# RESEARCH



# Feasibility and acceptability of a virtual learning module for navigating angry conversations in clinical encounters



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# Abstract

**Background** The use of technology in medical education has been increasing with more students exposed to some form of online learning or tutorials, under the umbrella of virtual learning (VL). Many programmes, particularly those involving virtual reality, have centred on practical skills, such as surgical techniques or anatomical knowledge, rather than communication. The study presented here examined the feasibility and acceptability of a VL module developed to aid communication when handling angry patients and their relatives.

**Methods** Participants were 4th and 5th year medical students at the Brighton and Sussex Medical School. Students were randomly allocated to receive training about having angry conversations in a clinical setting via virtual reality headset or desktop application. Prior to the intervention, everyone completed the SE12 self-efficacy questionnaire, a 5-item confidence measure, and free-response study specific survey. Following the module, they completed another study specific survey, with fixed and free responses, the confidence measure, along with the UTAUT2 questionnaire on acceptance and use of technology. Quantitative data was analysed descriptively, conceptual content analysis was applied to free responses. Participants received a £25 voucher for their time.

**Results** Twenty students took part in the project. Scores on the SE12 did not differ significantly between intervention arms. Confidence improved across all five categories - recognising responses that diffuse or exacerbate anger, identifying anger signals, remaining calm in hostile situations, moving forward with empathy, and applying techniques to different situations. Responses to the UTAUT2 indicated acceptance of VL, including the psychological safety it provides. Nineteen categories for free text responses were developed via content analysis. Participants spoke frequently about the challenges of navigating anger. There was initial apprehension VL would not feel realistic, though this was largely reversed post-intervention. Students expressed preference for a combination of VL, whichever modality, and face-to-face teaching, recognising benefits of both.

**Conclusion** Students found the training to be acceptable, providing them with tangible skills. There should be a consideration as to how to incorporate VL, with a mix of face-to-face practice for added realism.

Trial Registration Clinical trial number not applicable.

Keywords Virtual learning, Angry conversations, Clinical conversations, Feasibility and acceptability

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# Background

All technological innovations demand evaluation of their efficacy and application. This is evident within education and the increasing provision of virtual learning (VL) environments [1-3]. This term encompasses a broad range of teaching tools from online lectures and desktop applications to augmented or virtual reality (VR) [4]. VL aims to harness technology to provide a safe environment for students to develop skills, making and learning from mistakes as needed, outside of traditional pedagogical or classroom settings [5]. This type of psychological safety can encourage learners to be more immersive in their experiences without fear of shame or embarrassment [6]. VL can facilitate personalised learning, moving beyond purely didactic methods. This provides learners with an experience of ownership and participation [3, 7], while benefitting those who learn best by practice and simulation [8–10].

Research suggests the ability to interact as an active participant may enforce learning points [11], particularly when immersive technology provides feedback and opportunities for continued practice [12, 13]. To accomplish successful interactions, it is important to consider the realism of these exchanges within technology, ensuring they feel genuine enough for participants to gain something durable [4, 11, 14-17]. Otherwise known as fidelity, this idea has been a key component of theoretical models underpinning VL, alongside feedback, deliberate practice, mastery of learning and outcome measurement [17]. These are especially pertinent to VR interactions as immersion and the depiction of the patient are central [11]. Content and user familiarity with technology also influence these educational encounters [18]. Medical education has traditionally favoured didactic and in-person training [19, 20]. However, surgery and anatomy have used VL tools for some time [20-23].

While technology may facilitate the learning of practical skills, its role for improving soft skills, such as communication is only recently receiving attention [21]. Communication skills may be difficult to digitise, due to the combination of both verbal and non-verbal information [24, 25], and simulation may have a natural confine, lacking the nuance of human response and reaction [2]. More research is needed into using VL for this type of training [21] to better understand whether it can be adaptable for learners' needs and feasible to integrate into curricula [17, 26].

