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Review

Exploring virtual reality in undergraduate midwifery education: A qualitative systematic review

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ABSTRACT

Background: Virtual reality is a promising pedagogical tool in midwifery education, yet the experiential impact on students remains underexplored. This systematic review investigates how virtual reality is experienced in undergraduate midwifery education, addressing gaps in current literature.
Aim: To explore midwifery students' experiences of using a virtual reality learning tool during their undergraduate education, synthesise existing literature, and guide future studies.
Methods: A cross-section of nine databases relating to health, education, and computing was searched between January and February 2025. From 107 identified sources, 81 papers were searched against predefined eligibility criteria. Twenty-one full-text articles were assessed, and another 13 papers were excluded. Eight studies met the criteria for data extraction. Critical appraisal, data extraction, synthesis, and findings were undertaken collaboratively. A deviation from the original approach was expanding the scope to include nursing and healthcare students due to the limited midwifery-specific literature.
Findings: Three themes were identified: being safe, learning experience, and learning limitations.
Discussion: Participants found that virtual reality enhanced safe, effective care by enabling risk-free skill practice, deeper understanding of complex anatomy, and alignment with diverse learning styles. Experiences were mixed: some saw it as an engaging or best suited to younger learners, while others noted the novelty aspect. Challenges included limited access, high costs, steep learning curves alongside coursework, and issues such as discomfort, cybersickness, cognitive overload, and technical difficulties.
Conclusion: This review found that virtual reality engages health students and supports skill development, but the lasting pedagogical impact is unclear, requiring further research to refine use in healthcare settings.
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Summary of relevance

Problem or Issue

Little is known about the experiences of midwifery students who use virtual reality as a learning tool in their undergraduate education.

What is already known

Virtual reality is a promising simulation tool to enable healthcare students to gain skills that can be used in clinical practice settings.

What this paper adds

Virtual reality has the potential to engage midwifery and healthcare students, and is a valuable tool to support skill acquisition; its sustained pedagogical impact remains uncertain, warranting further research. This paper adds to the current body of knowledge and highlights gaps in the literature.

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1. Introduction

Virtual reality (VR) is a promising simulation tool used in many aspects of healthcare education, including midwifery (Frost, Delaney, & Fitzgerald, 2020; Mergen, Graf, & Meyerheim, 2024). Despite the enthusiasm for the use of this tool, there is little evidence of how VR simulation as a strategy in teaching and learning is experienced by undergraduate midwifery students and educators. Traditional simulation-based education (SBE) uses a variety of different techniques and equipment, including simulated patients, part-task trainers, or computerised manikins, and is widely recognised as a safe and effective way to deliver healthcare education (Henshaw & Dickerson, 2020; Lampropoulos, del Bosque, FernÁndez-Arias, & Vergara, 2025). However, compelling VR studies that focus on the experiences of midwifery students have yet to be formally evaluated within the literature.

Lessons learnt during the COVID-19 pandemic have provided renewed impetus to adapt and further develop pedagogically sound teaching and learning tools (Asgari & Darvishpour, 2024; Haanes, Nilsen, & Mofossbakke, 2024). The pandemic created a unique and challenging learning environment when new ways of delivering education were essential. Immersive VR is one of the technologies purporting educational value and has the potential to be widely adopted and incorporated into healthcare education (Lampropoulos et al., 2025; Mergen et al., 2024).

The rapid, cross-disciplinary evolution of VR demands that research be grounded in contemporary literature. A preliminary search of PROSPERO and JBI (Joana Briggs Institute) databases revealed no existing or ongoing systematic reviews (SRs) addressing the experiences of midwifery students using VR as a learning tool. Therefore, the preliminary search extended to a qualitative SR using the guidance and approach informed by PROSPERO and JBI (Porritt et al., 2024).

2. Review question

This qualitative SR explores midwifery students' experiences of using VR as a pedagogical tool in their undergraduate education, synthesises existing literature, and identifies gaps to guide future studies. The review question was framed using the PICo framework: Participants, Phenomenon of Interest, Context (Aromataris & Munn, 2020).

