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Exploring Cultural Identity: Perspectives from Social Sciences and Humanities

Enhancing learning in physical therapy education through simulated patients: A meta-analysis

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Abstract As hands-on instruction gives pupils the chance to apply the information and skills they gain while attending school to a real-world clinical setting, it may be beneficial for those participating in beginning employees physical therapy (PT) education programmes. Experiential learning is presently used in all entry-level PT programs in the form of clinical experiences; however, it has the potential to be included across the curriculum to improve student engagement as well as the application and retention of learned information. The objective of this article is to argue that there should be a greater emphasis placed on hands-on experience in physical therapy (PT) education programs that are designed for new graduates. Simulators, integrating medical experiences, volunteer work, public customer support organisations, and opportunities for professional growth are just a few of the various methods used in experiential education. The opportunity to put theoretical knowledge into practice in a setting free from criticism is very beneficial to students. Learning via experience may be especially helpful in subject preparation area when students have fewer opportunities to preparation their abilities since fewer possibilities are available. Students will be better prepared for the sort of meditative rehearsal that is necessary to make the changeover from learner to the skilled practitioner if they engage in the course of reflecting on their experiences, which is a typical activity that is conducted in combination with experiential learning.

Keywords: simulation, clinical education, physical therapy, physical education

1. Introduction

A physical therapist should be creative, work well with others, and put the patient first. This advanced level of practice requires therapists to have the information, abilities, attitudes, and values necessary to address the inherent ambiguity of their patients' problems within complicated and unpredictable settings. Like most other medical professionals, physical therapists have struggled to make sense of and put a name for the inconsistent variety and complexity of clinical issues they face today (Huhnet al 2019). Despite the substantial body of research supporting exposure treatment for anxiety disorders, it is seldom used in practice. Exposure therapy aims to help patients overcome their fears by exposing them to their triggers in a safe, controlled environment. Animals, inanimate things, circumstances, actions, ideas, mental pictures, bodily sensations, and emotional experiences may all trigger panic attacks in certain people. Numerous investigations have shown that exposure treatment effectively treats anxiety-related conditions, particularly obsessions (Boeldt et al 2019). As a result of the global spread of coronavirus disease 2019 (COVID-19), governments around the globe have enacted strict regulations restricting independence and mandating social isolation. Therefore, global medical systems do not fail. As a result of this change in thinking, funds inside diagnosis-related organisations will be reallocated to provide the intensive care individuals with severe COVID-19 will need, as well as to the original aim of lowering the global epidemic. Low-intensity care providers, such as musculoskeletal (MSK) physical therapists, are often close to patients, making these precautions an impediment to their jobs (Turolla et al 2020). Physical therapy (PT) for children is a specialty that focuses on helping children move better so they can take part fully in life from an early age. PT students may help children learn the fundamentals of pediatric physical therapy and apply those lessons in the classroom and the clinic. Entry-level therapists must be prepared to address patients and consumers of all ages. Thus, courses focusing on pediatric physical therapy are provided in modern PT training programs (Anderson et al 2019). The common sense model (CSM) is a theoretical framework that describes the psychological and emotional reactions people have to experiencing sickness and the ways in which they deal with these feelings. According to this theory, one's thoughts are among the most influential factors in shaping one’s actions. Research on making choices has shown that doctors' attitudes about a patient's illness strongly influence their prescribing habits. Healthcare providers with biological experience