The company, Bodyswaps©, created a module entitled 'Navigating Angry Conversations' in collaboration with the Royal Society of Medicine and Professor Dame Lesley Fallowfield [27]. The 45-minute programme has been designed to build effective communication skills to improve difficult conversations with patients and relatives. The module aims to help learners progressively develop and test communication skills needed to navigate anger, emphasising both inter and intrapersonal processes. The learner meets virtual patients and relatives throughout the experience who they engage with. A key feature of the module, aimed at medical trainees and newly qualified doctors, is the ability to 'bodyswap', experiencing and embodying the perspective of another, called an exocentric perspective, which adds to the realism of the experience [28, 29]. The module is available via VR headset or the desktop application, Bodyswaps Go©. The functionality of these options is similar; the headset provides body language feedback, though both modalities can detect things such as vocal tone.

Through three topics, the content targets five key skills – (1) understanding how different responses can diffuse or exacerbate anger (2) identifying anger signals (3) remaining calm in hostile situations (4) responding with empathy to move the situation forward and (5) applying these techniques to different situations.

In topic 1, the trainee is asked to provide a memorable angry clinical encounter. They are given feedback on this and hear techniques aimed at calming and grounding themselves. In topic 2, the student watches a clinical scenario within a breast care clinic. They see a doctor meeting with a young female patient and her angry husband and are tasked with identifying the signs of anger. They then watch the exchange again, however this time they take on the perspective of the doctor. They are prompted to use the calming techniques learned in topic 1. In topic 3, the learner continues with the scenario above and selects how the doctor should respond to the encounter, witnessing the different outcomes this can have. Finally, the learner meets an elderly, male patient in a busy urology clinic. This somewhat entitled individual is angry at having to wait and feels indignant about his situation. The student must de-escalate the exchange while acknowledging the patient's concerns.

Learners are provided with tools and personalised AI generated feedback throughout all three topics to help manage their own reactions and those of the patient/ relative.

In this study, we explored the feasibility and acceptability of using the virtual platform to provide communication training about anger to 4th and 5th year medical students. The intention of this small pilot study was to assess whether it was feasible to deliver the training module via virtual learning and whether the training was acceptable to participants in terms of learning outcomes and overall experience. It was not designed to make comparisons between the VR headset and desktop application.

# Methods

#### Recruitment

Participants were 4th and 5th year medical students at Brighton and Sussex Medical School. Undergraduate medical degrees in the UK are five years in duration with communication skills training included in each year. An advertisement was disseminated via university email and social media channels. This included the information sheet along with a link for individuals to book a timeslot to take part.

Researchers had no knowledge or information about individuals before they arrived, and they were assigned to a study arm based on which slot they booked. If necessary, this rule was adjusted to maintain balance between intervention arms.

# Measures and intervention procedure Self-efficacy questionnaire - SE12 [4, 30]

The SE12 was developed as a measure of self-efficacy in relation to clinical communication skills of health care professionals. The core measure consists of 12 items rated on a scale of 1 (very uncertain) to 10 (very certain). A total score from a maximum 120 is calculated.

# Unified theory of acceptance and use of technology questionnaire – UTAUT2 [31]

A modified version of the UTAUT2 questionnaire was used. The measure consists of 6 items relating to views on VL generally, and in the context of communication training, and 13 items contrasting other teaching methods to VL for learning communication techniques. Responses were made on a scale of 1 (completely disagree) to 7 (completely agree).

The SE12 was completed before the module to establish baseline self-efficacy. The UTAUT2 was completed after training, as familiarity of VL is required to answer items.

Written informed consent was received following a discussion with the researcher and review of the information sheet. Participants were asked to complete a set of pre-intervention questionnaires via Qualtrics (Qualtrics XM, December 2023 version) including 3 items to gather participant demographics (age, ethnicity, gender), the SE12 [4, 30] and a study specific measure with fixed and free text response options to questions about their expectations of module content and perceptions of VL.

They were then set up on their allocated technology platform, either VR Meta Quest2 (MQ2; Meta) headset or desktop application. Participants were guided to begin the module and the researcher remained with them while they completed a brief induction to ensure visual and audio qualities were working correctly. Once this phase of the module was complete, the researcher left the room so the student had privacy to interact with prompts as necessary. Students were not informed about the five key learning points prior to participating however these were established in the module introduction and revisited in a short debrief provided at the end of the module.

Once the module was finished, post-intervention measures were completed via Qualtrics, comprising a study specific questionnaire with fixed and free text response options to questions about the module and learning environment, along with the UTAUT2 [31].

Additional feedback was gathered from a built-in pre and post questionnaire within the module, assessing confidence levels on the 5 key components of the training. Participants were given a £25 voucher for their time following completion of all study materials.