1. What are the experiences of midwifery students who use VR as a learning tool during their undergraduate education programme?

2.1. Participants

The review initially focused on midwifery students, but due to the limited number of midwifery-specific studies, the search was broadened to include related disciplines such as nursing and medicine. This ensured alignment with the SR aims while also highlighting the paucity of midwifery-specific literature.

2.2. Phenomena of interest

This review examined studies on undergraduate midwifery students' experiences with VR. Because of limited midwifery-specific research, the PICo framework was broadened to include nursing and medical students while maintaining relevance to midwifery education.

2.3. Context

The context of this review was healthcare education. It is not restricted to any age or gender. One cultural consideration was incorporated, and that was the inclusion of a culturally appropriate evaluation tool.

2.4. Types of studies

This review considered studies focusing on qualitative data, including interviews, ethnography, case studies, and focus groups, as well as mixed methods or other designs, for example, randomised controlled trials (RCTs) or scoping reviews, where a qualitative component was present.

2.5. Methods

This review was conducted in accordance with an a priori protocol registered with PROSPERO (CRD42022337792) (Welfare, Crowther, Gilkison & Frost, 2022).

2.6. Search strategy

The SR aimed to identify published and unpublished research on VR in healthcare education, a field spanning health, education, and computer sciences. Guided by a research librarian, a cross-section of nine databases across these disciplines was searched: CINAHL, Medline, EBSCO, Web of Science, ERIC, A+Education, VOCED, IEEE, and Scopus.

A comprehensive nomenclature (Table 1) was developed to guide the search. The terms VR, augmented reality (AR), and mixed reality can be grouped together using the term extended reality. While these computer-generated modalities have distinct applications and should not be used interchangeably, all were included due to past overlap in the literature.

An initial search in Google Scholar and CINAHL identified relevant articles, whose title/abstract terms and index terms informed a full search strategy. This was adapted for each database and information source (Midwi* OR midwives OR midwifery AND virtual reality OR vr OR augmented reality OR ar OR mixed reality OR immersive technology AND experiences OR perceptions OR attitudes OR views). The primary researcher set the inclusion and exclusion criteria, which were refined by the research team to achieve consensus (Table 2). Peer-reviewed academic works were included, limited to studies since 2015 (plus seminal research) due to VR's rapid evolution and minimal prior use in healthcare education.

2.7. Study selection

A total of 107 sources identified from the database searches were imported to Covidence (version 2) (Covidence Version 2, n.d.), a web-based collaboration software platform designed to streamline the production of SRs. After removing duplicates, 81 papers remained. The primary researcher screened the titles and abstracts against the criteria, eliminating 60 sources. Twenty-one full-text

Table 1
Nomenclature.

Nomenclature				
ER	Teaching	Learning	Tool	Students
VR	Education	Education	Instrument	Scholars
AR	Training	Studying	Device	Undergraduate
MR	Lecturing	Be taught		Postgraduate
				Pupils/Learners

AR, augmented reality; ER, extended reality; MR, mixed reality; VR, virtual reality.

Table 2
Inclusion and exclusion criteria.

Inclusion criteria	**Rationale**
Studies published in English	Researchers are monolingual
Peer reviewed.	Ensures high-quality research
Ethics approval	Ethics approval studies with students. Ethics not required for SR or similar.
Published within the last 10 years, apart from seminal research	Rapidly changing technological field with limited application before 2015
Include midwifery, along with nursing and medical students.	Focus on undergraduate midwifery education
Education and learning.	Focus on education
Immersive VR.	Focus on immersive VR
Head-mounted display.	3D and Cave products are also called VR, HMD (Head Mounted Display), required for immersive VR
Use of similar technologies.	VR, AR, and MR are computer-generated applications. Terms are used interchangeably in the literature.
Experiences of participants.	Focus on experiences
Full-text articles accessible via databases or the primary author	Ensures all articles are thoroughly reviewed in the SR process
Exclusion criteria	**Rationale**
Studies not written in English.	Limited translation services available
Studies not peer-reviewed	Ensures high-quality research is used
Published more than 10 years ago, apart from seminal research	Limited healthcare application prior to 2015
Participants are not midwifery, nursing or medical students.	Focus on undergraduate midwifery education
Studies do not focus on healthcare education.	Focus on education
Does not include VR technology.	Focus on VR
Does not meet the evaluation framework criteria.	Ensures high-quality research is used
Human participant research without ethics approval	Ensures high-quality ethical research is used for SR.