are less likely to prescribe psychiatric medications than those with biological expertise. Medical professionals who have received scientific instruction and who have firm convictions about the rigid connections among discomfort, operation, and chronic low back pain CLBP tend to adhere less strictly to the clinical recommendations for the treatment of CLBP (Leysen et al 2021). A wide variety of preadmission variables related to PT assistant education programs have been investigated. Age, gender, undergraduate degree, Graduate Record Examination (GRE), prerequisite GPA, cumulative science GPA, cumulative undergraduate GPA, papers, and certificates of reference have all been used as predictors in the past. Admission rates, first-year GPAs, and NPTE scores are only some of the effects that have been researched concerning these preentry variables (Roman and Buman2019). Physical treatment has been shown to significantly enhance motor function in people with Parkinson's disease. VR is a potential therapy for people with PD because it can stimulate their senses of sight, sound, and touch to help them walk better. It allows patients to engage in simulated VR while medical staff observe and assess their development. Patients with PD benefit from visual cues, which help them walk faster, as well as from external stimuli that improve their gait. However, there are currently insufficient data to conclude that virtual reality may effectively enhance motor abilities in Parkinson's disease patients (Feng et al 2019). The physical therapy profession is well positioned to respond to this alarming trend. Learning, environmental training, security at work improvements, prescribed exercise and tracking, and hands-on manual treatments are just some ways in which physical therapists may help the population avoid and recover from musculoskeletal problems. Ergonomics is the science and practice of designing tools and work environments to reduce injury, disability, and illness in the workplace, save money for businesses, and boost employee output and morale (Pralland Ross 2019).

The Kononowicz examines the efficacy of virtual patients in health profession education by contrasting them with conventional methods, blending them with traditional methods, contrasting them with other forms of computerised learning, and examining variations in their design. Learning, behavior, and emotions were tracked as indicators of success. Following the Cochrane approach, they conducted a systematic study on the usefulness of computer-generated patient simulations for healthcare professionals in pre- and postregistration training. It consists of both single-patient and group randomised studies. Each pair of researchers made their study selections, data extractions, and bias assessments and then compared their findings (Kononowicz et al 2019). With the advent of the digital age, innovative instructional and learning models have become available in physiotherapy. The use of electronic devices in rehabilitation instruction and practice is anticipated to have benefits and drawbacks similar to those seen in other fields of study. This study investigated the increasing significance of technological learning environments in physiotherapist training and instruction. Academic institutions may benefit from a better understanding of the facilitators and obstacles of imparting physical therapy information and skills utilising instructional technology to improve their problem-solving and clinical thinking abilities (Tome and Coelho 2023). Over the last 50 years, physical sports therapy has expanded into a large and diverse field. Despite this expansion, data on doctors' entry-level training and knowledge of how to treat sports injuries are scarce (Mulligan et al 2020). The purpose of the study is to provide a snapshot of sports physical therapists' perspectives on three key issues: what sets sports physical therapy apart as a specialty, whether or not sports physical therapy content should be incorporated into beginning physical therapy curricula, and how prepared the average degrees feel to practice sports physical therapy.

Simulated patients are often used in PT programs to allow students to practice their skills in a safe setting. In most programs, simulated patients are used in the following ways: PT students might benefit from having simulated patients play out realistic therapeutic settings. A simulated patient might represent a person recovering from a sports injury, a neurological disorder, or surgery. Students may practice their learning in a realistic yet mimicking environment (PrvuBettger and Resnik 2020). The increasing prevalence of physical therapy leading to biopsychosocial-oriented treatments has made physical therapists well suited for biopsychosocial intervention as first-line practitioners in various healthcare environments. However, studies have shown that many of the present social and biopsychosocial techniques used by physical practitioners to treat severe musculoskeletal pain do not enhance treatment results any more than conventional physical therapy (Simpson et al 2021). Determining how physical therapists and PT students feel about and approach people who have dementia. The systematic review included a variety of research strategies.

All types of practicing physical therapists and students with at least one clinical rotation under their belts were represented. Eleven databases were searched. The proof was appraised using criteria developed by the Joanna Briggs Institute. According to the Joanna Briggs Institute's guidelines for multidisciplinary systematic examinations, a converging holistic strategy was used to synthesise the data. They qualified the quantitative data using subject research and thematic synthesis (Quick et al. 2022). In the last several decades, physical therapy education has evolved into a doctoral-level field with increased independence and breadth of practice. Parallel to these shifts, healthcare and higher education systems and structures have also shifted, making these once peripheral issues central to legislative and political debate. The development of internet, blended, and flipped learning approaches that augment or replace traditional classroom teaching with internet resources has further expanded educational opportunities (Gagnon et al 2020).

