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Designing a Video-based Remote Clinical Consultation Simulation With Artificial Intelligence-based Communication Detection

Perspectives From Health Care Professionals and Educators

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The aim of this research is to gather and analyze design ideas for a video-based remote clinical consultation application that uses AI to detect communication elements, such as nonverbal cues, during simulated consultations. The application is intended for use by health professions students and professionals in simulation-based training to develop nonverbal communication and video consultation skills. It provides feedback based on predefined rules applied to communication detected by AI. We conducted semi-structured interviews with 11 health care professionals and educators to explore their perspectives on video consultations, telehealth training in health professions education, and the methods used to teach nonverbal communication in these programs. The interview data were analyzed using inductive thematic analysis. The findings present key themes that can be used to inform design decisions for simulated video consultation situations, automated recognition of nonverbal communication in video consultation simulation, and feedback derived from it. We found that more objective measures of communication skills could enhance health professions education simulations. In addition, automatic feedback should focus on highlighting positive aspects of communication, limit low-level detail, and provide contextual information to support reflection. Finally, incorporating emotionally charged scenarios is valuable for teaching nonverbal communication skills.

Keywords: Artificial intelligence, Health care professionals, Nonverbal communication, Remote consultation, Simulation-based learning

Nonverbal communication is an important part of a clinician's overall communication in the health care setting, for example, influencing patient outcomes,[1] establishing a sense of immediacy,[2] and building a sense of trust.[3] In face-to-face consultations, clinicians can convey these through nonverbal cues, such as eye contact, facial expressions, and paralinguistic features, which are also the factors most often perceived by patients.[4] The use of remote consultations has increased due to global changes influenced by the COVID-19 pandemic.[5] It poses unique challenges for clinical communication, such as how to convey empathy in video-mediated communication, which tends to limit visual and auditory cues.[6]

Remote consultation refers to a health care service delivered via chat, phone, or video call.[7] Benefits related to remote health services include the availability of services to people living in rural areas and options for patients to access care,[8] and they can be useful in addressing issues such as health care workforce shortages.[9]

Studies have shown a growing interest and need to train students in health professions education programs, such as nursing and medicine, to effectively deliver telehealth services, including remote consultations.[10–13] Research has been conducted to develop curricula, courses, and simulation-based learning for telehealth, which is leading the way in providing telehealth training.[11] However, telehealth training is lacking a standardized curriculum and a way to measure and evaluate the effectiveness of the training.[10,11,14] Implementing effective telehealth teaching and learning remains unknown.[15]

Studies have been conducted on applications that combine video-based remote consultation training and nonverbal communication training, such as the ReflectLive,[16] EQClinic,[17] and the MPathic-VR, which uses a virtual avatar to train delivering bad news to patients.[18] The applications can be used in clinical consultation simulations, where they can detect the student's nonverbal communication with AI technology in the video consultation situation and provide feedback during or after the simulation. The studies on these applications have been positive, showing a

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potential benefit of using them in health professions education for students to become aware of their behavior in clinical settings and to improve their communication skills.[16–20] However, these are in an early stage of development and need to be further developed, for example, to provide more usable and actionable feedback to students.[21]

The aim of this study is to address these gaps by collecting design ideas for an application aimed at improving health professions students' and professionals' nonverbal communication and remote consultation skills in video consultation simulations, using AI to detect nonverbal cues. We explore health care professionals' and educators' perspectives on the design and implementation of an automatic feedback system that could provide usable and meaningful insights into students' nonverbal communication during simulation-based training. In addition, we aim to identify the context in which video consultations could be used in health professions education to support the development of skills necessary for effective remote consultations.

METHODS

We used a qualitative descriptive design to explore the perspectives of health care professionals and educators on designing a video consultation simulation that incorporates AI. We chose this research method to gain an in-depth and detailed understanding of the area of interest for which this method is particularly useful.[22] Ethical review was done by the Ethics Committee for Human Sciences at the University of Turku, Health Care Division (28/2023). We also obtained research permissions from the 2 participating universities.