AR, augmented reality; MR, mixed reality; SR, systematic review; VR, virtual reality.

studies were screened independently by two reviewers, resulting in 13 exclusions: five reported quantitative data only without student experiences, three used nonimmersive VR, and two focused on education theory. In total, eight papers were selected for data extraction, and the search results and study selection were fully reported and presented in a Preferred Reporting Items for SRs and Meta-analyses (PRISMA) flow diagram (PRISMA, 2020) generated (Table 3) using the online tool by Haddaway, Page, Pritchard, and McGuinness (2022).

2.8. Assessment of methodological quality

Selected articles were critically appraised to ensure rigour and quality using the Rauru Whakarare Evaluation Framework (RWEF) (Feekery & Jeffrey, 2019), which triangulates with the CASP (Critical Appraisal Skills Programme, 2023) and CRAAP (Currency, Relevance, Authority, Accuracy, and Purpose) (Blakeslee, 2004) evaluation frameworks. Given the Aotearoa/New Zealand context, incorporating the RWEF applied a bicultural lens aligned with Te Tiriti o Waitangi (1840) to ensure cultural safety for Māori participants and recognising that all research conducted in Aotearoa/New Zealand affects Māori; the use of this framework was critical for upholding obligations to, and sensitivity towards, Tangata Whenua (Māori, Aotearoa New Zealand's indigenous peoples).

2.9. Data extraction

Two independent reviewers systematically extracted data from the included studies using the standardised Covidence tool. Extracted information spanned population characteristics, cultural and geographical context, methodological design, and the integration of immersive VR in midwifery education. All findings were recorded verbatim to maintain fidelity to the original reports. Although the protocol stipulated contacting study authors for missing or additional data, this step was not required for this review.

Findings were synthesised to generate a set of statements that represent the aggregation, and broad themes were identified based on the similarity in meaning. These categories were then combined to produce a single comprehensive set of findings, which informed the outcome of this SR.

