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ORIGINAL RESEARCH

Athletic Therapy Students' Perceptions of High-Fidelity Manikin Simulation: A Pilot Study

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Context: Athletic therapy students learn emergency skills through a variety of modes, including students portraying injured athletes and cardiopulmonary resuscitation manikins. Although acceptable and satisfactory forms of teaching, these methods are limited in their ability to create realistic physiological symptoms of injury.

Objective: To assess how athletic therapy students perceive their learning needs (LNs) relative to the use of high-fidelity manikin simulation (HFMS) compared with student simulation (SS) in the laboratory setting.

Design: Pretest-posttest study design.

Setting: Nursing Simulation Centre, Sheridan College, Brampton, Ontario, Canada.

Patients or Other Participants: Thirty students from the Bachelor of Applied Health Science (Athletic Therapy) program at Sheridan College in years 2 and 4.

Intervention(s): Perceived LNs related to the use of the Laerdal Medical SimMan3G HFMS contrasted with the use of SS for learning to respond to a prescribed emergency scenario.

Main Outcome Measure(s): Participants completed questionnaires for both the SS and HFMS environments that consisted of 16 specific LNs spanning the cognitive, psychomotor, and affective domains of learning. Paired *t* tests and a 2-way analysis of variance were used to analyze the questionnaire data.

Results: Participants reported all LNs as being equally important in both environments, but HFMS was identified as a better environment for achieving 13 of the 16 LNs. The mean change from pretesting to posttesting of all LNs in the affective domain improved significantly ($P < .05$) in the HFMS environment. Year 4 participants deemed HFMS to be a more effective means of learning in the cognitive and psychomotor domains ($P < .05$).

Conclusions: The HFMS experience enhanced athletic therapy students' perceptions of their confidence, base of knowledge, decision-making skills, and overall acute management of critical lifesaving situations. The HMFS environment is a more effective tool for addressing the LNs in the affective domain, which includes skills related to confidence, attitudes, values, and appreciations.

Key Words: Emergency, education, affective domain, learning

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Athletic Therapy Students' Perceptions of High-Fidelity Manikin Simulation: A Pilot Study

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KEY POINTS

- Incorporating high-fidelity manikin simulation in athletic therapy training is an effective means of teaching skills from the affective domain of learning.
- High-fidelity manikin simulation can enhance student confidence, particularly with critical life support skills.
- The most beneficial time to introduce high-fidelity manikin simulation to students appears to be in the more senior years of athletic therapy education.

INTRODUCTION

Traumatic events are unfortunate and can bring about devastating consequences. Trauma has the potential to produce life-threatening injuries, and, as a result, emergency medical professionals must be trained in the most effective, up-to-date, and safe treatment techniques to optimize patient outcomes. Because of the life-and-death nature of emergency events, practicing the necessary skills and the most effective treatment in a real-life situation is not possible or realistic. Currently, students in the Athletic Therapy program at Sheridan College (Brampton, Ontario, Canada) learn emergency response for catastrophic injuries in a laboratory setting where students portray athletes who have experienced a traumatic situation or injuries. Although this form of teaching is satisfactory in developing the necessary skills for students, it presents some challenges.[1] Often in the laboratory setting, students are not exposed to authentic situations, as physiological symptoms of shock and other conditions (eg, increased heart rate, decreased blood pressure, pupil changes, altered breath sounds, fractures, severe bleeding) cannot be exhibited in a healthy individual. Furthermore, in our experience as clinical educators, this approach often results in a loss of focus of the mock patients. The laboratory setting can consist of up to 16 students, introducing the typical classroom distractions, such as other classmates, cell phones, talking, etc, which are not present in a more-controlled laboratory setting using high-fidelity simulation manikins. Although true-life emergency situations involve distractions for those responding, first-time learners benefit more from practicing assessment skills in a controlled environment during the early stages of learning.[2] Many professions, including anesthesiology,[3] pharmacy,[4] medicine,[5] nursing,[6] chiropractic,[7] physiotherapy,[8] and the military,[9] have used human patient simulation training successfully using high-fidelity manikins as a method to prepare their students and practicing professionals for real-life events. This form of simulation training has not been documented as a standard component in the education of the athletic therapy profession to date. High-fidelity simulation manikins can be used to create training environments to produce realistic scenarios involving injury and illness. These training environments are an effective adjunct to train students to recognize the signs and symptoms and then physically conduct the appropriate treatment for various emergency conditions. Furthermore, simulation environments afford the opportunity for the critical thinking necessary to respond to emergency situations without the risk of real-life consequences of errors in judgment.