Participant recruitment and sampling

We recruited 11 health care professionals and lecturers from higher education institutions in Finland involved in nursing and medical education. Interviewees were specifically recruited based on their experience in teaching clinical skills, conducting health care simulations, using video consultations to meet patients, or having knowledge and expertise in health care communication, such as clinician-patient interaction.

Participants were recruited through direct email invitations and snowball sampling. The recruitment process began by sending emails to individuals responsible for health professions education at the 2 educational institutes, asking for potential participants in their institute. In addition, the researchers' connections at these educational institutions were used to request participation in the interview. The first author who conducted the interviews had met one of the interviewees twice before the interview.

We reached a point in our recruitment process where the same people were recommended to us multiple times. During the recruitment process, interviewees were provided with an information sheet and a privacy statement outlining the topic and rationale for the study and privacy considerations. Interviewees were also told that this was part of the first author's dissertation research. Each participant was required to sign an informed consent form, and those who initially agreed to participate did not drop out during the study. In addition, the purpose and goal of the interview were described before each interview so that interviewees could focus their responses on remote care and communication training in health education. Before the interview began, interviewees were asked if they had any questions about any aspect of the study.

Data collection

The data used for this study were collected through semi-structured interviews. The interview questions were formulated based on the information and gaps identified in the literature review done for a similar application.[21] The interview structure and questions were tested in a pilot interview and modified according to what areas for improvement were found. The interviews covered the following topics: current remote care teaching methods, training for remote consultations, the importance of nonverbal communication in clinical encounters, methods of assessing simulations, and methods of providing feedback. The interviews also included a brief brainstorming about the application under development, such as what it could detect from clinical communication and how the feedback would be provided.

The interviews were conducted and recorded using Zoom, provided by the University of Turku, between November 2023 and February 2024. The interviews lasted between 31 and 70 minutes, with an average of 54 minutes, and each interview was conducted once. Ten of the 11 interviews lasted 47 minutes or more. The interviewees were given the time they needed to answer all the questions. Follow-up questions were also asked if the interviewer felt the need to ask for clarification or if more in-depth information on a topic would be valuable. After the ninth interview, we considered whether we had reached a saturation point with these interviews because the answers were starting to repeat themselves. We decided to conduct 2 more interviews to confirm this and stopped recruiting, given the detailed nature of the topic and interview topics. The interview recordings were first transcribed automatically using the speech recognition application Whisper (version 20231117, small model), which was run offline on a local computer, and then manually reviewed by listening to the recording. The transcriptions were verbatim, with the focus on the participants' words. The interviews were conducted, transcribed, and analyzed by the first author, who had conducted similar interviews in the past as part of his graduate studies.

Data analysis

We followed Braun and Clarke's guidelines for thematic analysis.[23] Specifically, we used inductive thematic analysis to comprehend the qualitative data. This method enables themes to emerge from the data rather than fitting the data into a pre-existing framework.[23] This approach was chosen to avoid overlooking unique or unexpected themes, which we consider important given the novelty of the research theme. This study report was guided by the Standards for Reporting Qualitative Research.[24]

The data analysis was conducted in a continuous and iterative fashion. The familiarization of the data was done

by the first author during the research process, beginning with the interviews themselves and continuing through the transcription phase and later reading the transcriptions. Once we were satisfied that we knew the data well, we began to highlight interesting parts of the text from which codes were formed. Coding and analysis were performed by the first author using NVivo 14 (release 14.23.2). The data and codes were reviewed several times in this ongoing process to ensure that no important information was missed. Themes were searched and identified by categorizing similar codes. The analysis continued during the writing of this report by refining the theme names and finding the parts of the transcripts that explained the themes.