2.10. Data characteristics

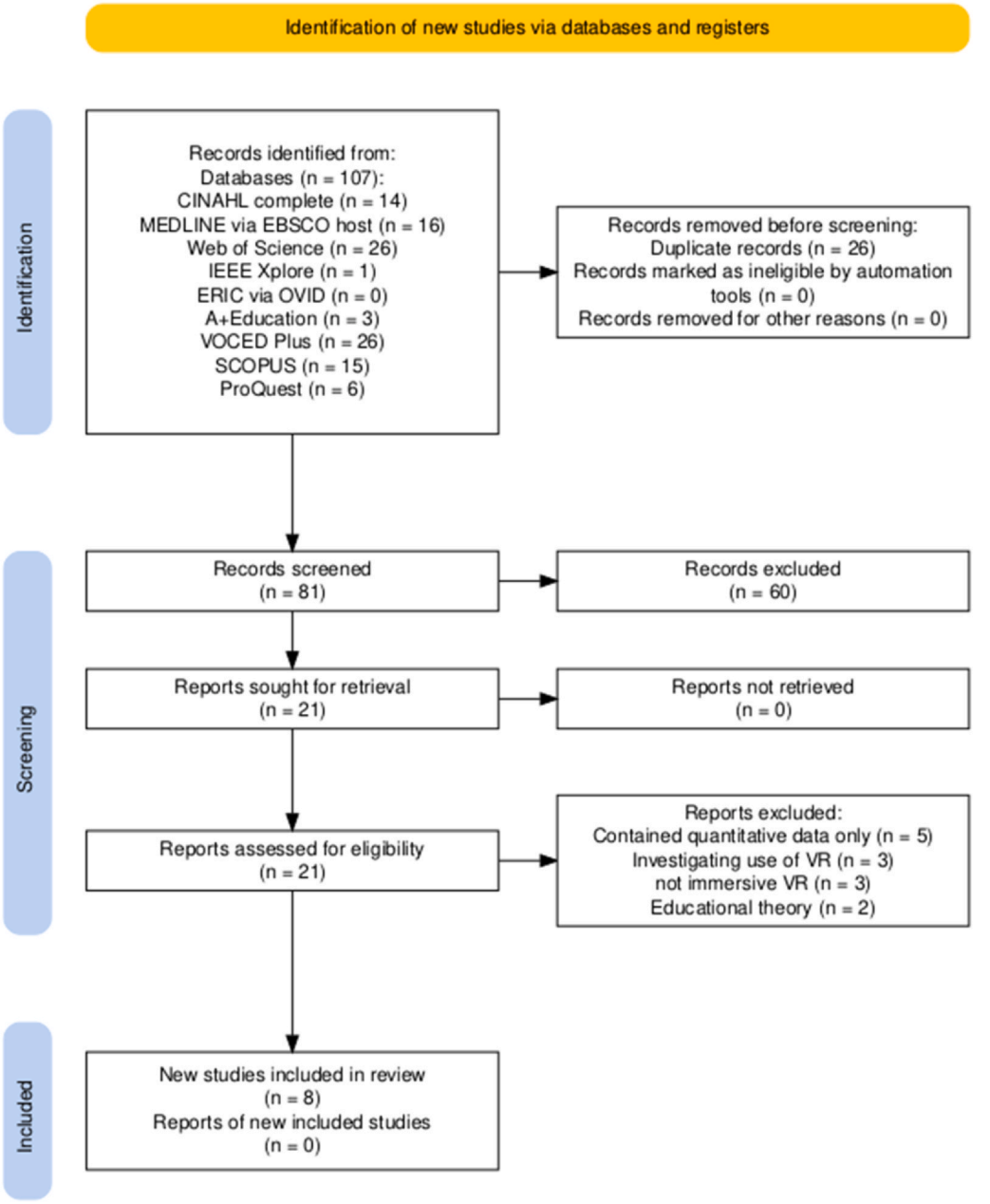
Eight international studies were included for this SR. Four originated from Ireland (Hardie et al., 2020; Ryan et al., 2022a; Ryan et al., 2022b; Saab et al., 2023), three from Australia (Downer, Gray, & Andersen, 2020; Fealy et al., 2019; Gray et al., 2022), and a joint research project between Australia and the United States of America (Hutchcraft, Wallon, Fealy, Jones, & Galvez, 2023). Six papers identified that ethical approval was granted by relevant institutions where researchers worked directly with students (Downer et al., 2020; Gray et al., 2022; Hardie et al., 2020; Ryan et al., 2022a, 2022b; Saab et al., 2023). No ethical approval was required for the final two papers, as one was an SR (Ryan et al., 2022b) and the other a scoping review (Fealy et al., 2019).

There was a variety of study designs. Five papers were mixed methods (Downer et al., 2020; Hardie et al., 2020; Hutchcraft et al., 2023; Ryan et al., 2022a; Saab et al., 2023), and one each of an RCT (Gray et al., 2022), a scoping review (Fealy et al., 2019), and an SR (Ryan et al., 2022a). All eight articles were published between 2019 and 2023. The study population was varied and included undergraduate nursing and midwifery students (Downer et al., 2020; Gray et al., 2022; Hardie et al., 2020; Ryan et al., 2022a, 2022b), undergraduate nursing students (Fealy et al., 2019), and a cohort of medical students (Hutchcraft et al., 2023). Although the final two papers did not specifically include midwifery students as participants, the SR by Fealy et al. (2019) had midwifery students in the inclusion criteria, and the participants in Hutchcraft et al. (2023) were evaluating the use of a midwifery-specific tool (Table 4). In studies presenting both quantitative and qualitative data, only qualitative findings were extracted for analysis, consistent with the focus on the participants' experiences.