Athletic therapists must be proficient in both the field and clinical realms of the profession. On the field of play, athletic therapists must be prepared to recognize and appropriately respond to potentially catastrophic life-threatening injuries. Traditional athletic therapy education includes the use of basic cardiopulmonary resuscitation (CPR) manikins and sometimes midfidelity manikins capable of simulating heart rate, breathing rate, and blood pressure (eg, Resusci Anne Simulator, Laerdal Medical Canada, Scarborough, Ontario). In addition, students simulate injured athletes (student simulation [SS]) to teach the necessary skills to succeed in recognizing and treating injuries sustained during traumatic events. Although these forms of training are effective, the use of high-fidelity manikin simulation (HFMS), such as SimMan3G (Laerdal Medical Canada), in the training of health care professionals has been shown to increase advanced cardiac life support (ACLS) knowledge, knowledge retention, and overall confidence compared with the above traditional forms of training.[1] In pharmacy,[4] chiropractic,[7] and physiotherapy[8] education, simulation in critical care and clinical care settings has been shown to enhance confidence in students and increase student satisfaction with learning, and students have indicated that simulation was an extremely valuable tool for their education.[10] Including the use of simulation in the medical curriculum improved the quality of care by residents in ACLS situations, and it was their recommendation that simulation be used as a complement to traditional education.[11] To date, there has been limited comprehensive research to indicate its efficacy in the profession of athletic therapy.

The primary purpose of this research study was to investigate whether athletic therapy students' perceived learning needs changed when using an HFMS experience compared with their typical SS experience. In addition, we examined whether the students' experience level (senior year versus sophomore year) influenced their learning in the 2 situations (HFMS versus SS).

METHODS

Thirty participants from the Bachelor of Applied Health Science (Athletic Therapy) program at Sheridan College provided informed consent after approval for the study was granted by the Sheridan College Research Ethics Board. Participants were separated into 2 groups: group A included students in the fourth year of the athletic therapy program and group B included students from the second year of the program. Each group contained 15 participants. All participants had successfully completed the Emergency Conditions I and II courses in year 2 of the 4-year program. All students were invited to participate, and participation was voluntary. The participants were not evaluated on their performance. All participants completed the same emergency scenario (anaphylactic shock with resulting cardiac arrest and successful

Table 1. Categorical Breakdown of Learning Needs From the Questionnaire Into the 3 Domains of Learning, With the Addition of the Environmental Feedback Classification

Question No.	Learning Need
Psychomotor domain	
1	Communicating with the team of therapists
2	Interacting and communicating with the athlete
4	Performing appropriate assessment
7	Anticipating and recognizing changes in athlete's condition
8	Taking appropriate action when athlete's condition changes
9	Reacting calmly to changes in athlete's condition
Cognitive domain	
6	Identifying athlete's problem/condition
5	Prioritizing care
11	Assessing outcomes of the care provided
12	Knowing what to do if I make an error in the care of the athlete
Affective domain	
3	Feeling supported by peers when making care-related decisions
13	Feeling challenged and stimulated
14	Feeling confident in my abilities
15	Improving my critical thinking skills with experience
16	Adding to my base of knowledge
Environmental feedback	
10	Receiving immediate feedback regarding athlete's condition

defibrillation treatment) with the SimMan3G high-fidelity simulation manikin as well as in the SS laboratory setting. The purpose of our investigation was not to evaluate the emotional response of a traumatic situation on the students' performance; consequently, the simulation scenario was designed to ensure survival of the patient or athlete.[12] No academic evaluation was conducted on the students' performance during the scenario, emphasizing the experience rather than the outcome. The students completed questionnaires (adapted from Leighton and Stick[13]) about their experiences in both the SS laboratory setting (regular curriculum) and the HFMS laboratory setting (experience with SimMan3G).

Questionnaires

In accordance with the Bloom taxonomy, learning is divided into 3 domains: cognitive, psychomotor, and affective.[14–16] The cognitive (knowledge) and psychomotor (physical) domains are typically the key building blocks in standard curriculum. The affective domain (attitude), however, is often a much more challenging part of curricular design. The Canadian Athletic Therapists' Association identified the same 3 domains as important in the division of professional competencies in athletic therapy.[17] Currently, these competencies govern both the professional and academic requirements for certification as an athletic therapist and align with the design of this study.

Questionnaires were designed based on the work of Leighton and Stick[13] and altered with permission to match the needs of this research project. Modifications were intended to capture elements from the 3 domains of learning from the Bloom taxonomy (psychomotor, affective, and cognitive) in order to identify in which area or areas the simulation training best augmented student learning. Table 1 categorizes the questions used in the analysis to evaluate perceived learning across the 3 domains. Question 10, which referred to the students' perception of the ability to receive immediate feedback regarding the athlete's condition, was not placed into any of the domains as it was not considered to be a concrete learning skill. The full questionnaires for each learning environment can be found in Appendices A and B.