RESULTS

This section presents the findings organized into 3 key themes derived from the interviews: (1) foundational requirements for educational use, (2) attentive presence for building care relationships remotely, and (3) constructive affirmation to support learning remote consultation skills. Figure 1 presents the themes and their corresponding components derived from the interview data.

The study involved interviewees from various levels of nursing and medical education, including educators who teach students pursuing bachelor's, master's, or licentiate degrees, as well as specialized physicians. Their areas of expertise included psychiatry, emergency care, general nursing and medicine, and health care communication. The overview of interviewees' sex, education, work experience, and video-based remote consultation experience is shown in Table 1.

Theme: Foundational requirements for educational use

Interviewees reported that nursing and medical curricula offer limited training on remote consultations. Participants involved in bachelor-level nursing studies mentioned that the new nursing curriculum for 2024 includes a specific module on digital health services that covers remote consultations, while the medical curriculum does not offer mandatory training on this topic. Clinical consultation training with paid simulated patients or fellow students acting as patients is included in the curricula of both nursing and medical students. During this training, students receive feedback primarily on their verbal communication and on the substantive expertise of their teachers and peers.

Interviewees emphasized the importance of understanding face-to-face clinical consultations in general and having a good foundation of that before exploring other methods, such as remote consultations. As one participant noted, "First, you have to be able to face a patient in real life with a wide range of patients before you can delve into remote consultations." Students also need to be familiar with the interpersonal aspects of consultation and its structure.

Interviewees believed that video consultation training should not replace face-to-face clinical consultation training but rather supplement it. They suggested integrating video consultation training into existing studies where consultation skills are already being addressed. This approach supports the importance of having a foundational understanding of clinical consultations before undergoing telehealth training, addressing the telehealth topic in the later stages of the course. Interviewees believed that the training could be integrated into any curriculum without requiring notable additional resources.

Interviewees felt that a video consultation simulation training with an interprofessional team of students from different health professions programs, such as nursing and medicine, would be a good way to conduct this type of training. This approach would enable students to practice communicating with other professionals. However, it presents major resource considerations, such as organizational difficulties for the educational institution. In addition, team-based simulation adds a new level of complexity in interpreting communication, as one said, "It is usually easier in terms of interaction and coherence of the interview when you are alone in that situation."

It was mentioned during the interviews that the teacher's unfamiliarity with video consultations could pose a barrier to implementing remote consultation training in the curriculum.

I think that there is also a lot of the fact that this is foreign, this is new, this is something that we ourselves have not been taught and what we have not learned, and therefore we have a high threshold to implement it into the teaching.

Interviewees agreed that nonverbal communication is crucial in patient encounters, particularly in challenging situations such as those involving dramatic life changes, difficult topics, or emotionally charged issues. Simulated situations could be emotional or sensitive, but also have simple instructions to provide a realistic experience for them to learn from.

They could be dramatic situations that you might only have a few times or that you might not have all the time in your life where you must tell someone that a relative has died or something very dramatic like that, so that you can get into those kinds of really shocking situations to practice so that they can learn their own reactions and learn it.

Theme: Attentive presence for building a care relationship remotely

Interviewees suggested monitoring nonverbal communication that demonstrates that one cares about the patient and the patient's needs, such as active listening, which may appear as maintaining appropriate eye contact, positioning the body toward the patient, nodding when the patient is talking, and being expressive without overdoing it, such as smiling when the patient is smiling. These were thought to be useful in both face-to-face patient encounters and in remote video encounters. Lack of expressiveness could convey disinterest, lack of concern, or the feeling that the clinician is not listening. Professionals should use an appropriate amount of nonverbal communication, depending on their individual communication style. In a clinical situation, one