2.11. Data synthesis

Qualitative findings were pooled in Covidence, exported to an Excel spreadsheet, and then synthesised into aggregated statements. Broad themes were identified based on similarity in meaning and combined for congruence with the research question. When textual pooling was not possible, the findings were presented in narrative form. Only findings found to be unambiguous and reliable were incorporated into the synthesis.

Table 3
PRISMA flow chart.



PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-analyses; VR, virtual reality.

2.12. Data analysis

The articles were thematically reviewed, and themes were identified (Braun & Clarke, 2021; Butler, Hall, & Copnell, 2016). The primary researcher conducted the initial analysis of the articles, with independent review by the research team; disputes were resolved through consensus at regular meetings.

2.13. Themes

These category descriptions were further collapsed and synthesised to produce three overarching themes: being safe, learning experience, and learning limitations. Direct quotes from the included articles are used to illustrate the three themes to convey meaning and ensure credibility (Table 5).

The first theme, *being safe,* reflected participants' perceptions that VR supported safe and effective care by enabling skill development and knowledge acquisition, particularly in complex areas such as anatomy and physiology (Downer et al., 2020; Gray et al., 2022). Importantly, the opportunity to practice without risk and to make mistakes in a controlled environment fostered psychological safety (Hardie et al., 2020; Saab et al., 2023). VR's adaptability to diverse learning styles and alignment with pedagogical principles were also seen to enhance learners' ability to achieve desired educational outcomes (Ryan et al., 2022b).

The second theme, *learning experiences,* captured the mixed responses to VR as a teaching tool. While many participants valued the novelty and reported heightened engagement (Ryan et al., 2022b; Saab et al., 2023), others expressed concerns about its suitability for all learner groups (Downer et al., 2020; Fealy et al., 2019; Gray et al.,

Table 4
Included articles.

Author	Setting	Year	Participants (number)	Tool description	Methodology	Main Qualitative Findings
Downer et al.	Australia	2020	Undergraduate midwifery students (14)	Anatomy and physiology of the uterus and birth of the placenta using 3D glasses and CAVE application	Mixed methods	Qualitative results showed that the 3D experiences reinforced learning and helped to reinforce the third-stage process. Students felt that more 3D visualisation technology should be developed
Fealey et al.	Australia	2019	Undergraduate nursing students	Assessing the integration of VR into nursing and midwifery education	Scoping Review (two articles only met criteria)	That students may improve their knowledge and skills using VR. There is a paucity of published literature on the application of VR in healthcare education, and further research is needed. It has the potential to assist in meeting challenges in obtaining clinical placements.
Gray et al.	Australia	2022	Undergraduate midwifery students (38)	Anatomy and physiology of the uterus and birth of the placenta using stereoscopic lenses attached to mobile phones to create immersive experiences	Randomised controlled trial	Discussion on positive and negative aspects of VR and limitations of the technology. Extends learning from static 2D, and allows for repeated, asynchronous, independent study for distant learning. A suitable tool to teach complex anatomy and physiology concepts
Hardie et al.	Ireland	2020	Bachelor of Science, Postgraduate in Children's and General nursing, General nursing and midwifery programmes (94)	Interactive storytelling using "Wonderful You" (BHD Immersive). Development of the five senses during foetal development	Mixed methods/ Evaluative study	Qualitative data showed enjoyment, fun and interactive, negative aspects included being uncomfortable, claustrophobic, and some experienced cybersickness.
Hutchcraft et al.	USA/ Australia	2023	Medical students (19)	'Road to Birth' focuses on maternal anatomy and physiological adaptation to pregnancy using immersive VR or handheld devices	Mixed methods	Qualitative themes mixed feedback because of poor graphics, reluctance to engage with VR, but increased knowledge acquisition.
Ryan et al.	Ireland	2022	Undergraduate and graduate degree midwifery students (41)	Foetal lie, position and presentation. Using immersive VR	Mixed methods	Learning experience was highly rated by the participants
Ryan et al.	Ireland	2022a	Medical, nursing and midwifery students (2722)	Assess the learning outcomes of VR, AR and MR compared with traditional teaching tools	SR of using VR, AR or MR	Knowledge gain is equal when using VR, AR or MR when compared with traditional learning modalities. VR, AR, and MR provide an enhanced learning environment, making it a useful and valuable tool in medical and nursing preclinical education. There were no specific to midwifery
Saab et al.	Ireland	2023	Undergraduate nursing and midwifery students	Virtual patients with deteriorating conditions are assessed using immersive VR	Mixed methods/ Usability study	Qualitative data showed that students had a positive learning experience in VR, as it is a safe learning environment. Technical and logistical challenges limited engagement and enjoyment.