All participants were asked to complete the questionnaires based on their experience responding to the anaphylactic scenario in each of the simulated environments. Group A (fourth-year athletic therapy students) completed the laboratory environment (SS) questionnaires 10 minutes before the simulation experience, and the simulation environment (HFMS) questionnaires after the debriefing of the simulation experience. Debriefing is a critical part of the simulation learning process.[18] Consequently, questionnaires were completed postdebriefing as the debriefing is conducted immediately after every simulation experience at our institution, regardless of the environment in which it takes place. The facilitators were careful to ensure that the debriefing did not address questions found within the questionnaires, but rather focused on participant skill performance in response to the condition presented. Because of the timelines of the research project, both questionnaires were given to the participants in group B (second-year athletic therapy students) at the same time, approximately 2 months after their simulation experience. Each question described a specific learning need, and students were asked to rate the learning need by how well it was met in each environment (simulation environment using HFMS and laboratory environment using SS) as well as their perceived importance of that learning need. A Likert-type scale from 4 to 1 was used in the questionnaires to evaluate the learning needs in each environment. A score of 4 indicated the learning needs were *well met*, a score of 3 indicated the learning needs were *met*, a score of 2 indicated the learning needs were *partially met*, and a score of 1 indicated the learning needs were *not met*. The term N/A was to be used if the student felt the specific

Table 2. Participant Demographics Organized by Group

Demographics	Mean ± SD		
	Second Year (n = 15)	Fourth Year (n = 15)	Total (N = 30)
Age, y	26 ± 8.8	24.6 ± 2.2	25.6 ± 7.3
Months in program	15.7 ± 6.5	39.3 ± 10.6	21.8 ± 12.4
Field hours	273.5 ± 110	593.3 ± 25.9	366.6 ± 177.0
Simulation experience	2.6 ± 1.6	1.0 ± 0.0	2.1 ± 1.5

environment was *not applicable* to the learning need. A 2-point rating scale was used to evaluate the students' perceptions of the importance of each learning need. A score of 2 indicated the learning need was *important*, a 1 indicated the learning need was *not important*, and a score of N/A was available if students did not feel the environment was a factor affecting the importance of the learning need.

Simulation Experience

Participants were asked to review a PowerPoint (Microsoft, Redmond, WA) presentation providing pictures of the SimMan 3G manikin and introductory videos created by users of SimMan 3G found on YouTube (ie, https://www.youtube.com/watch?v=nk2iW3_RD3k) before attending the simulation scenario to familiarize them with both the SimMan3G manikin itself (ie, where to check for pulses, etc) and its capabilities. All participants were placed in groups of 3 for both simulation experiences and scheduled into 65-minute time slots. Upon arrival at the simulation laboratory, participants were given 5 minutes to familiarize themselves further with the SimMan3G manikin. When participants were ready, they read the scenario briefing, which gave them a description of the events leading up to the anaphylactic reaction, and the scenario began. Each scenario followed the same pattern for each group of participants. The "athlete" (SimMan3G) had been stung by a bee and began experiencing the signs and symptoms of anaphylactic shock. Regardless of the students' performance, the athlete would experience cardiac arrest 12 minutes into the scenario. Participants were then required to shock the manikin with an automated external defibrillator (AED Trainer 2, Laerdal Medical Canada), engage in 2 minutes of CPR, and then shock the manikin a second time, after which time the athlete would regain heart rate and breathing rate, but would remain unconscious. The scenario was 20 minutes in length; students were given 5 minutes to collect themselves, after which a 20-minute debriefing was conducted with the primary instructor. Each group was asked the same set of questions, which focused on aspects in which the students perceived that they performed well, as well as areas they felt they needed to improve upon. The SimMan3G is capable of providing feedback to the participants and the instructor regarding the rate and depth of CPR compressions, lung volume for manual ventilation, time of initiation for palpable pulse evaluation, blood pressure readings, and (via microphones) the ability to respond to questions, which was incorporated into the debriefing session.

Statistical Analysis

All data analysis was conducted using Microsoft Office Excel 2007 and SPSS statistics computing program version 24.0 (IBM Inc, Armonk, NY). The data were analyzed using paired *t* tests for the student responses. In order to assess whether there were differences between second- and fourth-year students' improvement, we conducted a 2-way analysis of variance (ANOVA). The factor was the year of study, and the comparison was between the pretest and posttest scores. An α level of $P < .05$ was considered statistically significant. Descriptive statistics for all data are reported as mean ± SD.