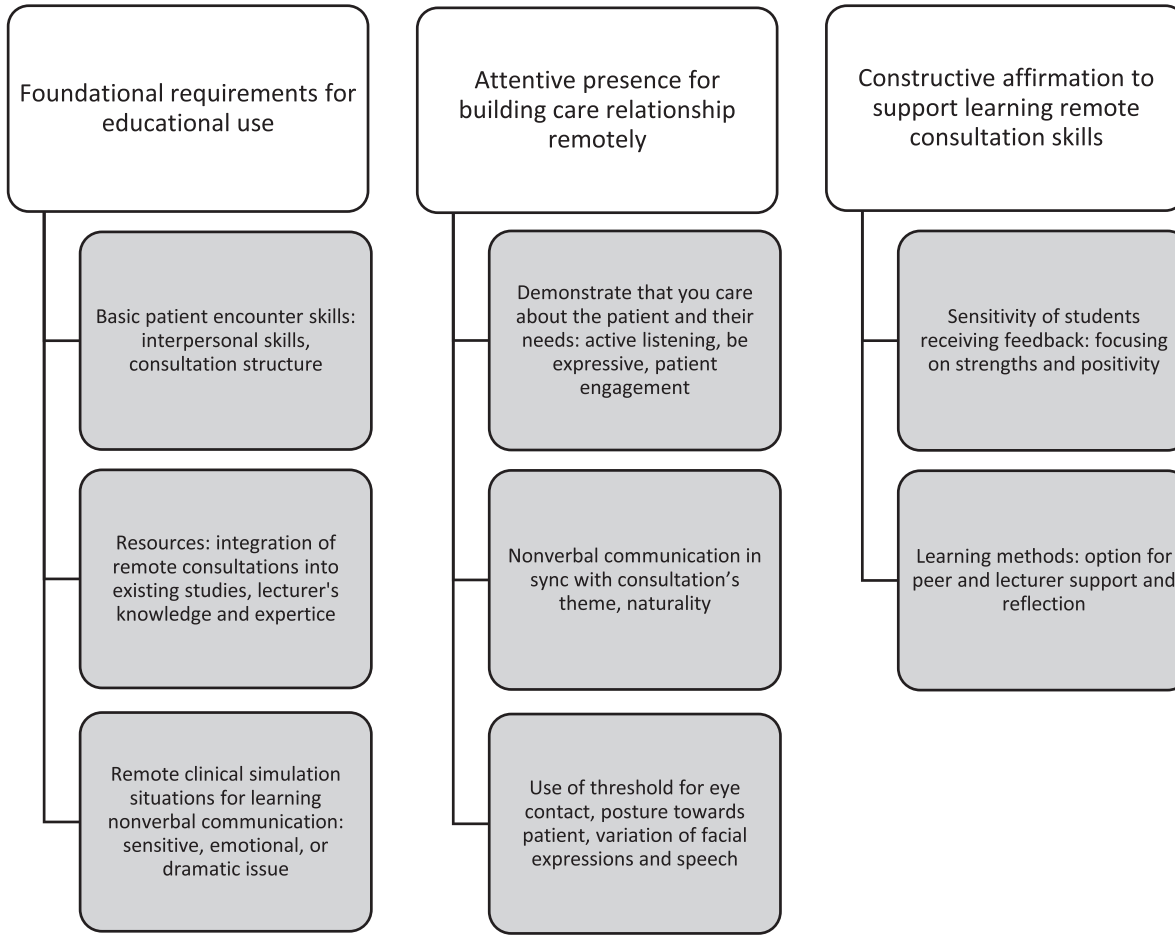

Figure 1. Health care professionals' perspectives on remote consultations and related education.

should avoid being too expressive as it may cause restlessness.

If you think that the nurse is completely expressionless all the time and does not use gestures, that's not good, because by nodding, facial expressions and smiling show that you are involved in what the patient is telling you.

In addition, interviewees noted that the health care industry has shifted from an authoritarian approach, where professionals dictate treatment to patients, to a more patient-centered approach that incorporates patients' preferences and personal matters in decision-making. As a result, training for patient encounters is now considered more important than it may have been in the past.

