3-18-2022

Observers have similar improvements in student learning outcomes as participants in athletic training simulation education

Alma Mattocks
amattocks@bellarmine.edu

Cover Letter

This letter serves to demonstrate that all authors involved in this manuscript are familiar with the instructions of the Simulation in Healthcare journal guidelines for authors, and agree to the contents of the submitted paper.

The authors report no conflicts of interest or financial disclosures related to the content of this submitted paper.

The authors would like to acknowledge the Northern Kentucky University Center for Simulation Education and affiliated simulation educators for their assistance with this project.

This study was funded by the Bellarmine University Office of Sponsored Projects.

There are no specific materials recommended for Supplementary Digital Content.

Observers have similar improvements in student learning outcomes as participants in athletic training simulation education.

Alma R. Mattocks, M.S., ATC Clinical Assistant Professor, Northern Kentucky University

Sara Mahoney Ph.D., FACSM, Associate Professor, Bellarmine University

Rachele Vogelpohl, Ph.D., ATC, Associate Professor, Northern Kentucky University

Kim Hawkins, PhD, APRN, FNP-C, Professor, Bellarmine University

Corresponding Author:

Alma Mattocks

Northern Kentucky University

Athletic Training Program

Nunn Drive HE 595J

Highland Heights, KY 41099

Mattocksa1@nku.edu

Tel 859-572-1547

Fax 859-572-6090

Work should be attributed to the School of Kinesiology, Counseling and Rehabilitative Sciences, Northern Kentucky University.

Abstract

Introduction

The use of standardized patient (SP) encounters in athletic training education programs have become more common; however, due to time and space constraints, it is possible that not all athletic training students will be able to directly participate in engaging with the SPs and instead some must be observers. The objective of this study was to determine if student participants who observe a simulation encounter, experience similar improvements in student learning outcomes as students who directly interact with SPs during the simulation encounter.

Methods

A pretest/posttest, randomized controlled trial was utilized. Nine athletic training students volunteered to participate in the research study. All participants completed a pretest survey including a knowledge assessment and confidence rating scale, followed by either a telehealth or in-person SP encounter of a lower extremity evaluation, and finished with a posttest survey.

Results

Two separate repeated measures ANOVAs of the composite knowledge scores and confidence rating scale found significant differences between the pretest and posttest respectively ($F = 14.12$, $p = 0.007$, $\eta_p^2 = 0.669$; $F = 88.44$, $p < 0.001$, $\eta_p^2 = 0.927$), with no significant difference between the participant or observer roles for either knowledge assessment ($F = 0.21$, $p = 0.658$, $\eta_p^2 = 0.030$) or confidence rating scale ($F = 2.67$, $p = 0.149$, $\eta_p^2 = 0.276$).

Conclusion

Athletic training students demonstrated similar increases in knowledge and confidence as a result of telehealth and in-person SP encounters regardless of their role as an observer or participant.

Athletic training educators should consider implementing SP encounters into their educational curriculums even if not all students are be able to be participants.

Introduction

Athletic trainers are health care professionals, who work under the direction and in collaboration with a physician to render service or treatment to athletic individuals.[1] To improve athletic training student knowledge, understanding, and application of skills, active learning techniques are often implemented into athletic training education curriculums.[2] In recent years, simulation and the use of a standardized patient (SP) for simulated patient scenarios have been implemented into athletic training education programs to enhance student learning outcomes.[3-9] Although SP encounters are increasingly utilized in athletic training education, barriers to implementing simulation and SP encounters include lack of faculty, resources, and support, which could make it difficult for every student in a program to actively participate in every encounter.[10] This is not a phenomenon unique to athletic training as Johnson [11] cited that nursing programs face a lack of faculty, simulation center constraints, and increasing student numbers and as a result must commonly have participants as well as observers in simulation activities.[11] Gardiner et al[12] reported that athletic training students generally perceived the use of SP in athletic training education to be positive; however, the students felt that during group activities, only the student(s) who were completing the encounter got the most out of the activity.[12] Furthermore, it was reported that athletic training students prefer to have active, hands-on learning experiences as opposed to observational learning experiences.[13] If athletic training programs must continue to utilize the observer role in simulation encounters, it is necessary to determine if similar achievements of student learning outcomes occur for both active participants and observers. There are currently no published studies identified comparing student learning outcomes of athletic training students in the observer and participant role.