RESULTS

All 30 participants completed the simulation experience as well as the laboratory and simulation questionnaires. The demographics—age (25.6 ± 7.3 years), hours of on-field coverage (366.6 ± 177.0), months in the program (21.8 ± 12.4), and number of simulation manikin exposures (number of times within the constructs of the academic program where students were exposed to a high- or midfidelity simulation manikin [2.1 ± 1.5])—are summarized in Table 2.

Of the 16 learning needs in the questionnaires, the means of student responses were significantly greater for the HFMS environment than for the SS experience in 13 LNs (Table 3). Overall, the students perceived the simulation experience as a more valuable means of achieving the necessary skills for emergency care (Table 3).

As a whole, the means of student responses identified the HFMS experience as meeting their learning needs more closely than the SS experience in all domains with the exception of question 2, "Interacting and communicating with the athlete," and question 6, "Prioritizing care" (Figure 1). In evaluating the means of the remaining 14 learning needs, 13 were reported to be more successfully achieved in the HFMS environment compared with the traditional laboratory environment. Further, there was a variance between the groups, with the fourth-year group responses favoring the HFMS experience when compared with the second-year group. The results of the ANOVA of change in score by group found significant differences within and between groups ($F = 5.955$, $df = 28$, $P = .021$). All students' learning needs scores improved, but the fourth-year students started with lower scores and reported a significantly higher perception of their learning needs having been met than the second-year students after the HFMS experience (Figure 2).

Of the 6 questions in the psychomotor domain, 4 demonstrated a statistically significantly better ability to be met in the HFMS environment compared with SS. Similarly, the cognitive domain showed more learning needs being better met in the HFMS environment, with 3 of the 4 questions demonstrating statistical significance. Finally, the questions used to identify the affective-domain learning needs all had statistically significant results identifying the HFMS as a

Table 3. Participant Responses

Question	Group A Responses			Group B Responses		
	Mean ± SD		*P* Value	Mean ± SD		*P* Value
	Laboratory	Simulation		Laboratory	Simulation	
Psychomotor domain						
1. Communicating with the team of therapists	3.07 ± 0.70	3.40 ± 0.74	.00[a]	3.27 ± 0.59	3.47 ± 0.64	.22
2. Interacting and communicating with the athlete	3.33 ± 0.62	3.40 ± 0.74	.00[a]	3.27 ± 0.70	3.13 ± 0.74	.01[a]
4. Performing appropriate assessment	3.00 ± 0.76	3.47 ± 0.64	.21	3.20 ± 0.68	3.53 ± 0.52	.33
7. Anticipating and recognizing changes in athlete's condition	2.73 ± 0.70	3.73 ± 0.46	.79	3.13 ± 0.74	3.53 ± 0.72	.63
8. Taking appropriate action when athlete's condition changes	2.93 ± 0.70	3.73 ± 0.46	.00[a]	3.20 ± 0.56	3.60 ± 0.63	.22
9. Reacting calmly to changes in athlete's condition	2.53 ± 0.64	3.53 ± 0.52	.05[a]	3.40 ± 0.63	3.40 ± 0.63	.17
Cognitive domain						
5. Identifying athlete's problem/ condition	3.20 ± 0.56	3.87 ± 0.35	.00[a]	3.14 ± 0.66	3.79 ± 0.43	1.00
6. Prioritizing care	2.93 ± 0.59	3.40 ± 0.51	.01[a]	3.60 ± 0.51	3.60 ± 0.51	.11
11. Assessing outcomes of the care provided	2.73 ± 0.70	3.47 ± 0.52	.00[a]	3.07 ± 0.70	3.27 ± 0.59	.27
12. Knowing what to do if I make an error in the care of the athlete	2.40 ± 0.91	3.67 ± 0.49	.01[a]	2.93 ± 0.70	3.13 ± 0.64	.05[a]
Affective domain						
3. Feeling supported by peers when making care-related decisions	2.80 ± 0.68	3.73 ± 0.46	.03[a]	3.27 ± 0.59	3.53 ± 0.52	1.00
13. Feeling challenged and simulated	3.40 ± 0.74	4.00 ± 0.00	.00[a]	3.33 ± 0.72	3.80 ± 0.41	.42
14. Feeling confident in my abilities	2.80 ± 0.41	3.40 ± 0.51	.00[a]	3.13 ± 0.64	3.40 ± 0.63	.05[a]
15. Improving my critical thinking skills with experience	2.73 ± 0.70	3.87 ± 0.35	.00[a]	3.20 ± 0.68	3.80 ± 0.56	.42
16. Adding to my base of knowledge	3.40 ± 0.51	3.87 ± 0.35	.00[a]	3.53 ± 0.64	3.87 ± 0.35	.01[a]
Environmental feedback						
10. Receiving immediate feedback regarding athlete's condition	2.87 ± 0.52	3.40 ± 0.74	.00[a]	3.13 ± 0.83	3.60 ± 0.63	.00[a]

[a] Indicates value of significance ($P < .05$).

superior platform for this type of learning compared with the SS setting. Group A (fourth-year students) perceived the HFMS environment as superior for achieving 12 of the 16 learning needs, whereas group B (second-year students) perceived the HFMS as the best environment for 5 of the 16 learning needs (Figure 3). Overall, both groups felt that the HFMS environment provided better immediate feedback regarding the athlete's condition than the SS environment. Question 10 was considered an element of environmental feedback rather than being classed into 1 of the 3 learning domains (Table 3).