2. Strategies for hands-on learning

There is wide variation in the extent to which experiential learning is included in PT programs. Specific forms of hands-on education require less time and effort than others. Which strategies are most effective for a given course depends on several factors, including budget, accessibility, time limits, and desired learning results.

2.1. Simulation

The notion of using virtual patients to teach physical therapy is not new. For many years, people have turned to simulation as a tool for learning and evaluating new abilities. One of the simulation's numerous advantages is that it can be employed for practicing a skill until it is mastered. Having the imitated patient look and act like a genuine patient is crucial for realistic simulation. This problem may be solved using digital patients and patient simulators for extensive training. If a simulation is successful, it will allow students to act as active participants in the learning process by experiencing, reflecting on, and then building upon that experience with new ideas and plans. Students were able to practice their skills without worrying about potentially injuring an actual patient by participating in simulations before their clinical rotations in the critical care unit of the hospital.

Training may include both actual and computer-generated patients who are acted upon in various simulated settings. Unlike in a more conventional medical context, patients in these simulations may rapidly advance during treatment, and the circumstances frequently depend on actual patient situations. All members of the simulation team need to be well versed in the patient's history and the goals of the exercise.

2.2. Synergistic clinical encounters

Apprenticeship training, in which students learn from more experienced doctors and long-term practice training, where students can improve their skills, has long been the backbone of medical school. The delivery, financing, and public perception of healthcare have undergone significant transformations in recent decades, as shown in Figure 1. Current global and municipal cost-containment and quality and safety demands pose a threat to this style of medical education. Reduced possibilities for direct patient care have arisen due to a shorter average hospital stay, limits on trainee work hours, and reduced physician discretion. Reduced training chances result from restrictions on trainees' work hours, production constraints, and patients' knowledge of trainees' practices.