The use of standardized patient (SP) encounters have been implemented into many health professions education programs such as athletic training,[3-6] nursing,[14] occupational therapy,[15] physical therapy,[16] and medicine.[17] Standardized patients have been defined as a person who has been trained to portray a patient in a realistic, reliable, repeatable and standardized manner to give each learner a fair and equal chance.[18] SP encounters have been described in athletic training education as one in which athletic training students will provide care to an individual who has received training to consistently represent a patient with a specific pathology.[5] SP encounters have been shown to be useful instructional and assessment techniques in athletic training programs by providing opportunities for athletic trainings students to apply clinical skills in a safe learning environment.[19-21] Furthermore, these SP encounters have shown to improve athletic training student learning outcomes such as skill acquisition[4] and confidence[3,6] for in-person SP encounters as well as telehealth encounters.[22] Previous research demonstrates that improvements in athletic training student learning outcomes can occur through either in-person[3] or telehealth[22] SP encounters, with a recent finding that there are no significant differences between telehealth and in-person SP encounters in terms of knowledge and confidence for athletic training students (A.M. Mattocks, ATC, unpublished data, January 2022). Currently, there are no published studies evaluating the effect of the role of the athletic training student within the encounters. Therefore, the purpose of this study was to determine if athletic training students who were observers experienced equivalent student learning outcomes in terms of knowledge acquisition and confidence as those athletic training students who were active participants.

Methods

Design

A pretest/posttest, randomized control study design was utilized to determine the difference between the observers and participant role in SP encounters for the athletic training student outcomes of knowledge and confidence. Participants self-selected into either a telehealth SP scenario, or an in-person SP scenario. Once participants were in their self-selected group, two participants were randomly chosen from each group by the primary investigator to serve as the active participant role, with the remaining students to serve in the observer role. The SP scenario was a lower extremity evaluation of a patient two weeks post anterior cruciate ligament (ACL) reconstruction with symptoms of a deep vein thrombosis (DVT). Due to a lack of validated SP scenarios specific to athletic training, the scenario was developed for this study by the primary investigator. After development, the scenario was assessed for face validity by a panel of local content experts including; two collegiate athletic trainers and one professional athletic trainer with background and expertise in injury evaluation; two athletic training faculty members with expertise in athletic training education, one nursing faculty member with expertise in simulation development and evaluation, and one exercise science faculty member with expertise in student evaluation and assessment.

Instrumentation

The pretest and posttest surveys assessed athletic training student knowledge and confidence surrounding a lower extremity evaluation. As there are no validated instruments available to assess knowledge acquisition for this SP scenario, a knowledge assessment quiz was developed by the primary investigator based on the content of the scenario. The quiz consists of eight questions that were either multiple choice or multiple answer. The quiz questions assessed the content of the learning objectives of the SP scenario as well as the differential diagnoses included in the scenario. After development, the quiz was assessed for face validity by the same panel of local content experts as the SP scenario.

Confidence was assessed using the confidence rating scale developed by Armstrong and Jarriel.[3]. The confidence rating scale consists of 17 items, scored on a five point Likert scale, to assess athletic training student confidence completing a clinical evaluation.[3] The scale was tested for face and content validity from a panel of five content experts and internal consistency with a Cronbach $\alpha = 0.971$.[3] This tool was then modified by adding one additional item regarding telehealth to assess athletic training student confidence in a telehealth encounter, and with the additional item demonstrated, intrarater reliability was established with a Cronbach $\alpha = 0.941$.[22] A survey battery with three total instruments including; the knowledge assessment quiz, confidence rating scale, and basic demographic data, was administered through Qualtrics® (Qualtrics, Inc., Provo, UT) for the pretest and posttest.

Procedures

Once recruited for the study, participants were scheduled for a date and time to come to the simulation center for the study. As this study evaluated both telehealth and in-person encounters, there were two dates and students were allowed to self-select to the date which was most accessible for them without knowledge of which group they would be in. The format of the SP encounters was the same for both the telehealth and in-person encounters, with the only difference being that the active participants either completed the evaluation of the SP in person or via Zoom© technology (Zoom Video Communications, Inc., San Jose, CA), whereas the observers watched the encounter over a large screen and were not allowed to interact with the patient in either encounter.