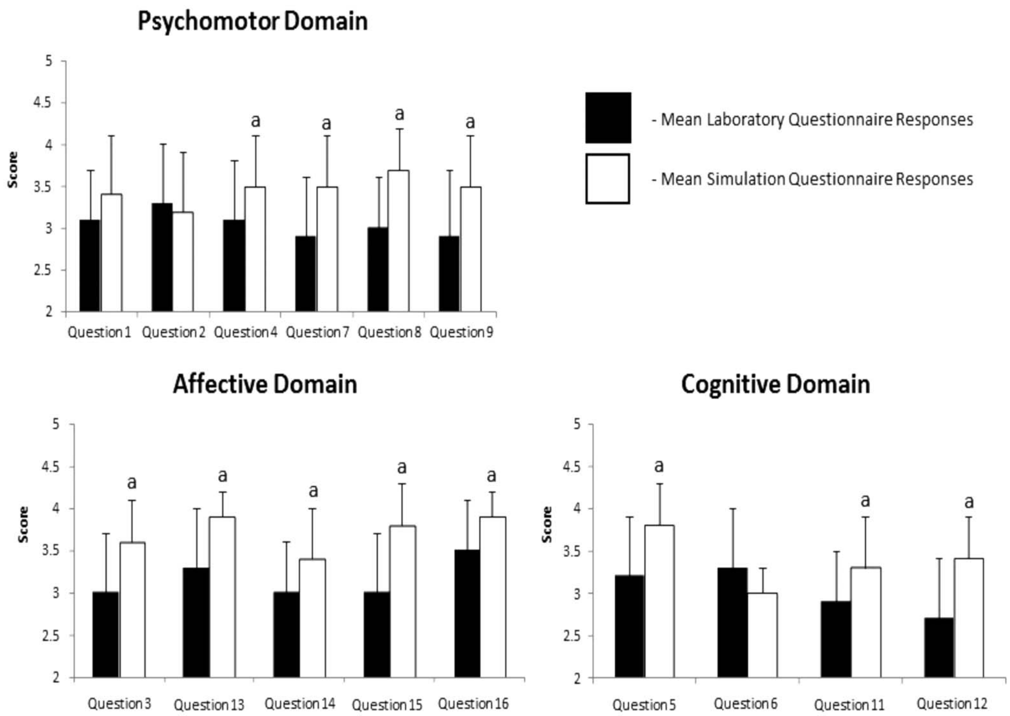
DISCUSSION

This study investigated the difference in student perceptions of having their learning needs met using an HFMS experience compared with the traditional SS laboratory experience. Overall, athletic therapy students rated the HFMS environment experience higher in meeting their learning needs when compared with their typical SS laboratory experience. Of the learning needs examined, those in the affective domain were rated higher than learning needs in other domains when using the HFMS environment. Of significant importance, the simulation manikin experience enhanced athletic therapy students' perceptions of their confidence, base of knowledge, decision-making skills, and overall acute management of critical lifesaving scenarios.

Although some differences existed between the perceptions of the second- and fourth-year students, the overall results of this study demonstrated that HFMS is a more effective method in accomplishing the elements of the affective domain than traditional SS. This is an important finding, as the affective domain is the most difficult domain to teach to students.[14–16] Cognitive-domain skills are typically taught through theory learned in the classroom and psychomotor skills through training in the laboratory. Affective skills are learned and acquired predominantly through experience.[16]

Research by Davis et al[10] investigated whether high-fidelity simulation would improve ACLS confidence, knowledge, and overall student satisfaction when compared with traditional lectures. Their results indicated that the simulation experience

Figure 1. Overall participant means indicate the majority of learning needs in each domain are better met in the simulation environment; of most note, all learning needs met statistical significance in the affective domain. [a] Represents a statistical significance of $P < .05$.