## Analysis

Data from SE12, UTAUT, fixed responses to the study specific post-intervention measure, and confidence ratings were analysed descriptively.

Free text responses to the study-specific measures were explored using a process of conceptual content analysis [32].

Both researchers read pre and post-intervention comments in the first instance for familiarity. RS then read the pre-intervention responses to begin categorisation. Our approach to coding was pragmatic based on identifying broad themes rather than specific key words [32, 33]. These were overarching groups independent of the valence of the text. Two authors (RS/VS) reviewed these initial categories and assessed them for relevance, duplication and any missing items. These formed the basis for our first provisional coding categories. We allowed for new categories or variations on terms to be added throughout the process, particularly as pre and postintervention questions varied.

Some codes were broken into their component parts, allowing for granularity in the data and better insight into the topics people were discussing. RS applied changes back to the text and VS reviewed for sense and agreement. Frequencies of each category were tabulated.

This small pilot study was conducted to assess the acceptability and feasibility of delivering the virtual learning module, not to make comparisons between the modes of delivery. As such, we make no direct comparisons between those who completed using the VR headset and those who completed via the desktop app.

# Results

Twenty medical students took part in the study. Participant demographics are shown in Table 1. Completion times varied with an overall range of 37–71 min (average 51.2). Completion times were similar in the two groups; time to complete in the VR group ranged from 37 to 71 min (average 54.7), the desktop ranged from 42 to 59 min (average 50.3).

Table 1Demographics

N=20	
Age	Range – 22–27
Gender	80% female (16) 20% male (4)
Ethnicity	12 different ethnicities were reported, broadly grouped as: 50% - Asian (10) 30% - British (6) 20% - African or Hispanic (4)
Year of education	60% year 5 (12) 40% year 4 (8)

#### **Pre-intervention findings**

The mean self-efficacy score was 86.65 (S.D. 13.59) with a range of 51–109 (maximum score is 120). This is lower than the reference group scores reported in the validation of the questionnaire [34] (mean 100.61, S.D. 8.38) but this is perhaps not surprising as participants in the validation study were health care professionals experienced in communicating with patients and families. Scores on the SE12 did not significantly differ between those allocated to desktop or VR.

In addition to the core 12, several individual items were presented, including one specifically about confidence to successfully handle angry patients and relatives. The mean score on this item was 5.45 (S.D. 2.01). Responses ranged from 1 to 9 out of a possible 10.

When analysing free text responses to the study specific questionnaires, we developed 19 qualitative codes across pre and post-intervention data. 798 categorisations were made across 14 questions. Counts for the most frequently used categories in response to each question theme, along with examples from the free text, are provided for the pre-intervention questionnaire in Table 2. Here we describe and explain the findings.

## **Challenges of anger**

Participants noted how challenging they found it to deescalate a heated situation. Often there was a desire to provide a solution to a problem and minimise confrontation, acknowledging this was not always possible. Learners wished to avoid internalising the patient's anger. They were aware of how their own body language could influence the outcome of a conversation.

#### **Expectations of learning module**

Participants hoped that the module would focus on communication skills, particularly providing techniques, tips and key phrases to use. Often, these were referenced in relation to de-escalating tense situations. Students spoke of their own reactions to angry situations, wanting to learn about their responses and how to stay calm. There were 5 categorisations where participants acknowledged

