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ORIGINAL RESEARCH

The Effect of Using Video Simulation and Hands-on Simulation Training on Preclinical Medical Students' Confidence in Dermatological Suturing Skills

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Aim and Objectives: This study aimed to compare between the use of hands-on simulation training sessions versus video training on students' confidence in suturing skills. The study measured the effect of using hands-on simulation training versus video-recorded simulation training on medical students' suturing skills.

Methods: This study was conducted at College of Medicine, Jouf University. All third-year medical students (n=98) were invited to participate in the study. However, only 81 (male=57, female=24) of them participated in this study. A randomized pretest–posttest control group study design was used to assess self-ratings of confidence in skills. All participants attended a lecture and were then divided into two groups: the experimental group (n=34) had simulation activities, while the control group (n=47) watched video-recorded training. A paired *t*-test was used to assess the difference between the pretest and post-test scores within each group. The independent *t*-test was used to compare the overall mean between both groups.

Results: Statistically significant differences (improvements) of students' confidence in skills were detected in both groups. The mean difference between pre- and post-test scores for the experimental group was 1.47 ($p<0.001$), and it was 0.92 ($p<0.001$) for the control group.

Conclusion: Both hands-on simulation training sessions and video training sessions are beneficial for teaching suturing skills for students. Furthermore, a long-term follow-up multicenter study that evaluates the impact of confidence in skin suturing skills on competence development is warranted among different university students in Saudi Arabia.

Keywords: dermatology, Saudi Arabia, self-confidence, simulation, skills, students, suturing

Introduction

With modern technological advances in media, surgical videos are being produced with ever-increasing frequency and sophistication. Surgical videos are used for marketing, demonstration, and education.[1] The acquisition of surgical skills by medical students involves didactic instruction, practice, and feedback, which often consume considerable faculty teaching time. The advocacy among medical educators for the use of novel teaching methods that utilize computer-based training and bench models has been increasing in recent years.[2–4]

Correctly performed surgical sutures are the basis for surgical safety and require surgical quality and excellence in techniques. As a result, many health and medical colleges around the world have started using simulation as a teaching technique to enhance students' knowledge and skills.[5] Summers et al showed that video instruction was more effective than the traditional method of didactic teaching during training sessions of suturing and knot-tying skills among medical students.[6] Xeroulis et al demonstrated that self-directed video training provided equal retention of knot tying performance compared to summary expert feedback.[7] Similar results were reported by Schittek et al who found that the effect of non-interactive and interactive video materials on learning led to equivalent learning and retention of skills.[8] Research and comparative data analyses in the field of surgical suturing are still required to help identify suitable teaching techniques

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that improve students' ability to master suturing.[9] A recent survey conducted by Kumins et al in 2020 reported that using self-directed, subsequent video training effectively improves surgical suturing skills among medical students and could play a significant role in distant learning.[10] Several authors have previously explored the relationship between confidence and competence in medical and surgical education.[11–13] A study in 2022 by Gottlieb et al 2022 reported that in competency-based medical education, improving confidence must be an integral component as it helps in safe and skillful practice.[12]

Simulation is a safe alternate learning method instead of practicing on patients. The learner can do a limitless practice in a designed environment that allows the learner to correct any mistakes without any consequences, such as harming patients. Simulation can be used for simple tasks and more advanced clinical procedures.[1] To date, there are no studies conducted in Saudi Arabia on the effects of the use of hands-on versus video-recorded simulation training on medical students' suturing skills. Many colleges in Saudi Arabia including the College of Medicine at Jouf University decided to shift all learning including clinical skills to the Blackboard, a learning management system, to deliver the learning materials due to COVID-19 pandemic. This study aimed to evaluate the effect of the use of hands-on simulation training versus video-recorded training on medical students' confidence in suturing skills at Jouf University, Al-Jouf, Saudi Arabia.

Participants and Methods

Setting and Participants

The current experimental study was conducted in the clinical Simulation Center, College of Medicine, Jouf University. As we know so far, this is the first randomized study designed to evaluate two teaching methods (ie, hands-on simulation training and video-recorded training) for skin suturing among medical students in Saudi Arabia.

Eighty-one participants (57 males and 24 females) from the College of Medicine, Jouf University participated in the study. All participants were volunteering third-year undergraduate preclinical phase students during the academic year of 2021–2022. Third-year medical students who had similar previous training on skin suturing were excluded. Their academic performance was close within the range of a GPA of 4–4.5.

Questionnaire

A 10-item questionnaire was used to assess students' confidence in their dermatological suturing skills. This questionnaire was designed by a panel of experts from general surgery and dermatology department. The face validity and internal consistency of the questionnaire was ensured by the same panel of experts and pretested on ten students who were inquired on the clarity of all items to confirm that there was no misunderstanding of any item. All of them had proper understanding of the questions, and no suggestions were received. The questionnaire assessed the level of confidence in skills among all students. Students were requested to rate their level of confidence, with 1 is not confident to 5 is very confident. The pilot data were analyzed by using Statistical Package for Social Sciences (SPSS) for Windows v. 25.0 (IBM SPSS Statistics, IBM Corporation, Armonk, NY, USA). A Cronbach's α score of 0.785 was obtained, KMO and Bartlett's test yielded results depicting that variables are significantly correlated on PCA. No changes were done on the primary version which was the final version of the questionnaire used in the main study (Please see Appendix 1 – pre and post-test skills questionnaire for more information).