On the date of the scheduled patient encounters, all participants from each group began together in a debriefing room. Participants were welcomed to the simulation center, given a brief overview of the structure of the study, signed informed consent forms, and then completed the pretest survey through Qualtrics® (Qualtrics, Inc., Provo, UT). After participants completed the pretest survey, the simulation educator and primary investigator led the students through a structured pre-brief including the learning objectives of the encounter, and pertinent history of the patient encounter including the surgical history of the patient, and three complications that could arise which serve as the differential diagnosis for the patient scenario; DVT, compartment syndrome, and cellulitis. Participants were encouraged to ask questions prior to the patient encounters to ensure they were adequately prepared for the SP encounters.

At the conclusion of the pre-brief, two participants were randomly chosen from each group to be the active participants during the SP encounter, with the remaining participants to be observers. For the in-person SP encounter the two active participants then went into the patient exam room to complete the SP evaluation, whilst the observers live-streamed the encounter on a large screen the debriefing room. For the telehealth SP encounter the two active participants were located in the front of the room nearest to the computer to be the only two participants to interact with the SP while the observers remained silent and watched on the large screen. Observers were encouraged to take notes during the encounter to facilitate the debrief.

At the conclusion of the SP encounters, all participants were debriefed by the simulation educator using an adaptation of the Debriefing for Meaningful Learning© (DML) method.[23-25] DML was established for nursing simulation, to develop clinical reasoning through reflective thinking, and typically follows a specific structure, including worksheets to guide the debriefer and learners through the process.[23-25] For the purposes of this study, this method was adapted for athletic training students, and the worksheets were not utilized; however, the simulation educator followed the typical DML structure, with Socratic questioning, to uncover reflection-in-action, reflection-on-action, and reflection-beyond-action.[23-25] Due to the nature of DML, the structure of the debrief was the same; however, the conversation between the students differed slightly in the groups based on the actions of the active participants that occurred during the SP evaluation. Immediately following the debriefing, participants completed the posttest assignment through Qualtrics® (Qualtrics, Inc., Provo, UT) and were then finished with the study.

Statistical Analysis

Data was downloaded from Qualtrics® (Qualtrics, Inc., Provo, UT) and coded to remove personal identifiers. Composite scores were calculated for the knowledge assessment quiz as well as the confidence rating scale for both participants and observers, and then uploaded to IBM SPSS (IBM SPSS version 26, IBM Corporation, Armonk, New York) for analysis. Descriptive statistics of the composite scores were analyzed for means, standard deviations, and 95% confidence intervals. Two separate repeated measures Analysis of Variance (ANOVA) were utilized to determine the difference in composite knowledge scores due to role, and composite confidence score due to role. Alpha was set at $p = 0.05$ to determine statistical significance.

Results

Nine participants completed the study, four (44.4%) were categorized as active participants as they had an active role in the SP encounters and five (55.6%) served in an observer role. Of the total participants there were three (33.3%) males, and six (66.7%) females. All participants were in professional athletic training programs, two (22.2%) were in a graduate level program, with the remaining seven (77.8%) in an undergraduate level program. All participants (100%) had previous experience with simulation but no previous experience with a

SP encounter of any form. In addition, two (22.2%) had previous experience with telemedicine as a patient, with no participants having previous experience with telemedicine as a practitioner.

Descriptive statistics of survey score between roles are available in Table 1. A repeated measures ANOVA revealed a significant difference ($F=14.12$, $p=0.007$, $\eta_p^2=0.669$) between total knowledge scores from the pretest to posttest, but no significant difference ($F=0.21$, $p=0.658$, $\eta_p^2= 0.030$) between observers or participants when controlling for the pretest as shown in Table 2. For the total confidence scores, there was also a significant difference between pre and posttest ($F=88.44$, $p<0.001$, $\eta_p^2 = 0.927$), with no significant difference between roles ($F=2.67$, $p=0.149$, $\eta_p^2 =0.276$) as shown in Table 3. Differences between composite scores for both knowledge and confidence between participants and observers is available in Figure 1.