# Table 2 Category counts from the pre-intervention questionnaire

Question theme	Categories*	Examples
What is most chal- lenging about an angry conversation? Included question(s): • What do you find most challenging about a conversation with someone who is angry?	Frequent categories: • Navigating own and others emo- tions (8). • De-escalation (8). • Not able to pro- vide a solution (4). • Maintaining or regaining focus (4).	When they are shouting. Sometimes I will 'smile' when I am uncomfortable, which makes the other person more angry. (1) What I found most chal- lenging is coming up with a solution / plan that the patient agrees with and is happy with. (18)
Expected learning from the module included question(s): • What topics do you hope might be covered in this module? • What do you hope to learn from this module? • Which of these poutcomes is most important to you?	Frequent categories: • Communication skills (36). • De-escalation (16). • Navigating own and others emo- tions (9). • Practice (6). • Talking to rela- tives (5).	Learning key phrases and techniques to calm a patient down and de- escalate them. (8) Language and commu- nication techniques to handle angry people, how to apply these in a clinical setting. (5)
Virtual learning as a teaching method Included question(s): • What are your perceptions of virtual learning as a teaching method? • What are your perceptions of virtual learning compared to traditional teaching methods (e.g. lectures, small groups, role play)? Please indicate whether you have experience of virtual learning.	Frequent categories: • Realism (14). • Resource consid- erations (10). • Comparison of modalities (10). • Use of virtual learning in educa- tion (9). • Self-directed learning (8). • Traditional teach- ing (7). • Virtual learning (6). • Practice (5).	I have never experienced virtual learning. I think it does seem exciting and immersive It could also be a good method for a student to observe a doctor carrying out a con- sultation. I do think that actors for simulation are irreplaceable in medical education in my opinion though. (13) I have not had any virtual learning however I think it is more flexible than tradi- tional methods and inter- active scenarios can make it more real and a better learning experience. Al- though I wouldn't replace small groups and role play with virtual learning as nothing is better than practicing on real people, but I think it makes a good adjunct (20)

\* Includes categories reference by 4 or more participants (20%+)

that the module might offer an opportunity for practice within a safe environment.

### Perceptions of VL

Learners across both groups reflected on the perceived realism of VL with concerns that it would be impossible to replicate human interaction and therefore lack fidelity. Pre-intervention, 3/15 sections of text categorised as relating to realism were positive, 2/15 were neutral/ mixed and 10/15 were negative. Negative expectations pre-intervention centred on apprehension that it may feel fake, and that interaction would be limited.

Few participants had any previous exposure to VL methods beyond online lectures. When discussing their expectations about VL as an education tool, 5 of the categorisations were positive, 4 were neutral and 1 was negative. Most people presumed that VL would lack the ability to read and respond to body language. Participants made comparisons between learning methods, largely feeling that VL might be useful but would not ultimately compare to face-to-face role plays. Students did reflect it may offer resource savings such as time and capacity. Some recognised the value of VL for anatomical or surgical content.

## Post-intervention findings

Fixed responses from the study-specific post-intervention measure are presented in Table 3. Qualitative coding counts for frequently used categories, along with examples, are provided in Table 4.

### **Experiences of learning module**

Participants felt the module met or exceeded their expectations, with some surprise at the level of interaction it afforded. As part of their learning, they reflected on the techniques they had taken away, including phrases and structures to use. This included recognising signs of

Tab	le 3	Fixed	response	totals	on th	ne po	ost-inter\	/ention
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# questionnaire

Question	Responses (N=20)
Did the module content meet your expectations?	100% - yes*
Did the module learning outcomes meet your expectations?	95% - Yes (19) 5% - Not sure (1)
Did you repeat any exercises for practice?	80% - No (16) 20% - Yes (4)
Was the tailored feedback you received helpful?	95% - Yes (19) 5% - Not sure (1)
Did you find it helpful to experience your communi- cation from the other person's perspective?	70% - Yes (14) 25% - Not sure (5) 5% - No (1)
Did you complete all of the sections of the module?	100% - yes
Do you feel better able to manage a conversation with someone who is angry?	95% - Yes (19) 5% - Not sure (1)
Did this virtual learning experience meet your expectations as a teaching method?	85% - Yes (17) 15% - Not sure (3)
Would you prefer to complete this module as a vir- tual learning experience or with traditional teaching methods (e.g. lectures, small groups, role play)?	60% - Virtual Learning (12) 40% - Traditional teaching (8)
Would you prefer to complete this module using immersive VR or via the desktop app?	75% - Virtual real- ity (15) 25% - Desktop (5)

\* One participant responded 'no' but in the accompanying free text stated that the module content exceeded expectations

anger and feeling being better equipped to diffuse these. However, one individual noted the practice did not feel natural.

Learners described experiencing their own body language and communication from a perspective outside of themselves. This feedback gave students insight into how they may be perceived by others and highlighted areas for development. It was acknowledged that their performance may not accurately reflect their behaviour in a face-to-face scenario. There were occasional limitations to the feedback as a result of the technology and/or module, for example not being heard correctly.

## Learning outcomes

Students highlighted a better awareness of accessible tools to manage patients and internalised discomfort. For example, there were references to breathing and grounding techniques which could be practiced. There was acknowledgment these would need to be tested in real scenarios to appreciate their benefit.

