hawthorne effect, as students were aware that their feedback was being collected for research purposes. This awareness may have influenced their responses, leading them to provide

answers they believed were desirable rather than fully reflecting their authentic experiences. It should be noted that there may be differences in student experiences based on factors such as year of study, prior simulation exposure or other individual variables. However, this study was designed to provide an overall understanding of student experiences, rather than to compare groups. As such, potential subgroup differences were beyond the scope of the analysis.

The response rate for this study was 17.6%, with a notable proportion of students beginning but not completing the questionnaire. This raises the possibility of response bias, as it is likely that students who were more motivated, reflective, or engaged with the simulation activity were over-represented in the final sample. As a result, the findings may not capture the full diversity of student experiences. This limitation is important to consider when interpreting the data, although the depth and richness of the responses obtained remain valuable for exploring the aim.

CONCLUSION

This research explored student paramedics' experiences of participating in group-based simulation as an assessment strategy, rather than solely as a learning tool.

Students broadly perceived the simulation as an appropriate and meaningful way to be assessed, noting its alignment with real-world practice and its capacity to test clinical reasoning, decision-making and teamwork under pressure. The assessment design fostered engagement, enhanced professional confidence and promoted peer learning.

However, perceptions of fairness and accuracy varied. While some students valued the authenticity and felt that their performance reflected their competence, others raised concerns about subjectivity in grading, variability in group participation and the emotional intensity of being assessed in a high-fidelity environment. These factors contributed to differing levels of cognitive overload and anxiety, highlighting the need for clearer grading rubrics, structured group roles and pre-assessment preparation.

Overall, while simulation-based assessment was largely viewed as educationally valuable and professionally relevant, its implementation must be carefully managed to ensure consistency, transparency and emotional safety. Further research is needed to evaluate the validity and reliability of simulation as a summative assessment tool, and to explore its impact on students' long-term competence and confidence in clinical settings.

Recommendations

The following recommendations are suggested.

Enhancing simulation fidelity

Further research is needed to examine the relationship between high-fidelity simulation and competency outcomes. Effective simulation design requires careful planning to ensure a balance between realism and cognitive load. Future studies could explore how high-fidelity simulations may be evaluated and used as formal assessment tools within healthcare education.

Non-technical skill development

Incorporating structured training in teamwork, communication, leadership and decision-making within SBE would enhance student preparedness for the role of a paramedic. Structured debriefing sessions should be employed to reinforce these competencies.

Expanding peer-assisted learning

Given the positive impact of peer interaction, initiatives should be integrated into simulation training. By integrating the skill sets of the students, it could further enrich the learning experience and reduce assessment anxiety.

Investigate the long-term impact on clinical practice

A longitudinal study could be conducted to assess whether the skills gained through high-fidelity simulations translate into improved clinical performance and patient outcomes.

Support reflective practice

Implementing structured frameworks for debriefing and self-reflection can enhance students' ability to analyse their performance critically. This has been recognised by the participants as crucial for their professional development as autonomous clinicians.

By implementing these recommendations, healthcare education programmes can enhance simulation-based learning, ensuring students develop the necessary technical and NTS to thrive in high-pressure healthcare environments.

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