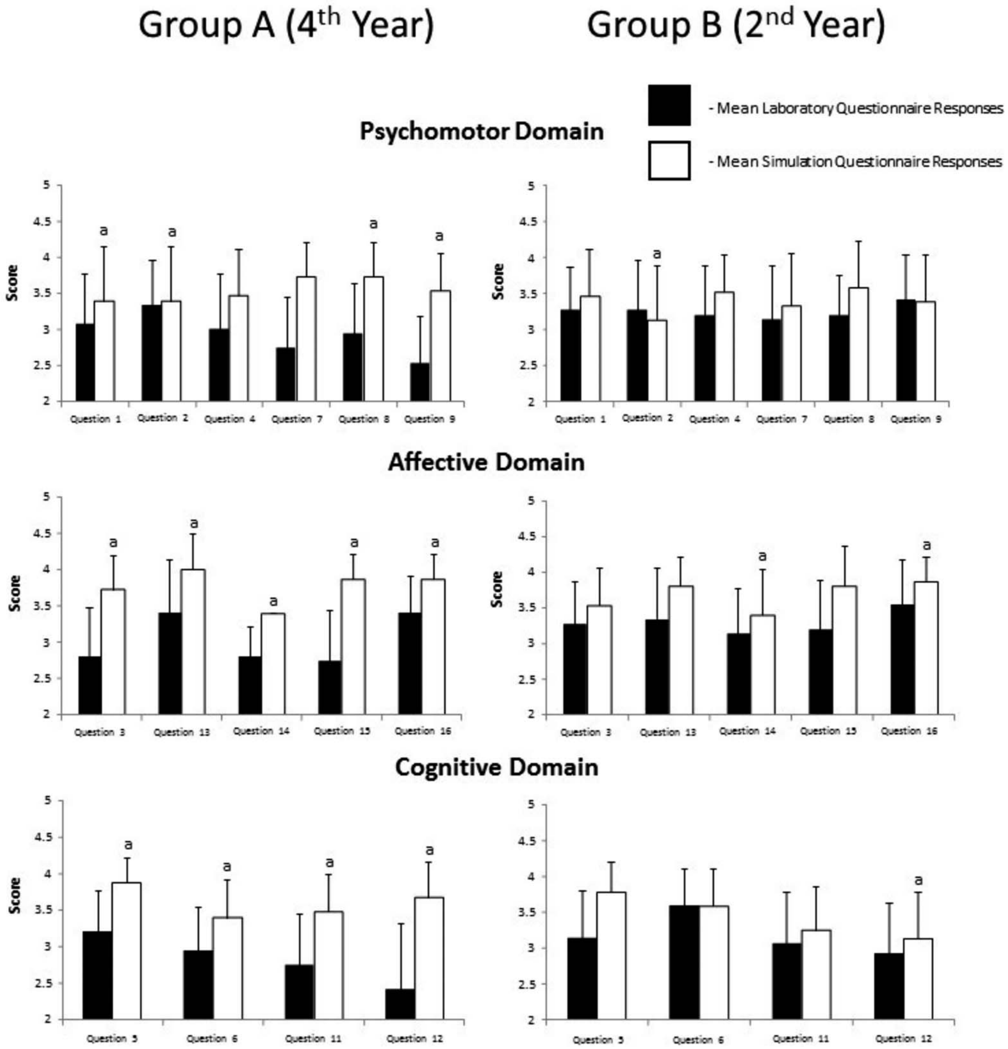
did not improve students' knowledge more than attending lectures; however, it did improve students' confidence in their skills, as well as satisfaction with learning.[10] It was recommended that future curricula incorporate simulation as a complement to lecture learning in ACLS education.[10] This supports the use of HFMS in athletic therapy education as it allows students to "experience" catastrophic injury scenarios in a safe environment and gain essential confidence without real-world consequences. It also exposes students to injuries and conditions that they may not encounter during their education tenure, giving them the necessary skills and experience to begin their career with confidence.

Palmer et al[19] investigated the use of HFMS in a training exercise with general medical conditions for an athletic training class. Their research[19] suggests the use of HFMS in curriculum could enhance learning experiences for students, as well as potentially alleviate some stress on the faculty.[19] The use of high-fidelity simulation manikins can help bridge the gap between clinical experiences and classroom learning, and provide a valuable tool for preparing students to enter the workforce.[18] It was also suggested that the use of HFMS provides students the opportunity to practice communication, critical thinking, clinical decision-making, and technical skills in a safe but realistic environment.[6,8,11,18–20] Our research supports these findings and suggests that students can develop skills within the affective domain of learning that are not often as easily developed in a formal educational setting.[21] Racchini et al[22] suggest the use of a debriefing session when using HFMS to provide the students an opportunity to reflect on the scenario and consider it as an important aspect to the simulation experience. For this research study, students had an opportunity to reflect on their scenario after completion in both simulation environments with a group facilitator. It is important to note that the debriefing was used as a tool to enhance the students' learning through each experience and did not include elements pertaining to the content of the questionnaires. The inclusion of a debriefing session is a valuable tool to help students understand and be active participants in their learning.[22]