It is also a larger trend today, such as the loss of authority. (…) parents, medical doctors, politicians, professors or doctors, their position has been declined and you can't impose from the top to the bottom and tell the truth, but it is more like an interaction.

Interviewees highlighted the importance of nonverbal communication, aligning with the consultation topic in the clinical setting. Nonverbal communication is context sensitive. We should consider the type of encounter, the individuals involved, and learned behavior, such as cultural aspects, when interpreting nonverbal cues. Nevertheless, nodding, smiling, and maintaining eye contact were regarded as universal or common behaviors that indicate active listening. Interviewees were skeptical of the idea of trying to define thresholds for a specific nonverbal cue. However, they believed that nonverbal cues such as eye contact, nodding, smiling, and body positioning cues could potentially be used to establish a threshold that should be achieved in the patient encounter, such as smiling at the start of the meeting.

Nonverbal communication can be a challenge in videoconferencing. Interviewees often found videoconferencing to be more rigid and less natural. For example, looking directly into the camera can be unnatural for both the clinician and the patient, and it can be difficult to convey emotions via videoconferencing, which can lead to various situations, such as the patient trying to express emotions, but the clinician being unable to see or respond to them. However, interviewees also found that a meaningful care connection can be established with the patient regardless of the limitations.

Table 1
Overview of participants

	N = 11	Percent	Years
Sex			
Male	3	27	
Female	8	73	
Education			
Doctor of Medicine	3	27	
Doctor of Social Sciences	1	9	
Licentiate of Medicine	1	9	
Master of Health Sciences	5	46	
Master of Social Sciences	1	9	
Highlights of work experiences			
Lecturing in health care–related fields			3-20
Nursing			10-25
Medical work			3-24
Health care communication research			< 10
Video consultation experience			
No experience	6	55	
Some experience	1	9	
Experienced	4	36	

Connecting with the patient is immediately more challenging when you are doing a remote consultation. The devices put a distance between the participants, making them feel like they are not in the same space. It puts a little more emphasis on interaction skills and establishing contact.

Theme: Constructive affirmation to support learning remote consultation skills

The sensitivity of receiving feedback from communication is a problem identified by the lecturers who participated in this study. Having a tool that outsources some of the feedback given can be helpful to deal with the sensitivity felt by students. The feedback could feel more objective and not influenced by the lecturer's subjective experience, also removing the personal chemistry between the lecturer and student that can influence the feedback. Particularly at the undergraduate level, lecturers observe student activity and form opinions based on their level of expertise.

For some of the students it has been a bit difficult to understand the feedback. (…) I think that some kind of more objective measurement could support the fact that it's not just the teachers' idea and is due to the fact that we are different, but that there is also some kind of factual basis for this.

Students feel pressure in the simulations, which can manifest, for example, as giggling. This can cause problems when giving feedback because the student's behavior in the simulated situation is not something they would do in the real situation. As one stated, "the simulation is ruined in terms of gestures, facial expressions, and nonverbal communication in general if the student is really nervous. It shows in it. Of course, you also must be subtle with the feedback too."

One principle that emerged from the interviews was that feedback on nonverbal communication should emphasize positive elements and the individual strengths of the students, rather than simply scoring on a good-bad axis. There is no absolute good or bad way to communicate, only different approaches that can be used. Standardizing nonverbal communication can be challenging because people are unique, and clinical situations vary. Feedback should focus on helping students become aware of their communication, picking up the positive elements of the communication, and providing alternative ways for students to communicate in different clinical situations.

Interviewees expressed that students need to have access to the feedback provided by the AI, and depending on the student, they should have the possibility to work through the feedback with lecturers or peers. We should consider whether the student can understand the feedback from the application alone or whether it requires interpretation by the trained lecturer.

It depends a little bit on the quality of the feedback. If it is such that it is really accurate, then it might be enough for the student to see it himself. If it is such that there are many opinions about it, then it might be good that there are other people, such as the student or the lecturer, who can reflect on how to deal with this feedback.