Procedure

The research protocol has been ethically approved by the Local Committee of Bioethics (LCBE), Jouf University, Ministry of Education, Saudi Arabia (through wide approval number 8–02–43, dated 27, December 2021). A list of third-year undergraduate preclinical phase students was obtained from the university. Piface software had been used for the calculation of the sample size which revealed that the required number for this study is 70 (35 of them belonged to the experimental group and 35 were in the control group). However, 81 students attended on the day of the activity. All participants were asked to fill out the informed consent and attend a lecture about suturing skills. After the lecture, students were asked to fill the pretest questionnaire. Consequently, all participants were divided randomly into two groups evenly: a) the experimental group and b) the control group. The random allotment process was executed by using

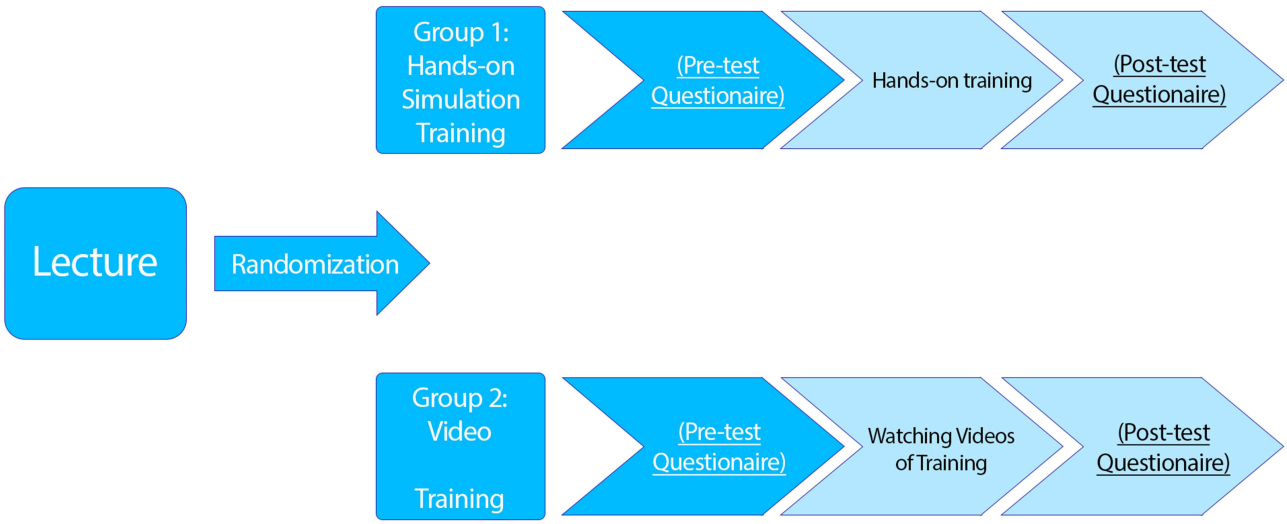

Figure 1 The process of all activities for both the experimental and control groups.

the blind draw procedure. All students' numbers were kept in a box and then selected randomly to either group. Then, the experimental group attended the hands-on simulation training, and the control group attended the video training session. The experimental group had the hands-on simulation training sessions and included 35 students (male = 24, female = 11) who were divided into six small groups to receive the hands-on simulation training. The experimental group was instructed by two faculty members, who received a standardized training to deliver similar training to the students. The control group included 46 students (male = 33, female = 13) who watched video-recorded about the suturing surgical skills followed by post-test questionnaire (Figure 1).

The Experimental (Simulation) Group

This students' group constituted active participants in the simulation training sessions after were divided into small groups. The students in each small group received training about the surgical suturing skills, and they practiced under the supervision of the faculty members. Then, the post-test questionnaire was completed by the participants.

The Control Group

This students' batch did not receive simulation training. After participating the lecture, students watched video training about the surgical suturing skills for approximately 40 minutes at the same time, while the experimental group was receiving the hands-on training. The video training was similar to the hands-on simulation used in the experimental group. After attending the video training session, the students completed the post-test questionnaire.

Results

Data from 81 students were included in the data analysis using SSPS software. The gender was the only categorical variables in both groups, and there were no significant differences between the groups (P-value >0.05) (Table 1). The results of the experimental group (group 1) were significantly changed after the hands-on simulation training (M=3.97; SD=±1.47; $p<0.001$) compared to the results obtained before the hands-on simulation training (M=2.50; SD=±0.87) (Table 2). On the other hand, the results of the control group (group 2) were significantly changed after the video training session (M=3.63; SD=±0.92; $p<0.001$) compared to the results obtained before the video training session (M=2.71; SD=±1.03) (Table 3).