# **VL** environment

Participants considered the use of VL to convey educational material. Often comparisons were made to traditional role play scenarios. For some, VL could be an adjunct to face-to-face work whereas others felt the latter was irreplaceable. A conversation about realism was central to these opinions; there were many positive comments that the experience was more realistic than expected, however participants also made comparisons to the role plays they had experienced in their training, feeling that these may offer more authenticity. At this time point, 18 sections of text were categorised as relating to realism; 9 were positive and 9 were negative. Participants felt the anxiety of an angry person in front of you, even in role play, was better preparation for real life conversations. However, there was a suggestion that this type of immersive training may benefit more junior students, or allow for practice without added pressure. Of the 22 categorisations about the use of VL in medical education, 16 were positive, 1 was neutral and 5 were negative. When asked whether they would prefer to complete the VL module using the VR headset or the desktop app (irrespective of which modality they had actually completed using), VR was preferred by the majority.

Figure 1a-1e shows pre and post self-assessment of confidence (rated 1–5) in relation to the five key learning points. Responses have been categorised as 'high' confidence, relating to a score of 4 or 5, or 'low/moderate' confidence, relating to a score of 1–3. The charts show the proportion of respondents rating high levels of confidence before and after the intervention. Scores on all measures improved, though some key learning elements were already high at baseline, limiting the opportunity for

# Table 4 Category counts from the pre-intervention questionnaire

Question theme	Categories*	Examples
Did the module meet your expectations? Included question(s): • Did the module content meet your expectations? • Did the module learning outcomes meet your expectations?	Frequent categories: • Feedback on module (17). • Communication skills (14). • Practice (9). • Navigating own and others' emotions (8). • De-escalation (4).	I felt as though the module was well put together and helped navigate angry conversations with clear outcomes starting from observing to finally putting skills into practice. (6) I really liked the way calming techniques were presented during scenarios and the way different verbal cues were presented. (12)
Module feedback and experience Included question(s): • Was the tailored feedback you received helpful? • Did you find it helpful to experience your communi- cation from the other person's perspective?	Frequent categories: • Personalised feedback (10). • Awareness of impact of own body language and emotion (8). • Feedback on module (8). • Practice (4).	It was good to have the statistics about how I did during the consultation, but I think that exercise isn't a mirror of how I would perform in clinical practice. (17). I never really considered the effect of the variation in my tone before and I thought it was very helpful to see the range of an- swers and responses that can be said to defuse a situation. (19)
Do you feel better prepared to have a conversation with someone who is angry Included question(s): • Do you feel better able to manage a conversation with someone who is angry?	Frequent categories: • Navigating own and others' emotions (11). • Communication skills (10).	Learning about the subtle signs of when someone might be angry was really helpful and is hopefully something I can use in practice. Also, techniques to calm myself down were helpful, so hopefully these will help in dealing with angry patients. (3) Because, it gave me techniques to use and allowed me to practise and then provided feedback which told me that I was using the techniques successfully. (4)
<ul> <li>Virtual learning as a teaching method inc. preferences</li> <li>Included question(s):</li> <li>Did this virtual learning experience meet your expectations as a teaching method?</li> <li>Would you prefer to complete this module as a virtual learning experience or with traditional teaching methods (e.g. lectures, small groups, role play)?</li> <li>Would you prefer to complete this module using immersive VR or via the desktop app?</li> </ul>	Frequent categories: • Comparison of modalities (21). • Use of virtual learning for education (19). • Realism (15). • Feedback on module (15). • Safety (6). • Virtual learning (6).	Virtual is really great for having a go at diffusing situations in an environment where you feel you won't be judged and feel comfortable at making mistakes. The only mode of learning that I feel will be better for more senior medical students will be role plays (not lectures etc.) as this best emulates real-life situations. I feel this virtual learning is best for more junior medical students and HCPs. (10) Definitely more interactive and forced me to think/participate so I got more out of the experience. I prefer roleplay as it is real humans/actors but I often don't get involved and let others do the talking. (7)

\* Includes categories reference by 4 or more participants (20%+)

advancement. As might be expected, baseline confidence scores were related to overall self-efficacy. Due to a data transfer issue, data is only available from 19 respondents.