Discussion

This purpose of this study was to determine if there was a difference in knowledge acquisition or confidence as a result of SP encounters among participants and observers in athletic training students. We found that both participants and observers noted an increase in confidence and knowledge acquisition as a result of both the SP encounters; however, there was not a significant difference between the participants or observers. Our results were similar to Paloncy et al[7] who evaluated the athletic training student learning outcome of self-efficacy among athletic training students and failed to find a significant difference between participants or observers in athletic training students self-efficacy before and after a high fidelity simulation. The focus of the Paloncy et al[7] study was not focused on the difference between participants and observers; however, they did report the results of both.

Despite the fact that there is currently no other identified published research comparing the participant and observer role in athletic training, this has been covered in other health care profession education programs. Bong et al[26] assessed anesthesia trainees in terms of stress and performance during simulation-based training scenarios as a participant or observer. In this study they reported that observers not only had equivalent performance to participants, but they also demonstrated lower stress[26], supporting the findings of our study. Similarly, Johnson[11] found that nursing student observers had comparable gains and decays of knowledge to those who actively participated in simulation, providing a basis that students may not have to actually complete the simulation to experience benefits.

A systematic review and meta-analysis of studies in medicine, nursing and anesthesia by Delisle et al[27] reported conflicting results with some studies demonstrating differences between participants and observers. Blanie et al[28] evaluated the active participant and observer roles in anesthesia students and reported that while both groups experienced a significant increase in medical knowledge, participants had a higher score and increased satisfaction, when compared with the observer group. Weiler et al[29] assessed different roles in nursing students by assigning students to one of five roles including, lead nurse, secondary nurse, documenter, medication administer, and caller. The results of their study showed that nursing students who were in the lead nurse, secondary nurse or documenter had significantly increased critical thinking scores when compared with the caller and medication nurse.[29] Their results suggest that the more active participant roles may have improved critical thinking than the roles which are less active participating. Finally, McCoy et al[30] evaluated medical students in a prospective randomized crossover study comparing telesimulation to standard simulation and found no differences in evaluation scores between groups.[30] Although there seems to be some discrepancy on the role of observers and participants in nursing, medicine, and anesthesia, our results support a growing body of literature which supports a similar learning potential in the observer role.

In addition to researching the effect of the observer role on student learning outcomes, there has also be research to determine student's preferences on roles. Harder et al[31] completed a qualitative analysis of nursing students to determine preference of either the active or observer role. It was reported that nursing students preferred to be assigned to the active role rather than the observer role and that students perceived their learning experience was impaired when they were not assigned to a clear role or when they were assigned to an observer role.[31] Mazerolle et al[32] also found that AT students prefer more active learning style for their clinical learning experiences. With students preferring the active role over the observer role, some researchers have sought to determine the importance of preparing students for the observer role to enhance student learning outcomes.[33,34] O'Regan et al[34] discussed that students needed a clear role when assigned to the observer role to ensure they had positive student learning outcomes and supports the use of observer's tools and inclusion of observers. In non-medical research Hoover et al[35] completed a study on undergraduate students in management and found that observational learning for a simulation about negotiation allowed those students to have "insight in advance of action". Furthermore, medical students were found to have higher levels of both positive and negative emotions as active participants as compared with observer roles.[36] These studies suggest that although students may prefer active participant roles, if properly prepared, the observer role can demonstrate positive results. Our study provides support for the observer role in athletic training education and demonstrates that as programs increase the use of simulation and SP encounters in their professional programs, it is feasible to include the use of observers as they may experience similar gains in knowledge and confidence as those students who actively participate.

Limitations

The main limitation of this study is the small sample size. As such, these results may not be generalized to the larger population. Future research should be completed with larger sample sizes across multiple institutions to ensure there are no significant differences in learning or confidence between participants and observers in SP encounters. Another limitation in our study is the use of a SP scenario and knowledge assessment that have not been evaluated for content validity and reliability. Future research could determine the content validity and reliability of both the SP scenario and knowledge assessment.

Our findings suggest that athletic training students will experience positive student learning outcomes regardless of their role as either an active participant or observer in a SP scenario. This data supports the use of simulated SP scenarios in athletic training education, even if there are not enough resources to allow every student to be able to be an active participant in every scenario. Athletic training educators should continue to utilize active learning techniques such as SP encounters to enhance student learning outcomes.