AR, augmented reality; MR, mixed reality; SR, systematic review; VR, virtual reality.

Table 5
Synthesised themes and direct quotes.

Synthesised themes	Collapsing themes	Direct quotes
Being Safe	Skill acquisition or not	" … found this VR experience very helpful to learn about the different presentations"(Ryan et al., 2022, p.5)
	Knowledge transfer	
	Repetitive practice	"100% of students felt the 3D immersive experience was beneficial (Downer et al., 2020, p.30)
	Learning theory content	"Increasing confidence by providing space for trial and error" (Saab et al., 2023, p.4)
	Safe learning environment	"did not change knowledge levels of participants on tests"(Ryan et al., 2022, p.1)
	Safe place to make mistakes	"several less engaged" and "distracted"(Hardie et al., 2020, p.7)
	Teaching methods	"I am a visual learner" (Ryan et al., 2022, p. 5)
	Learning styles, VR, and learner preferences	"a combination of teaching methods is most appropriate in supporting student learning" (Gray et al., 2022, p.6)
	Clinical experiences limited (Covid, culture, country)	"VR was perceived to promote equity among students" (Saab et al., 2023, p.3)
	Interest and age of learners	"a lack of interest in VR would result in some students to become distracted and disengaged" (Saab et al., 2023, p.6) "threat to compassion and human connections" (Saab et al., 2023, p.4)
	Increased cognitive load	
	Physical symptoms of cybersickness	
Learning experience	Acceptable and better learning experience	" … help them remember in the future compared to traditional teaching methods"(Hardie et al., 2020, p.7)
	Emotive inducing positive and negative	"captivating, innovative, empowering nature of VR" (Saab et al., 2023)
	Enjoyable	"it was so realistic and added to my knowledge" (Hardie et al., 2020, p.7)
	Engagement or not	"it was helpful to watch the physiology moving" (Downer et al., 2020, p.30)
Learning limitations	Logistical barriers	"exciting and affordable opportunities to improve nursing and midwifery education" (Fealy et al., 2019, p.18)
	Need clear buy-in from staff and institutions	"New innovations should not be introduced without formal evaluation" (Downer et al., 2020, p.31)
	Challenges and threats to actualisation	"Students want a usable grade product" and "the RtB software was not the same quality they are used to" (Hutchcraft et al., 2023, p.9-10)
	Cost implications	"addressing challenges and threats to actualisation"(Saab et al., 2023, p.4)
	Hardware challenges	"low-cost VR technologies have the potential to reduce inequities"(Saab et al., 2023, p.1239)
	Equity amongst learners	"it's an accessibility issue to make a student come to a library on campus was an inconvenience" (Hutchcraft et al., 2023, p.10)

2022). Differences in age, technological comfort and learning preferences influenced perceptions of relevance (Saab et al., 2023), highlighting the need for careful consideration of how VR is introduced and supported within education programmes.

The third theme, *learning limitations,* highlights how students faced barriers to this style of learning. This included limited equipment access (Hutchcraft et al., 2023; Saab et al., 2023), high development costs (with potential fee impact), and extra time demands to master unfamiliar interfaces, alongside coursework and placements. In addition, physical discomfort, cybersickness, cognitive overload, and technical difficulties were reported (Hardie et al., 2020; Hutchcraft et al., 2023). These learning limitations could impose further constraints on VR's feasibility in midwifery education.