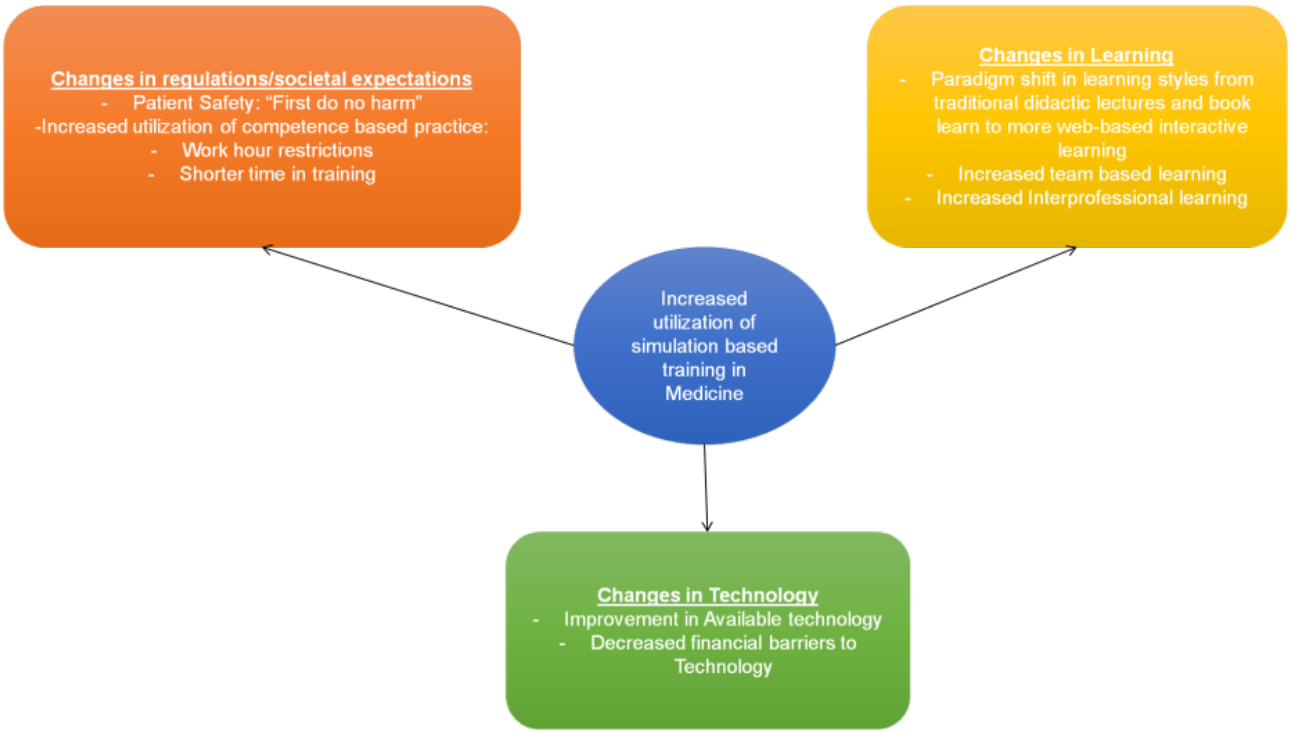

Figure 1 Reasons why medical schools should use simulation-based teaching more.

Traditional paradigms of medical education are becoming more challenging to implement in light of these changes, which translate to a shorter training period, fewer direct patient interactions, and less opportunity to conduct operations. Before working on real patients, trainees may rehearse a procedure or clinical situation in a virtual setting with the help of simulation training. The level of realism in these workshops varies with the cases and tools used.

Simulations are used in many nonmedical contexts to train professionals, including pilots, military people, firefighters, and nuclear power plant staff, on how to handle emergencies.

The medical industry is rapidly using simulation technology to improve clinical education. For instance, simulated patients are used in the medical field to assist in training future doctors in interpersonal and professional interactions by providing a secure space for students to practice and obtain instructor advice. Simulation-based learning in medical school is more effective than problem-based learning in improving analytical and managerial proficiency.

2.3. Integrated clinical experience (ICE)

ICE enables students to interact with clients/patients right away. While there are several approaches to ICE emancipation, the most common approaches include eight to ten students for every clinical educator on the faculty. Most PPEs have a student-to-clinical-teacher ratio of 2:1 or less. Students gain from ICE because they have real-world experience interacting with patients and clients and responding to their needs and those of their caregivers. Self-evaluation is encouraged via ICE's many tools. Although professors often play the role of practical instructors in ICE settings, top-notch clinical locations and medical instructors may also play an essential role in student learning. Because of the increased urgency with which ICE-taught abilities must be demonstrated, they can potentially improve classroom responsibility.

2.4. Community patient resource group (CPRG)

The CPRG is a novel approach for facilitating communication between medical professionals and academics. The Community Physical Therapy Resource Group (CPRG) is composed of local residents who have partnered alongside the school to serve as "patients" for pupils from physical therapy (PT) departments. At different points throughout the academic year, the group participates in activities designed to provide participants with the chance to evaluate actual "patients" whose conditions are similar to those studied in class.

2.5. Professional practice opportunity (PPO)

PPO is similar to ICE, except that it provides more guidance. Participants must visit two to four clinical locations, complete an assignment related to the area of competence, and consider the care given to at least one patient. Students are expected to perform interesting clinical assessments, shares, and research. Pupils can use and even enhance their connection skills even while learning new skills, which is not the primary objective. Students are able to discover further about the experience of being entailed in folks by meeting a variety of individuals. This method can be particularly useful in situations such as cardiac treatment centres and neonatal critical care units, where students are typically unable to receive practical experience. Students with a particular interest in these topics can still experience the quality of care provided there and potentially interact with professionals who might later serve as instructors.

3. Elements for enhanced learning

There are various experiential learning approaches, yet they have certain basic features.