Table 5 shows descriptive statistics for responses to the modified UTAUT2 items. Participants in this study were positive about VL; 12 of the 18 items had a median and/ or mode of maximum 7.

Particularly notable was the endorsement that it provides a psychologically safe place to learn and practice communication skills, going beyond that of other teaching methods. This aligns with the findings from the content analysis of free text responses.

# Discussion

This paper presents data from a small pilot study delivering communication training to medical students using virtual learning. Through pre and post-intervention surveys, the learners reflected on their expectations, perceptions and experiences of the module and learning modalities more broadly.

Pre-intervention questionnaires indicated a desire for additional training to support communication skill development. There was apprehension about dealing with anger, in knowing how to respond and also how to manage personal feelings. Participants had a range of responses, from 1 to 9, to the pertinent question on the SE12, demonstrating the varied uncertainty in this area. Following the module, students reflected on what they took away from the training – such as tools to de-escalate tension and grounding techniques to personally anchor. Post-intervention confidence scores improved on all areas, notably in managing the conversation with empathy and applying the techniques to different situations. Participants reported being better equipped to deal with these conversations, feeling the training delivered on its objectives.

Participants made frequent comparisons between virtual and face-to-face role plays, noting the pressure and anxiety found in the latter better replicated the clinical environment. Despite this, post-intervention results show a higher proportion of preference for VL over traditional teaching methods (12/20). Furthermore, when asked whether they would prefer to complete the module using the VR headset or the desktop app (irrespective of which modality they had actually completed it using) 15/20 stated that they would prefer to complete the

# Recognising







# Identifying

Fig. 1b Confidence rating for identifying anger signals



Fig. 1c Confidence rating for remaining calm in hostile situations





Fig. 1d Confidence rating for moving the situation forward with empathy

module using VR rather than via desktop learning. Some comments in free text responses suggested that desktop learning allowed for distraction and lacked the immersive experience. This is reflected in recent reviews on VL, with VR found to offer additional experiential benefit [13, 22]. As reported in other studies participants valued the psychological safety provide by VL, that it removes the fear of speaking and making mistakes in front of others [22, 25]. Free text responses showed a desire for a mixed approach, ultimately wanting some face-to-face practice while seeing the benefit for VL to develop communication skills. Some made the distinction of when each method may be useful – VL for earlier learning, whereas traditional role play may be preferential in the final years

# Transfer



Fig. 1e Confidence rating for applying these techniques to different situations

Table 5
 Responses to the modified UTAUT questionnaire

	UTAUT factor	Mean (S.D.)	Median/ Mode	Range of re- sponses
l believe this virtual learning experience helps me to improve my communication skills	Performance expectancy	5.75 (1.37)	6/6	1-7
I believe using virtual learning could help me to achieve my goals in terms of com- munication skills	Performance expectancy	5.40 (1.50)	6/6	1-7
I am confident that using virtual learning could help me to perform effectively on tasks requiring communication skills	Performance expectancy	5.50 (1.47)	6/6	1-7
I find virtual learning easy to use	Effort expectancy	6.25 (0.97)	7/7	4-7
Learning communication skills using virtual learning is enjoyable	Hedonic motivation	5.85 (1.60)	6.5/7	1-7
I like to experiment with new technologies	Personal innovativeness	6.35 (1.46)	7/7	1-7
Compared to other teaching methods, learning communication skills using vir	tual learning:			
Helps me to be more confident when interacting with other people		5.05 (1.67)	5/5	1-7
Helps me to become more skilled interacting with other people		5.00 (1.59)	5/5	1-7
Increases how engaged I am with learning communication skills		5.55 (1.64)	6/7	1-7
Increases my interest in communication skills training		5.70 (1.75)	6.5/7	1-7
Helps me to become more aware of my current skills		5.85 (1.50)	6/7	1-7
Provides a more psychologically safe place to learn communication skills		6.45 (1.10)	7/7	3-7
Provides me with more opportunities to practice my communication skills		5.95 (1.61)	7/7	1-7
Makes me more focused while practicing my communication skills		5.60 (1.76)	6/7	1-7
Helps me to better remember what I've learned		5.50 (1.85)	6/7	1-7
Helps me to empathise more with others		4.55 (1.76)	5/5	1-7
Provides me with more detailed personal feedback on my communication skills		5.40 (1.90)	6/7	1-7
Makes it less complicated to practice my communication skills		5.80 (1.64)	6.5/7	1-7

of training, as the last preparation before Foundation Year 1 roles (the first year of training after completing undergraduate medical degree in the UK).