These themes provide the foundation for the following discussion, where their implications for midwifery education and practice are critically examined.

3. Discussion

The included articles reflected the use of VR in midwifery and healthcare education, but the methodological inconsistencies and varied terminology (e.g. 'artifact', 'tool') hindered the synthesis of results and themes. Similarly, while the review aimed to explore learners' 'lived experiences', the absence of a clear definition in the selected articles meant that all references to experiences spanning personal learning, attitudes towards VR, and perceived clinical preparedness were grouped together under a single experience theme.

Being safe encompasses both psychological safety and skill development. Students recognised the need to build skills to avoid harm to healthcare consumers, linking safety to clinical competence and knowledge (Frost et al., 2020). VR was seen as a space to make mistakes without risk, as VR provided a space where "… you can feel free to make errors and increase confidence", (Saab et al., 2023, p.4) and enabling safe practice for complex scenarios (Fealy et al., 2019) while augmenting skills gained in simulation (Saab et al., 2023). This aligns with Gasteiger, van der Veer, Wilson, and Dowding (2022) (p.11), who found that VR/AR enhances skill transfer to clinical practice by providing a safe learning environment that increases knowledge. Similar benefits were reported by Mergen et al. (2024). Establishing psychological safety remains critical for students exposed to high levels of stress, particularly in high-fidelity environments. Unlike traditional workplaces, students can, as Madsgaard and Svellingen (2025) note, engage with the interplay of discomfort and cognitive challenge, allowing them to make mistakes and deepen learning.

While some of the studies reported students' self-perceived skill gains, quantitative findings often showed little or no measurable improvement. For example, Gray et al. (2022) observed short-term knowledge gains after midwifery students used the third stage of labour tool, but no lasting effects. Ryan et al. (2022a) found no change in foetal-lie knowledge, and Yu, Yang, Ku, and Mann (2021) saw no statistical difference after using VR with the neonatal intensive care training tool. Nonetheless, Grey et al. (2023), Ryan et al. (2022b), and Yu et al. (2021) all noted that students *felt* they had learned more, with Ryan et al. (2022b) adding that these gains were comparable to traditional methods.

The gap between students' perceived skill gains and short-lived objective improvement indicates that VR, while engaging, students still require reinforcement through blended learning and traditional simulation to secure lasting knowledge retention, a need underscored by Ajemba, Ikwe, and Iroanya (2024) and Alharbi, Nurfianti, Mullen, McClure, and Miller (2024), who highlight addressing knowledge gaps and advancing research in this area. Alongside this need for reinforcement, VR has demonstrated its value in helping midwifery students to grasp complex anatomical and physiological concepts (Gray et al., 2022; Ryan et al., 2022a; Saab et al., 2023). Students reported benefits from its immersive visualisation from "seeing what was going on inside" (Gray et al., 2022, p.5) to zooming in on specific structures, suggesting that this deeper manipulation can augment initial comprehension.

Beyond technical competence, midwifery and other healthcare students must build interpersonal and intrapersonal skills, including communication, empathy, and critical thinking. Evidence on VR's effectiveness is mixed; some studies highlight limited transfer to clinical contexts (Coffey, 2015; Dean, Williams, & Balnaves, 2017; Frost et al., 2020), while others report that simulation can foster these capabilities (Godbold & Cairnduff, 2024; Mergen et al., 2024). Building on this, Grey et al. (2022) and Ryan et al. (2022b) draw on Jeffries' (2015) simulation theory to emphasise the role of structured pre- and post-briefing. Such a briefing enhances learning by enabling students to discuss, reflect, and address misconceptions in a supportive setting (Badowski & Wells-Beede, 2022; Cust, 2022).