References

1. Pursuing and maintaining accreditation of professional programs in athletic trainings. Commission on Accreditation of Athletic Training Education. Accessed June 11, 2021. https://caate.net/wp-content/uploads/2021/01/Pursuing-Maintaining-and-Guide-to-2020-Standards-FInal_approved-Dec-2020.pdf

2. Harris N, Welch Bacon CE. Developing Cognitive Skills Through Active Learning: A Systematic Review of Health Care Professions. *Athletic Training Education Journal*. 2019;14(2):135-148. doi:10.4085/1402135

3. Armstrong KJ, Jarriel AJ. Standardized Patient Encounters Improved Athletic Training Students' Confidence in Clinical Evaluations. *Athletic Training Education Journal*. 2015;10(2):113-121. doi:10.4085/1002113

4. Armstrong KJ, Jarriel AJ. Standardized Patients Provide a Reliable Assessment of Athletic Training Students' Clinical Skills. *Athletic Training Education Journal*. 2016;11(2):88-94. doi:10.4085/110288

5. Armstrong KJ, Walker SE, Weidner T. Simulated Patients Are Predominantly Used to Teach and Evaluate Athletic Training Students' Skills: A 10-Year Follow-Up. *Athletic Training Education Journal*. 2018;13(3):281-289. doi:10.4085/1303281

6. Walker S, Weidner T, Armstrong KJ. Standardized Patient Encounters and Individual Case-Based Simulations Improve Students' Confidence and Promote Reflection: A Preliminary Study. *Athletic Training Education Journal*. 2015;10(2):130-137. doi:10.4085/1002130

7. Paloncy KA, Georges L, Liggett AJ. A High-Fidelity Simulation Is Effective in Improving Athletic Training Students' Self-Efficacy with Emergency Cardiovascular Care Skills. *Athletic Training Education Journal*. 2019;14(2):108-116. doi:10.4085/1402108

8. Carmack JN, Kemery SR, Moore SM, et al. Care Across Campus: Athletic Training, Nursing, and Occupational Therapy Student Experiences in an Interprofessional Simulation. *Athletic Training Education Journal*. 2018;13(4):332-339. doi:10.4085/1304332

9. Tivener K, Doherty-Restrepo JL. Current Literature Summary: Review of High-Fidelity Simulation in Professional Education. *Athletic Training Education Journal*. 2014;9(4):190-192. doi:10.4085/0904190

10. Cuchna JW, Walker SE, Van Lunen BL. Simulations and Standardized Patients in Athletic Training: Part 2 Athletic Training Educators' Perceived Barriers to Use. *Athletic Training Education Journal*. 2019;14(1):48-54. doi:10.4085/140148

11. Johnson BK. Simulation Observers Learn the Same as Participants: The Evidence. *Clinical Simulation in Nursing*. 2019;33:26-34. doi:10.1016/j.ecns.2019.04.006

12. Gardiner A, Cuchna JW, Walker SE, Clines S, Welch-Bacon C, Van Lunen BL. Student perceptions of standardized patient use in athletic training education. *Athletic Training Education Journal*. 2019;14(1):64-72.

13. Mazerolle SM, Bowman TG, Benes SS. Defining the Engaging Learning Experience from the Athletic Training Student Perspective. *Athletic Training Education Journal*. 2014;9(4):182-189. doi:10.4085/0904182

14. Sideras S, McKenzie G, Noone J, Markle D, Frazier M, Sullivan M. Making Simulation Come Alive: Standardized Patients in Undergraduate Nursing Education. *Nursing Education Perspectives*. 2013;34(6):421-425.

15. Herge EA, Lorch A, DeAngelis T, Vause-Earland T, Mollo K, Zapletal A. The Standardized Patient Encounter: A Dynamic Educational Approach to Enhance Students' Clinical Healthcare Skills. *Journal of Allied Health*. 2013;42(4):229-235.

16. Cahalin LP, Markowski A, Hickey M, Hayward L. A Cardiopulmonary Instructor's Perspective on a Standardized Patient Experience: Implications for Cardiopulmonary Physical Therapy Education. *Cardiopulmonary Physical Therapy Journal*. 2011;33(2):21-30.

17. Lane JL, Slavin S, Ziv A. Simulation in medical education: A review. *Simulation and Gaming*. 2001;32(3):297-314.

18. Lewis KL, Bohnert CA, Gammon WL, et al. The Associate of Standardized Patient Educators (ASPE) Standards of Best Practice (SOBP). *Advances in Simulation*. 2017;2(10):1-8. doi:DOI 10.1186/s41077-017-0043-4

19. Walker SE, Weidner T. Standardized Patients Provide Realistic and Worthwhile Experiences for Athletic Training Students. *Athletic Training Education Journal*. 2010;5(2):77-86.