DISCUSSION

The aim of this study was to explore health care professionals and educators' perspectives on the design of video-based remote clinical consultation simulation using AI, intended for health professions students and professionals. The finding provides insights into how the automated feedback system should provide feedback for the students by addressing key areas of nonverbal communication and how the use of the application could be integrated into the health professions curriculum. Semi-structured interviews were conducted with health care professionals and lecturers to achieve these objectives.

Simulated remote clinical situations

The results suggest that video consultation simulations in health professions education specifically for learning nonverbal communication could focus on sensitive, emotional, or dramatic cases. In general, the interviewees saw the importance of nonverbal communication in these types of difficult situations. For example, a situation in which the students tell the simulated patient that they have diabetes, which they will have to manage for the rest of their lives. Delivering this type of information via videoconferencing can be difficult for the patient because the distance created by videoconferencing can make it difficult for the clinician to convey empathy.[6] Practicing these types of cases would be beneficial, as mentioned in the interviews, since they are not often practiced and can be perceived positively by students, for example, adding variety to the simulations.[25]

Lecturers may lack competency in this type of remote patient encounter, so additional training may be needed. However, the interviewees felt that this type of simulation could be integrated into the curriculum without requiring

significant changes to the courses, although this can vary greatly between countries and education institutions providing health professions education.[15]

Nonverbal communication feedback

The interviewees indicated that lecturer feedback on nonverbal communication is often subjective and that there is a lack of tools to provide detailed feedback on nonverbal communication. Interviewees were positive that an application able to detect nonverbal communication and provide feedback on behavior would be beneficial to the training of clinical consultations. One of the main issues with the previous applications, such as ReflectLive[16] and EQClinic,[17] designed for training nonverbal communication in a simulated clinical setting, was that they had difficulty providing meaningful nonverbal communication feedback to students. For example, if the application reports that the user nodded 5 times during the encounter, it only reflects the frequency of nodding without conveying its meaning, which limits its value for learning.

One potential solution we identified to improve feedback from these types of applications is to draw inspiration from the in-person simulations, aiming to reduce the level of detail in the feedback while providing contextual information alongside it. We found that lecturers provide more high-level feedback on communication and do not try to count how many times one smiled or nodded, or how many seconds one looked at the patient. However, this does not imply that we should refrain from collecting detailed data from the simulation. Rather, the level of detail presented to students should be limited. For example, elements of active listening, such as maintaining eye contact, use of different facial expressions, and nodding, can be detected and quantified by taking time, counting occurrences, or calculating a percentage. This information is then used to formulate contextualized feedback for the student.

We could monitor if the student nodded during the encounter and provide feedback explaining why nodding is good, and provide the source of the information to promote evidence-based knowledge and to improve the quality of the feedback. This can encourage students to practice self-regulated learning and reflection on their communication, and to learn best practices and etiquette for clinical video-mediated communication identified in research.[26] However, students need to be motivated to reflect on the feedback they receive, for example, through a guided reflective assessment with predefined questions, or with a peer, such as a fellow student, to challenge the one whose turn it is to reflect.[27] A general discussion of the feedback with the entire study group can also be helpful and an easy way to go over the feedback in a debriefing format, as used in the simulation-based learning activities.[28]

Interviewees felt that rather than focusing on individual facial expressions, it might be more useful to track how much these change over the course of the consultation, as being expressive is a way of showing interest in the patient's situation.[29] For example, the clinician should have at least 2 appropriate expressions, in which case the rule or threshold is met. The drawback of these thresholds, and of nonverbal communication itself, is that they vary from culture to culture, making it difficult to apply the designed application universally to other cultures without modification.[30]

Interviewees felt that it was important for the expressed nonverbal communication to adapt to the patient's behavior, which is also found in previous research.[31] This synchronization of clinician-patient interaction could be detected in different ways, for example, detecting the nonverbal communication of a simulated patient, as done by Wu et al,[32] where the application automatically detects the clinician's nonverbal mimicry. Another way could be a textual analysis of the conversation between the professional and the patient to understand the nature of the encounter. To our knowledge, no studies have attempted this. The use of large language models could be utilized to identify consultation topics.