Statistically significant differences (improvements) of students' confidence in skills were detected in both groups. The difference of improvements of both groups was significant. The mean difference between pre- and post-test scores for the experimental group was 1.47 ($p<0.001$), and it was 0.92 ($p<0.001$) for the control group. Table 4 showed the pre- and post-test scores for the experimental and control groups.

Table 1 Characteristics of the Study Participants with Pre- and Post-Test Scores

	Gender	N	Mean	SD	P-value
Pre-score	F	24	2.67	0.96	0.754
	M	57	2.60	0.98	
Post-score	F	24	3.97	0.94	0.159
	M	57	3.69	0.72	

Table 2 Pre- and Post-Test Scores for the Experimental Group

Group 1		Mean	SD	P-value
Hands-on simulation	Total score (pre-event)	2.50	0.87	<0.001
	Total score (post-event)	3.97	0.69	

Table 3 Pre- and Post-Test Scores for the Control Group

Group 2		Mean	SD	P-value
Video training	Total score (pre-event)	2.71	1.03	<0.001
	Total score (post-event)	3.63	0.84	

Table 4 Pre- and Post-Test Scores for the Experimental and Control Groups

	Group	N	Mean	SD	P-value
Total score (pretest)	Hands-on simulation	35	2.50	0.87	0.338
	Video training	46	2.71	1.03	
Total score (post-test)	Hands-on simulation	35	3.97	0.69	0.054
	Video training	46	3.63	0.84	
Difference	Hands-on	35	1.47	0.85	0.019

Discussion

Teaching and training medical students on how to perform suturing skills competently requires well-designed learning environments. Therefore, simulation can play a major role in this process. The use of simulation helps students (and novice practitioners) to improve their professional competencies with no impact on patients.[14] The literature is scant of studies that compared between two methods of teaching suturing skills, particularly in Saudi Arabia. This study aimed to measure the effects of "hands-on simulation training" and "video training session" on the level of confidence in skin suturing skills among undergraduate medical students. This study found that the use of hands-on simulation training sessions or video training sessions facilitated student learning. Although hands-on simulation training led to better students' self-confidence in suturing skills, training is feasible for teaching such skills via recorded videos. Medical colleges are encouraged to use both (mixed method) teaching methods for teaching clinical skills.

The results of this study are consistent with other published studies. Nousiainen et al assigned 24 medical students in three groups randomly (eight students per group; Group one=self-study with video; Group two=self-study with interactive video; Group three=the combination of self-study with interactive video with the addition of subsequent expert instruction). All participants attended a video training session. Then, they performed a pretest by tying a suture in an artificial model. After completion of the pretest, the participants were assigned to their group' the post-test that involved completing one suture was performed immediately after the practice session. All three groups demonstrated significant improvements on both measures between the pre- and post-tests.[15]

The present study results are similiar with the research done by Denadai et al In their study, they assigned 16 medical students to a control group (textbooks and video lessons) (n=8) and an experimental group (hands-on training) (n=8). First, all the students were taught through a video presentation how to do suturing. All students underwent an individual pretest by making sutures. Even though both experimental and control groups have had a improved performance ($p<0.05$) in the post-test when correlated with the pretest, the results of post-test revealed that the experimental batch had a better achievement when compared with the control group.[16]

Affin assigned 88 medical students to two groups: the simulation-based learning group (n=44) and the experimental (workshop-based learning) group (n=44). The pre and post-test evaluation had been made with the same MCQs and evaluated separately for both groups. The experimental group scored better in the post-test MCQ's when compared to the other group. However, there was no significant difference between two groups regarding the suturing skills.[17] Similar to the present research, Goh reported that both teaching methods were beneficial for the students. Faculties need to choose appropriate training methods for the instructional materials with application for the theoretical frameworks and assessment rubric to support best practice.[18]

In contrast to the current study, Sakamoto et al conducted an RCT and found simulation practice more beneficial than video-based training. The possible difference between the present study and the latter study could be due to the study setting and type of surgical training. The study done by Sakamoto et al assessed the skills related to microsurgery, and the present study assessed skin suturing skills.[19] Interestingly, a recent systematic review executed by Ahmet et al concluded that video-based virtual training could be an effective method to improve the confidence and competencies of medical students' surgical skills.[20]

Limitations

Although the event was successful, the study was a single-centre study. The items included in the questionnaire were not covering all related areas of suturing skills. Although there were no differences between groups in terms of demographics, compared different cohort levels and universities would also be beneficial. Finally, the present study findings were based on short-term training.

Conclusion

This study did not assess student's learning; however, it evaluated students' confidence in their skills. The results revealed that the use of hands-on simulation trainings or video training sessions can facilitate students' competencies and learning by improving their confidence. The use of simulation to train medical students on specific skills is important and should be expand. Medical colleges are encouraged to use both teaching methods for teaching clinical skills. Furthermore, a long-term follow-up multicenter study that evaluates the impact of confidence in skin suturing skills on competence development is warranted among different university students in Saudi Arabia.

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Disclosure

The author reports no conflicts of interest in this work.

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