When comparing the fourth-year and second-year group responses (Figure 2), the fourth-year group rated the simulation experience as higher in meeting learning needs for all domains, most significantly in the affective and cognitive domains. It is important to consider that second-year students only have on average 200 to 300 hours of practical on-field experience (during their on-field practical experience), and the fourth-year students have in some cases in excess of 600 hours of on-field practical experience. It is possible that because of their greater experience in both an academic and a professional capacity, the fourth-year students have a greater appreciation for what their learning needs are and how HFMS can play a significant role in their ability to improve these skills. The results from the 2-way ANOVA further support this finding, suggesting that the fourth-year students responded better to the simulation experience, potentially because of a greater number of years of formal education and experience in emergency situations (Figure 3). This finding suggests the most effective time to add HFMS into athletic therapy curriculum may be in the senior year(s) of study to provide the student with the most benefit in learning.

Most students indicate that a variety of teaching and learning techniques is more effective for their learning.[23] It is our opinion that HFMS should be considered a beneficial

Figure 2. Upon separating the groups and analyzing the variance in responses, group A (the fourth-year students) responded better to the simulation environment compared with group B (the second-year students). This difference may be attributed to experience, knowledge, and readiness to start their career.

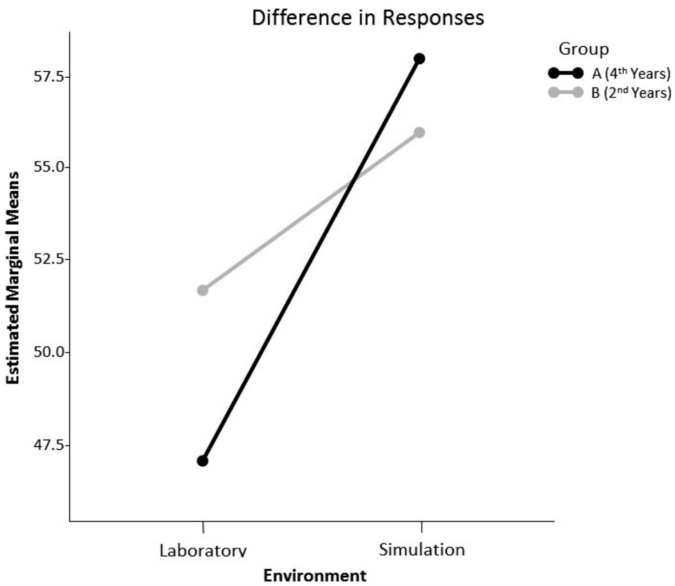


complement to the traditional laboratory experience, but should not be used in isolation. In our study, the overall response to question 2, interacting and communicating with the athlete, supports this recommendation. The SimMan3G is equipped with internal microphones through which the operator can directly answer any questions asked to the manikin. In the laboratory situations, students receive information from a classmate acting as an injured athlete. Although human-to-human communication is most realistic, in the laboratory setting this can often result in information being released too easily. Because of this, it would seem that communication with the athlete should be more effective in the simulation experience. In the debriefing sessions, however, the students often commented that the athlete responses were slow, unrealistic, and hard to hear. Future scenarios using the simulation manikin should ensure questions are answered quickly, accurately, and with a sense of urgency that reflects real-life emergency situations. It is important to realize, however, that human-to-human contact is an important skill to foster, so it would be our recommendation that emergency recognition and response training use both forms of teaching and learning.[24]

LIMITATIONS

It is possible that some of the differences in scores between the second- and fourth-year student responses were due to the timelines of this study. The fourth-year group of students completed each questionnaire and the simulation experience all in the same day, whereas the second-year group of students completed the questionnaires approximately 2 months after the simulation manikin experience. We acknowledge the delay in the administration of the questionnaires for the second-year group of students is a limitation of our study. The difference in the timing of the questionnaires between the 2 groups was due to the timelines and logistics surrounding the study. The only opportunity to compare these 2 groups necessitated a delayed administration of the questionnaire for 1 group. However, as the fourth-year students had lower baseline scores, this difference in administration times is unlikely to have changed the direction of the results. Finally, although the questionnaire was based on the previously validated work of Leighton and Stick,[13] we made slight modifications to better reflect the athletic therapy environment, and these changes were not validated for this pilot study.

Figure 3. Upon separating group responses, both groups rated the majority of learning needs as better met in the simulation environment; however, the fourth-year group rated the simulation environment as better meeting their learning needs in a statistically significant manner. [a] Represents a statistically significant finding ($P < .05$).