3.1. Pedagogical impact on the students' experiences

Five articles (Downer et al., 2020; Gray et al., 2022; Hardie et al., 2020; Ryan et al., 2022a) discussed pedagogy, predominantly constructivist and experiential approaches, which view learning as active and iterative, underpinned by collaboration, problem-solving, reflection, and debriefing (Baldwin, 2020; Knowles, 1990). While pedagogy does not directly determine subjective experience, neglecting it in VR integration may inadvertently affect learner outcomes. This presents an opportunity to develop pedagogical approaches that align with the evolving role of VR in healthcare education (Garrett & Dickerson, 2023; Mergen et al., 2024).

Learning limitations refer to the added complexities of integrating VR into health education, particularly financial costs for development, maintenance, and roll-out (Mergen et al., 2024; Mondal & Mondal, 2025; Ryan et al., 2022a, 2022b; Saab et al., 2023). Bowen-Withington, Zambas, Macdiarmid, Cook, and Neville (2020) stated that "for workload planning, educators need to be mindful that the creation of simulated learning experiences for nursing students involves significant preparatory time (p.47)". These 'costs' in both development and educator time may restrict adoption in low-resourced settings, where equity gains are most needed, reflecting the limited infrastructural support that can shape students' VR learning experiences (Mondal & Mondal, 2025).

In addition to the cost and workload pressure, four studies noted higher cognitive load for both educators and students when using VR compared to traditional SBE (Hardie et al., 2020; Madsgaard & Svellingen, 2025; Sari, Pranesti, Solikhatun, Nurbaiti, & Yuniarti, 2024). Sari et al. (2024) found that minimising unnecessary cognitive demands and aligning VR environments with specific learning tasks support effective processing and positive learning outcomes for students.

The *Learning limitations* theme highlighted learner frustration when VR malfunctioned, including connectivity issues, glitches, and non-functioning equipment, which leads to student disengagement and mistrust in VR as a learning tool (Gray et al., 2022; Hardie et al., 2020; Hutchcraft et al., 2023; Mondal & Mondal, 2025). Five studies also reported side effects such as cybersickness and physical discomfort when wearing the immersive headsets (Gray et al., 2022; Hardie et al., 2020; Hutchcraft et al., 2023; Mergen et al., 2024; Ryan et al., 2022a; Saab et al., 2023) and effectively compromise potential cognitive or experiential learning when using VR. The risk of not addressing this is that VR remains a novelty rather than a sustainable tool for healthcare education.

Collectively, these findings highlight a clear gap in the evidence base of using VR in healthcare education, underscoring the need for further research into both student and educator experiences of VR. Future studies should identify pedagogical approaches that optimise learning, while examining the physical and psycho-social emotional impacts of VR use. Establishing standardised terminology will also be critical to ensure consistency and comparability across this emerging field.

3.2. Limitations

The broad, multidisciplinary search produced a diverse range of articles, yet few directly examined the experiences of midwifery students. The absence of a socio-cultural context limited the understanding of how VR might shape midwifery education and the transition into professional practice. The predominance of studies from high-income countries (particularly Ireland) constrains the transferability of findings to midwifery education in lower-resourced or culturally diverse settings.

4. Conclusion

In conclusion, this systematic qualitative review has followed a robust process to examine the current available literature on the experiences of midwifery students who have used VR as a learning tool within undergraduate programmes. This review highlights that while VR is a novel, innovative approach that enhances student engagement and supports perceived skill acquisition in undergraduate midwifery education, evidence of lasting pedagogical impact remains limited. Therefore, to optimise VR's role in midwifery education, further research is needed to refine its application, compare it with traditional SBE, and integrate both student and educator perspectives to align the technology with sound pedagogical principles.

Author contributions

Melanie Welfare: Conceptualization, methodology, formal analysis, data curation, writing – original draft. **Susan Crowther**: Conceptualization, data curation, writing – review and editing, supervision. **Lynn Chapman**: Writing – review and editing, supervision. **Jane Frost**: Data curation, writing – review and edition, supervision. All authors approved the final version.

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Ethical statement

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Declaration of Competing Interest

The authors declare no conflicts of interest.

Declaration of Generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used Chat GPT to improve readability and language, after using this tool the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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