20. Sims-Koenig KN, Walker SE, Winkelmann ZK, Bush JM, Eberman LE. Translation of Standardized Patient Encounter Performance and Reflection to Clinical Practice. *Athletic Training Education Journal*. 2019;14(2):117-127. doi:10.4085/1402117

21. Davenport J, Walker SE, Eberman LE, Bacon CEW. Athletic Training Educators' Perceptions of Using Standardized Patients in Teaching. *Athletic Training Education Journal*. 2020;15(1):3-17. doi:10.4085/150119081

22. Winkelmann Z, Eberman LE. The Confidence and Abilities to Assess a Simulated Patient Using Telemedicine. *Athletic Training Education Journal*. 2020;15(2):132-147. doi:10.4085/1947-380x-62-19

23. Dreifuerst KT. The essentials of debreifing in simulation learning: A concept analysis. *Nursing Education Perspectives*. 2009;30(2):109-114.

24. Dreifuerst KT. Getting Started With Debriefing for Meaningful Learning. *Clinical Simulation in Nursing*. 2015;11:268-275.

25. Dreifuerst KT, Bradley CS, Johnson BK. Using Debriefing for Meaningful Learning With Screen-Based Simulation. *Nurse Educ*. 2021;46(4):239-244. doi:10.1097/NNE.0000000000000930

26. Bong CL, Lee S, Ng ASB, Allen JC, Lim EHL, Vidyarthi A. The effects of active (hot-seat) versus observer roles during simulation-based training on stress levels and non-technical performance: a randomized trial. *Adv Simul (Lond)*. 2017;2:7. doi:10.1186/s41077-017-0040-7

27. Delisle M, Ward MAR, Pradarelli JC, Panda N, Howard JD, Hannenberg AA. Comparing the Learning Effectiveness of Healthcare Simulation in the Observer Versus Active Role: Systematic Review and Meta-Analysis. *Simul Healthc*. Oct 2019;14(5):318-332. doi:10.1097/SIH.0000000000000377

28. Blanie A, Gorse S, Roulleau P, Figueiredo S, Benhamou D. Impact of learners' role (active participant-observer or observer only) on learning outcomes during high-fidelity simulation sessions in anaesthesia: A single center, prospective and randomised study. *Anaesth Crit Care Pain Med*. 2018;37:417-422.

29. Weiler DT, Gibson AL, Saleem JJ. The effect of role assignment in high fidelity patient simulation on nursing students: An experimental research study. *Nurse Education Today*. 2018;63:29-34.

30. McCoy CE, Sayegh J, Rahman A, Landgorf M, Anderson C, Lotfipour S. Prospective randomized crossover study of telesimulation versus standard simulation for teaching medical students the management of critically ill patients. *AEM Education and Training*. 2017;1(4):287-292. doi:10.1002/aet2.10047

31. Harder N, Ross CJM, Paul P. Student Perspective of Roles Assignment in High-Fidelity Simulation: An Ethnographic Study. *Clinical Simulation in Nursing*. 2013;9(9):e329-e334. doi:10.1016/j.ecns.2012.09.003

32. Mazerolle SM, Walker SE, Thrasher AB. Exploring the Transition to Practice for the Newly Credentialed Athletic Trainer: A Programmatic View. *J Athl Train*. Oct 2015;50(10):1042-53. doi:10.4085/1062-6050-50.9.02

33. Johnson BK. Observational Experiential Learning: Theoretical Support for Observer Roles in Health Care Simulation. *J Nurs Educ*. Jan 1 2020;59(1):7-14. doi:10.3928/01484834-20191223-03

34. O'Regan S, Molloy E, Watterson L, Nestel D. Observer roles that optimise learning in healthcare simulation education: a systematic review. *Adv Simul (Lond)*. 2016;1:4. doi:10.1186/s41077-015-0004-8

35. Hoover JD, Giambatista RC, Belkin LY. Eyes On, Hands On: Vicarious Observational Learning as an Enhancement of Direct Experience. *Academy of Management Learning & Education*. 2012;11(4):591-608. doi:10.5465/amle.2010.0102