3.1. Affective and psychomotor skill development via early practice

Educational experiences, in contrast to other professional practice experiences (PPE), may be included in the theoretical section of the PT curriculum right from the course of study. Learning is reinforced and given meaning when students are given opportunities to use their newfound knowledge soon after being introduced to it. It is common for learners to feel more at ease with "hard" skills such as physical examination than with "soft" skills such as patient interviewing and management at the outset of their medical education. Students may obtain affective, psychological, and mental abilities in a controlled setting by gaining early patient experience.

3.2. Action-based Education

Students must apply their understanding to new situations to complete hands-on tasks for actual academic credit, and learners need to use what they know in new situations. Students must use higher-order thought and take an involved role in their learning. Active learning made a large difference in how well the students thought they could apply what they learned in class and how well they knew about the topic. Simulations, ICEs, service learning, CPRGs, and PPOs all help students learn more actively because they require students to use and combine what they already know. Many PT schools try to use training methods that support active learning, but lectures are still the most common way to obtain information. Active learning can be added to PT curricula with the help of experiential learning, which can be used in addition to class or other idle ways of teaching.

3.3. Stable impartial setting

By taking away the pressure that comes with PPEs, hands-on learning gives students the chance to make faults in a low-stakes setting. It has been shown that giving individuals a secure setting for practicing skills improves their self-esteem, trust,

clinical thinking, and ability to do more than one thing at a time in complicated situations. There is no chance that a patient will be hurt during computer training activities. Pupils can still feel the effects of bad choices, but they can try again and again to improve their skills without worrying about long-term effects. This setting could be particularly beneficial for students who are learning skills for emergency care or a circulatory situation. Some forms of hands-on training, such as CPRGs, PPOs, ICEs, and volunteerism, allow students to utilise their skills in a setting that fosters growth and improvement while allowing them to make errors without facing severe consequences. This is because these programmes involve less monitoring than others.

3.4. Self-examination and introspection

Traditional classrooms seldom allow pupils to receive constructive criticism of their social and verbal abilities. When students engage in the guided practice of these abilities in fresh contexts with classmates and patients or customers, they have several chances to evaluate their performance. Students are often asked to consider criticism and assess their progress. Students may acquire the abilities necessary for self-reflection via guided introspection as they develop professionally. Teachers may stimulate students' capacity for reflection and self-analysis by having them complete tasks related to their actual learning experiences. According to research, physiotherapy students benefit from opportunities for practice, examination, self-assessment, and criticism. They also found that students' scores were lower in those areas of exercise regardless of the subgroup that concentrated on communication abilities, suggesting that PT courses may benefit from a greater emphasis on interpersonal skills training. Experiential learning was deemed the most efficient approach to instruction in relationships.

4. Experiencing people of varying ages and medical conditions

It is simple to include high-risk age groups and diagnoses in PT courses when using a simulator. Students may practice skills such as physiological surveillance in a low-stakes setting using simulations that include patients with complicated appearances. Evaluation should focus on activities such as introspection, the integration of new and existing bodies of information, and participatory clinical reasoning to maximise the learning potential of the experience. Students are frequently discouraged from requesting specialist clinics due to a lack of availability of PPE if they are very confident that this is the area of healthcare in which they want to work as professionals. There are no such restrictions with hands-on instruction; it may provide for more varied educational opportunities. Measuring clinical practice competence using simulated patients did not significantly differ from other teaching methodologies. However, the authors admitted that additional studies are needed to fully address the implications of experiential learning.

The students acted out the scenario in groups of participants. The same case was being worked on by both groups of trainees at different stages of the client's clinical development. A total of 98% (n = 66) of those in class B and 99% (n = 72) of the students in class A completed the clinical decision machine tool (CDM) satisfactorily before taking part in the game. The second-year learners had a first response rate of 94% (n = 65) after the virtual exercise. Nevertheless, because of missing data, two more people were eliminated during the procedure, leaving a total rate of response of 91% (n = 67). The first response rate of the freshman-year class was 96% (n = 72) after the simulation was finished. The ultimate percentage of respondents was 95% (n = 62); nevertheless, one of the respondents was eliminated because of inaccurate information. Figure 2 displays every category's responses.