Interviewees suggested that the feedback provided only emphasizes the positive aspects of the communication. This could be accomplished by following the elements of positive pedagogy, which emphasize the well-being and happiness of the students.[33] In the research done by Dirks et al,[34] they interviewed primary care clinicians about what kind of automatic feedback they would like to have from an application that monitors their communication in clinical settings related to implicit bias. They found that, in addition to data-driven feedback and guided reflection, one solution could be automated feedback that picks up on aspects that may be problematic in their communication.[34] Although, in the later findings of Bedmutha et al[35,36] and Bascom et al,[37] clinicians preferred personalized data-driven dashboards. Using negative feedback with students may not be appropriate. As we found in our interviews, there are always students who react with negative emotions to the feedback they receive, especially corrective or negative feedback. This has also been reported in other studies, especially among undergraduates.[38] However, social and interpersonal factors may not weigh as heavily when feedback is provided by a computer application, as opposed to a teacher whose opinions may be more subjective. Emotion regulation strategies or other methods of managing individuals' emotions have been identified as a core competency of an educator, leading simulations,[39,40] and these should be taken into account whether the feedback comes from the application or the teacher.

While AI can potentially be used to standardize the nonverbal communication feedback given in simulations, the implementation of these tools must address ethical and privacy issues. The European Union has an Artificial Intelligence Act law[41] that prohibits the use of emotional artificial intelligence in education. It is uncertain how this is to be applied and whether the type of nonverbal communication recognition planned in this application will conflict with the Act. We can already say that this type of technology falls into the category of high-risk applications, and the use of the application should be carefully considered, in particular, the kind of nonverbal communication to be detected and the information to be collected and stored. Even without the European Union Artificial Intelligence Act, the ethical and privacy issues and compliance with regional regulations such as the General Data Protection Regulation in the European Union need to be carefully considered and planned so that we do not cause harm to users.

Limitations

This study has limitations. The method involved recruiting interviewees through direct email and snowball sampling. Interviewees who accepted to participate in this study may have had an initial interest and a positive attitude toward the subject, which could have potentially biased the group of people attending the interviews. The following research methodological considerations must be taken into account when assessing the trustworthiness of the study results according to the quality criteria of Lincoln and Guba[42]: (1) The transcriptions were made by the first author alone, and the texts were not reviewed by other authors or participants. (2) The initial theming of the interview data was conducted by the first author, which may make the analysis more susceptible to bias according to his preconceptions, values, and assumptions. However, the analysis and results were discussed among all authors. The reliance on a small, culturally specific sample from Finland may limit the generalizability of the findings. Future studies could include more diverse participants, for example, to explore cultural aspects of nonverbal communication in a remote consultation context. Finally, we collected basic demographic data from interviewees but did not gather information on any additional simulation training they may have received, nor did we analyze correlations between work experience and interview responses. These factors should be considered in future research.

CONCLUSIONS

The findings of this study highlight the potential of a video consultation application that uses AI in remote clinical simulations to improve health professions students' and professionals' communication skills and provide more objective feedback. An application that minimizes low-level feedback, such as counting of smiles during the encounter, and provides more high-level insights, such as how those smiles affect empathy development, could provide more actionable and context-specific guidance on nonverbal communication in video consultations. The application would be particularly valuable in clinical simulations involving sensitive or emotional scenarios, where nonverbal communication is crucial. Importantly, feedback on nonverbal communication should emphasize the positive aspects of communication and avoid scoring on a good-bad axis, which can be detrimental to student learning.

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