36. Rogers T, Andler C, O'Brien B, van Schaik S. Self-Reported Emotions in Simulation-Based Learning: Active Participants vs. Observers. *Simul Healthc*. Jun 2019;14(3):140-145. doi:10.1097/SIH.0000000000000354

Table 1

Descriptive Statistics of Survey Scores

		Knowledge Assessment			Confidence Rating Score		
Role	**TimePoint**	**Mean**	**SD**	**95% CI**	**Mean**	**SD**	**95%CI**
Participant	Pretest	14.38	1.65	(11.95,16.80)	33.00	7.87	(25.14,40.86)
	Posttest	16.88	2.14	(14.50,19.26)	26.75	8.77	(18.55,39.95)
Observer	Pretest	13.20	2.31	(11.03, 15.37)	32.40	5.55	(25.37,39.43)
	Posttest	16.40	1.92	(14.27, 18.53)	28.00	5.15	(20.67,35.34)

Table 2 Repeated Measures ANOVA for Knowledge Assessment

Within-subjects effects

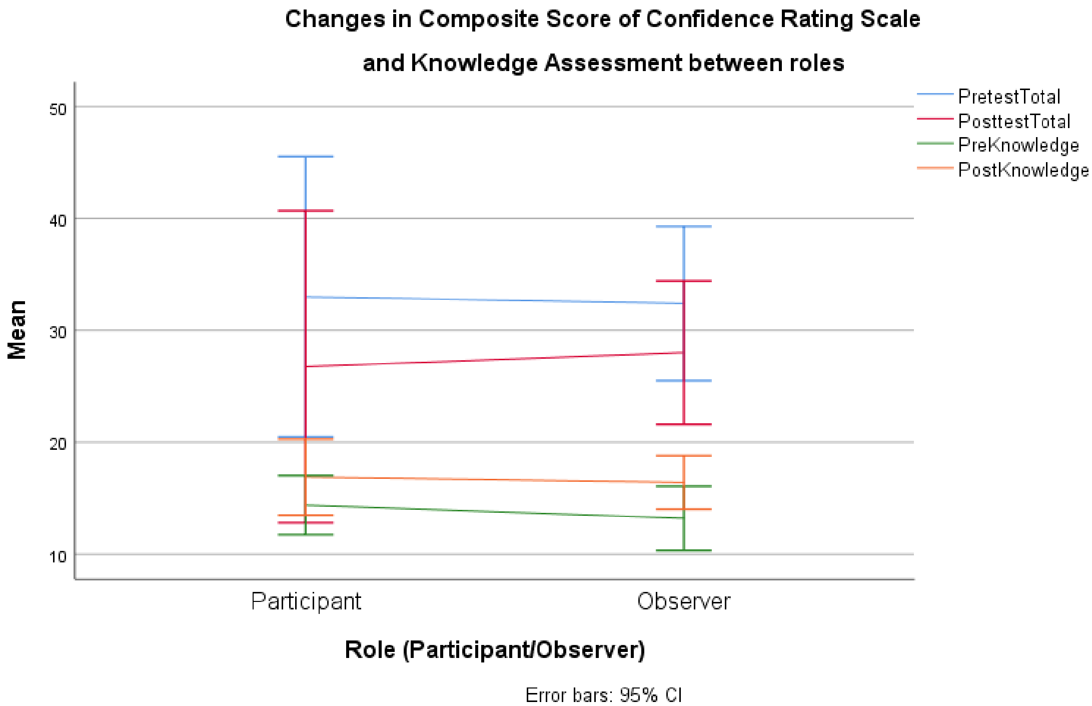
Source	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**	**Partial Eta Squared**
Time	72.20	1	72.20	14.12	0.007	0.669
Time*Role	1.09	1	1.09	0.21	0.658	0.030
Error	35.80	7	5.11			

Table 3 Repeated Measures ANOVA for Total Confidence Scores

Within-subjects effects

Source	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**	**Partial Eta Squared**
Time	252.05	1	252.05	88.44	0.000	0.927
Time*Role	7.61	1	7.61	2.67	0.149	0.276
Error	19.95	7	2.85			

Figure 1



Composite scores change between participant and observer role for pretest and posttest

*Results with 95% CI error bars.