FUTURE RESEARCH

Future research should investigate how to implement HFMS education into current school curricula as well as continuing education courses, as cost and individual institutional resources may be limiting factors in providing valuable training for athletic therapy students. There is a need to investigate the effectiveness of this intervention (use of simulation manikins) on learning outcome measures (retention, knowledge transfer) in comparison with traditional instructional strategies. More research is required to expand on the number of students exposed to HFMS experiences and whether students who are exposed to these experiences develop their skills significantly better than those only exposed to the traditional laboratory experience methods of education.

CONCLUSIONS

This pilot research suggests that using a high-fidelity manikin is associated with better-perceived leaning outcomes. Students in the Athletic Therapy program at Sheridan College perceived the simulation environment as a more effective learning experience than the traditional laboratory environment. This suggests that the high-fidelity simulation manikin is a useful learning tool and that collaboration between classroom and simulation laboratory learning may further assist students in developing their skills in all learning domains, but most significantly in the affective domain. This tool may be best received in the more senior years of students' learning, when they have had more experience in both classroom skill execution and professional training opportunities. Accordingly, this provides valuable opportunities for students to develop their self-confidence and critical thinking skills, key elements to providing competent graduates.

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Appendix A. Laboratory Environment Questionnaire[a]

Learning Need	Simulated Environment					Importance of Learning Need		
	Well Met	Met	Partially Met	Not Met	Not Applicable	Important	Not Important	Not Applicable
1. Communicating with the team of therapists	4	3	2	1	N/A	2	1	N/A
2. Interacting and communicating with athlete	4	3	2	1	N/A	2	1	N/A
3. Feeling supported by peers when making care related decisions	4	3	2	1	N/A	2	1	N/A
4. Performing appropriate assessment	4	3	2	1	N/A	2	1	N/A
5. Identifying athlete's problem/condition	4	3	2	1	N/A	2	1	N/A
6. Prioritizing care	4	3	2	1	N/A	2	1	N/A
7. Anticipating and recognizing changes in athletes condition	4	3	2	1	N/A	2	1	N/A
8. Taking appropriate action when athletes condition changes	4	3	2	1	N/A	2	1	N/A
9. Reacting calmly to changes in athletes condition	4	3	2	1	N/A	2	1	N/A
10. Receiving immediate feedback regarding athlete's condition	4	3	2	1	N/A	2	1	N/A
11. Assessing outcomes of the care provided	4	3	2	1	N/A	2	1	N/A
12. Knowing what to do if I make an error in care of the athlete	4	3	2	1	N/A	2	1	N/A
13. Feeling challenged and stimulated	4	3	2	1	N/A	2	1	N/A
14. Feeling confident in my abilities	4	3	2	1	N/A	2	1	N/A
15. Improving my critical thinking skills with experience	4	3	2	1	N/A	2	1	N/A
16. Adding to my base of knowledge	4	3	2	1	N/A	2	1	N/A

[a] Altered with permission to match the needs of this research project.

Appendix B. Simulation Environment Questionnaire[a]

Learning Need	Simulated Environment					Importance of Learning Need		
	Well Met	Met	Partially Met	Not Met	Not Applicable	Important	Not Important	Not Applicable
1. Communicating with the team of therapists	4	3	2	1	N/A	2	1	N/A
2. Interacting and communicating with athlete	4	3	2	1	N/A	2	1	N/A
3. Feeling supported by peers when making care related decisions	4	3	2	1	N/A	2	1	N/A
4. Performing appropriate assessment	4	3	2	1	N/A	2	1	N/A
5. Identifying athlete's problem/condition	4	3	2	1	N/A	2	1	N/A
6. Prioritizing care	4	3	2	1	N/A	2	1	N/A
7. Anticipating and recognizing changes in athletes condition	4	3	2	1	N/A	2	1	N/A
8. Taking appropriate action when athletes condition changes	4	3	2	1	N/A	2	1	N/A
9. Reacting calmly to changes in athletes condition	4	3	2	1	N/A	2	1	N/A
10. Receiving immediate feedback regarding athlete's condition	4	3	2	1	N/A	2	1	N/A
11. Assessing outcomes of the care provided	4	3	2	1	N/A	2	1	N/A
12. Knowing what to do if I make an error in care of the athlete	4	3	2	1	N/A	2	1	N/A
13. Feeling challenged and stimulated	4	3	2	1	N/A	2	1	N/A
14. Feeling confident in my abilities	4	3	2	1	N/A	2	1	N/A
15. Improving my critical thinking skills with experience	4	3	2	1	N/A	2	1	N/A
16. Adding to my base of knowledge	4	3	2	1	N/A	2	1	N/A

[a] Altered with permission to match the needs of this research project.