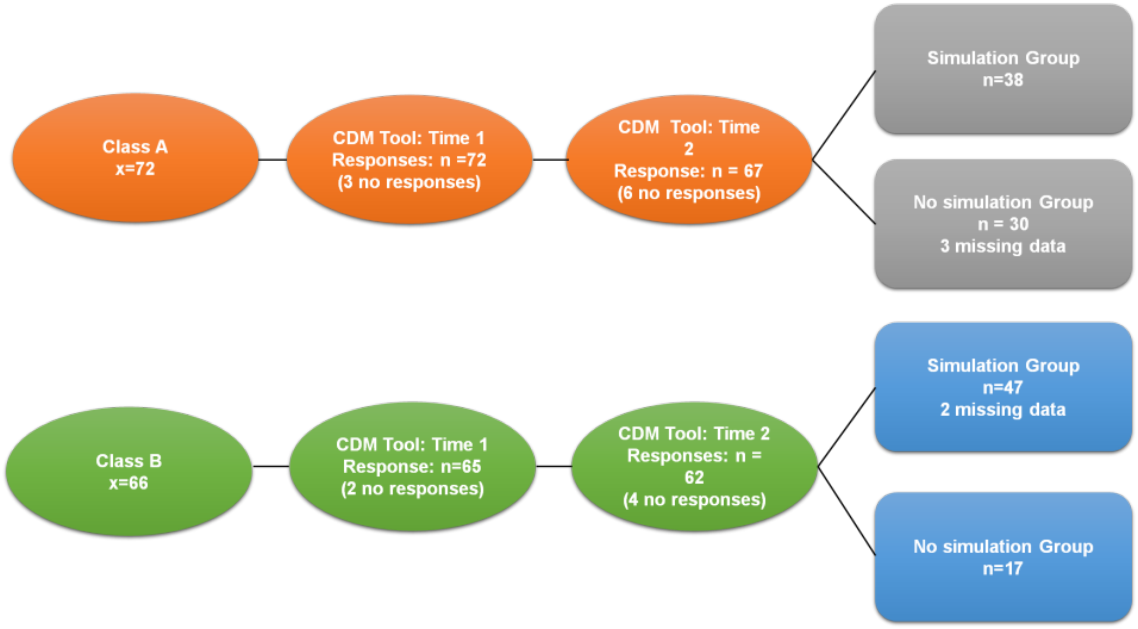

Figure 2 Simulation and response among patients.

5. Results and Discussion

Every PT programme may include hands-on training provided that the faculty is willing and accommodating. Pupils may be better equipped to succeed in formalised PPEs without as much concern for their psychosocial abilities if they are given opportunities to develop their trust and social skills via hands-on instruction early in their education. To help students progress from inexperienced to proficient physical therapists, it is essential to encourage introspection early in their training.

The relationship between time and simulation engagement was considerable. An example where the learner participates in a simulation—which might be a task trainer or a mixture of both simulations—is shown in Figure 3 and Table 1. A closer look at the fundamental impacts revealed that although there was actually no disparity across the groups before the experimentation, after the simulations, a statistically significant disparity appeared among groups. In other words, the number of people in the group participating in the simulation increased noticeably.

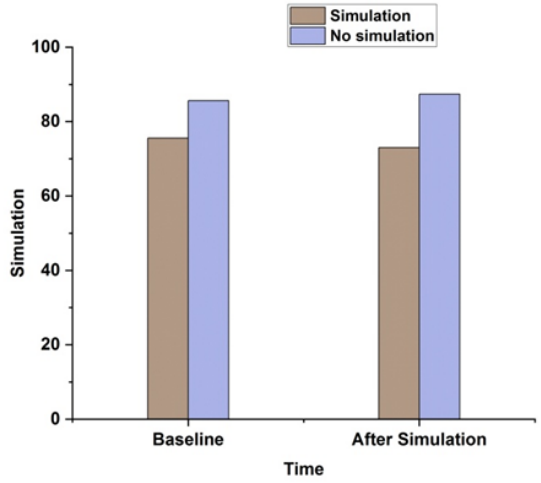

Figure 3 Relationships between simulator engagement and duration.