There were initial concerns about how realistic learning in a virtual environment would feel echoing concerns of fidelity found in the literature [14, 15, 17]. As theoretical underpinnings demonstrate, there is a need for learners to perceive the VL environment as believable and immersive. It is interesting that those taking part naturally reflected on these principles at both pre and post-intervention timepoints. Pre-intervention, students questioned whether the module would replicate a clinical exchange. They were apprehensive that the interaction would be limited or feel 'fake' and that they might experience a lack of connection to the characters in the module. However, following the intervention, there was some surprise at how realistic the experience was. While there were positive comments that the experience was more realistic than expected, there remained some concern that the characters in the module did not engage or express emotion as may happen in a real situation.

The virtual environment allows the trainee to view things from their own perspective, but also outside of themselves or through the eyes of another [29]. With the ability to control and dictate movement and speech, the user gains a sense of agency over their virtual avatar, further increasing fidelity and learning outcomes [9, 28]. Providing this embodiment as part of VR may be a particularly useful way to invoke affect [9, 35]. These features within the Bodyswaps<sup>©</sup> module seemed to address the doubts around realism. Students reported the exocentric opportunity to view the scenario through someone else's eyes as beneficial.

Current literature suggests that VL, and VR in particular, has the potential to be useful for medical education [22]. These tools address gaps in learning, as more is required from medical trainees and their curriculum [2, 12, 15, 20]. While the focus has predominantly been on surgical and practical learning, research indicates a role for this technology in the learning of communication skills [22, 36-39]. Our pilot work has provided some evidence about the potential efficacy and acceptability of VL in communication skills training, while the wide range in time to complete the module (37-71 min) suggests that some participants engaged more with the module and the opportunity to practice. More research should be undertaken to explore this further, particularly in the durability of skills learnt via VL and their adaptability to medical education training [25, 36, 37].

# Limitations

A key outcome of feasibility studies is uptake. We aimed for thirty participants but were only able to recruit twenty in the study period. Our recruitment period was towards the end of the academic year when there were significant deadlines, exam dates and holiday periods. The intervention took place on the university campus but due to the nature of the population, they were often at other sites on placement or out of area completely. It may be that those students who participated were more motivated to undertake communication skills training [38].

A few students had initial difficulty with the VR headset, often due to wearing glasses. However, all participants were able to use the VR headset. Some also reported that the microphone had not heard them correctly and so their feedback was not relevant. These technical challenges are important to address to ensure the learner is given the most supportive experience [22]. To provide psychological safety, we left students alone for their learning experience. Students were advised how to raise technical issues with us, however being absent from the room meant we were unable to rectify any misaligned feedback due to these issues unless the student sought help [22].

This study was designed to assess the feasibility and acceptability of delivering the virtual learning module. As such, it was not designed or powered to make comparisons between mode of delivery (VR/desktop) and there was no follow up assessment of the learning outcomes. Future comparative studies into the efficacy of the learning module will include objective assessment of communication skills, and long term follow up to assess retention of skills over time and transfer into clinical practice, with comparisons made between the two modalities as well as traditional teaching methods.

# Conclusions

This pilot study set out to assess the feasibility and acceptability of using VL for communication training around having angry conversations. Students reported this as a positive experience which gave them tangible skills to take away. Their feedback suggests using virtual tools for education would be of benefit, but there was a strong emphasis on retaining some face-to-face interaction to prepare for the reality of being with patients.

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#### Author contributions

This study was conceptualised by LJF and designed by VS/RS/LJF. Material preparation, data collection and analysis were performed by VS/RS. All authors contributed to the first draft of the manuscript, reviewed and edited later drafts, and approved the final manuscript.

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#### Data availability

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

#### Declarations

#### Ethics approval and consent to participate

The research has been approved by the Brighton and Sussex Medical School Research Governance and Ethics Committee (RGEC). The ethical review application number of the study is ER/RMLS21/10. All participants provided written informed consent.

#### **Consent for publication**

Not applicable.

#### Competing interests

The authors declare no competing interests.

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