Table 1 Relationships between with and without simulation.

Time	Simulation	
	Simulation	No simulation
Baseline	75.54	85.64
After Simulation	73.03	87.39

The curriculum had a substantial time-by-year interaction impact, as shown in Figure 4 and Table 2. In addition, when looking at the simple effects, we find that our conclusions hold at both time 1 (baseline) and time 2. At both times, the CDM scores of the class B students were greater than those of the class A students. In addition, between time 1 and time 2, both groups showed substantial gains in CDM scores. The correlation between time and academic year was moderate.

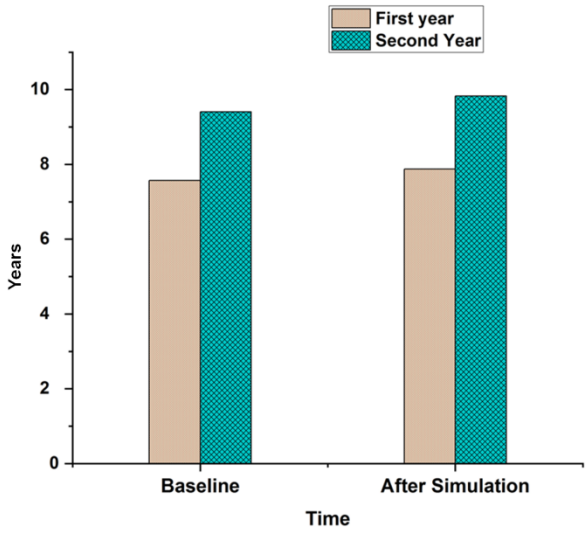

Figure 4 Significant interaction effect between time and year.

Table 2 Relationships between time and year.

Time	Year	
	First year	Second Year
Baseline	75.68	94.06
After Simulation	78.78	98.27

6. Final considerations

Although the value of practical experience has been widely acknowledged, the optimal approach and the level of immersion required to produce favourable results remain unknown. To generalise the slight variations in student learning, further research is necessary to evaluate different approaches to experiential learning that focus on the same patient group. Education for new physical therapists should heavily emphasise hands-on experience. According to the research, there were noticeable gains after taking part in only one simulation. If the findings can be reproduced, simulation opens the possibility of academic and possibly further education. When designing an instructional program, it is essential to give careful consideration to the resources, including money, equipment, and training, needed to carry out simulations. By simulating team-based healthcare settings, simulated patients also help with cross-disciplinary learning. Physical therapists often work with other health care workers, and virtual patients give students a chance to practice communicating and working as a team with people from different fields. By working with virtual coworkers from different fields, students learn how to address problems that involve more than one field, improve teamwork, and build a patient-centred approach to care.

Ethical Considerations

Not Applicable.

Conflict of Interest

The authors declare no conflict of interest.

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References

Anderson, D.K., Furze, J.A. & Moore, J.G., (2019). Moving toward excellence in pediatric physical therapy education: a scoping review. *Pediatric Physical Therapy,* 31(1), 95-113.*DOI:* 10.1097/PEP.0000000000000549

Boeldt, D., McMahon, E., McFaul, M. & Greenleaf, W., (2019). Using virtual reality exposure therapy to enhance treatment of anxiety disorders: Identifying areas of clinical adoption and potential obstacles. *Frontiers in psychiatry*, 10, 773. https://doi.org/10.3389/fpsyt.2019.00773

Feng, H., Li, C., Liu, J., Wang, L., Ma, J., Li, G., Gan, L., Shang, X. & Wu, Z., (2019). Virtual reality rehabilitation versus conventional physical therapy for improving balance and gait in Parkinson's disease patients: a randomized controlled trial. *Medical science monitor: international medical journal of experimental and clinical research,* 25, 4186.doi: 10.12659/MSM.916455

Gagnon, K., Young, B., Bachman, T., Longbottom, T., Severin, R. & Walker, M.J., (2020). Doctor of physical therapy education in a hybrid learning environment: reimagining the possibilities and navigating a "new normal". *Physical Therapy*, 100(8), 1268-1277.https://doi.org/10.1093/ptj/pzaa096

Huhn, K., Gilliland, S.J., Black, L.L., Wainwright, S.F. & Christensen, N., (2019). Clinical reasoning in physical therapy: a concept analysis. *Physical therapy*, 99(4), 440-456.https://doi.org/10.1093/ptj/pzy148

Kononowicz, A.A., Woodham, L.A., Edelbring, S., Stathakarou, N., Davies, D., Saxena, N., Car, L.T., Carlstedt-Duke, J., Car, J. & Zary, N., (2019). Virtual patient simulations in health professions education: systematic review and meta-analysis by the digital health education collaboration. *Journal of medical Internet research,* 21(7), e14676doi: 10.2196/14676

Leysen, M., Nijs, J., Van Wilgen, P., Demoulin, C., Dankaerts, W., Danneels, L., Voogt, L., Köke, A., Pitance, L. & Roussel, N., (2021). Attitudes and beliefs on low back pain in physical therapy education: A cross-sectional study. *Brazilian journal of physical therapy*, 25(3), 319-328.https://doi.org/10.1016/j.bjpt.2020.08.002

Mulligan, E.P., Rauh, M.J., Heiderscheit, B. & Jenkins, W.L., 2020. Sports Physical Therapy Education in the United States: Where Do We Go from Here? A Survey of American Academy of Sports Physical Therapy Members. *Journal of allied health*, 49(2), 79E-87E.

Prall, J. & Ross, M., (2019). The management of work-related musculoskeletal injuries in an occupational health setting: the role of the physical therapist. *Journal of exercise rehabilitation*, 15(2), 193.doi: 10.12965/jer.1836636.318

PrvuBettger, J. & Resnik, L.J., (2020). Telerehabilitation in the age of COVID-19: an opportunity for learning health system research. *Physical therapy*, 100(11), 1913-1916.https://doi.org/10.1093/ptj/pzaa151

Quick, S.M., Snowdon, D.A., Lawler, K., McGinley, J.L., Soh, S.E. & Callisaya, M.L., (2022). Physical Therapist and Physical Therapist Student Knowledge, Confidence, Attitudes, and Beliefs About Providing Care for People With Dementia: A Mixed-Methods Systematic Review. *Physical Therapy*, 102(5), p.pzac010.https://doi.org/10.1093/ptj/pzac010

Roman, G. & Buman, M.P., (2019). Pre-admission predictors of graduation success from a physical therapy education program in the United States. *Journal of Educational Evaluation for Health Professions*, 16.DOI: https://doi.org/10.3352/jeehp.2019.16.5

Simpson, P., Holopainen, R., Schütze, R., O'Sullivan, P., Smith, A., Linton, S.J., Nicholas, M. & Kent, P., (2021). Training of physical therapists to deliver individualized biopsychosocial interventions to treat musculoskeletal pain conditions: a scoping review. *Physical therapy*, 101(10), p.pzab188.https://doi.org/10.1093/ptj/pzab188

Tome, A. & Coelho, J.L., (2023). Physiotherapy Education in the Digital Era: A Roadmap of Educational Technologies for Allied Health Educators. *In Handbook of Research on Instructional Technologies in Health Education and Allied Disciplines*, 26-54. IGI Global.DOI: 10.4018/978-1-6684-7164-7.ch002

Turolla, A., Rossettini, G., Viceconti, A., Palese, A. & Geri, T., (2020). Musculoskeletal physical therapy during the COVID-19 pandemic: is telerehabilitation the answer?. *Physical therapy*, 100(8), 1260-1264https://doi.org/10.1093/ptj/pzaa093