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TITLE: The effect of high fidelity simulated learning methods on physiotherapy pre-registration education: a systematic review protocol. [Protocol.]

YEAR: 2017

Version history:

The first version of this protocol was originally made available on 30-11-2017.
This version of the protocol was originally made available on 30-11-2017.
In total, there have been zero known revisions of the protocol.

Review objective

The objective of this review is to identify if high fidelity simulated learning methods are effective at enhancing clinical/practical skills compared to usual, low fidelity simulated learning methods in pre-registration physiotherapy education.

Background

Physiotherapy education ensures that students have the required knowledge and skills to practice as entry level physiotherapists upon graduation.[1-4] Consequently student physiotherapists require theoretical knowledge across a range of areas in addition to the ability to clinically reason, interact with patients and other members of the interdisciplinary team, provide education and advice as well as apply physical treatments.[1-4]

The pre-registration training of physiotherapists has traditionally incorporated college/university learning combined with clinical practice. During university-based learning there is usually a combination of theoretical and practical learning: The theory being learned in a normal classroom followed by practice of physical/practical skills on peers in an environment that replicates the outpatient environment with plinths, hand tables, stools and chairs. Practical learning for all key areas of physiotherapy practice (musculoskeletal, cardiovascular and neurological – in and outpatient) would be undertaken in the same setting. Students would then undertake periods of supervised practice in a clinical setting where they are expected to apply the theory and practical skills they have learned to the assessment and treatment of patients.

The physiotherapy profession advocates that pre-registration education ensures graduates are equipped to practice autonomously.[5] Consequently students are required to be able to undertake the duties of a physiotherapist including performing assessment and treatment skills, the application of clinical reasoning skills and effective communication and team working skills immediately upon graduation.[1-5] Although the various physiotherapy professional bodies indicate required course content, their recommendations about teaching and learning methods are more vague simply indicating that course teams should give consideration to teaching and learning methods that maximize learning and that prepare students well for initial practice.[1,2] In fact only the World Confederation for Physical Therapy (WCPT) mention how practical skills should be developed indicating that students should practice on each other, a form of low fidelity simulation.[5]

Isselberg and McGaghie[6] suggest that learning the cognitive knowledge required in practice is different

to the learning required for acquiring clinical/practical skills. They indicate that for the development of clinical/practical skills learners need to engage in repeated and deliberate practice and receive specific and focused feedback. This means students need to be active and engaged learners, something that is supported by Bland, Topping and Wood[7] who also indicate that students need to understand how the cognitive and psychomotor skills required for professional practice interact.

In the UK, healthcare has been driving a quality agenda for many years. It has a strong focus on the provision of effective, high quality but value for money care.[8] Additionally, patient safety is essential with this having been highlighted recently in the Francis Report[9] and the World Health Organization (WHO) developing a patient safety curriculum.[10] These drivers are reiterated in other countries, for example the Affordable Care Act.[11] The imperative to provide safe, effective and efficient high quality care in addition to increases in student numbers in some countries and reducing staff numbers in others is putting pressure on student placement opportunities due to challenges to provide sufficient supervision to ensure safety and still achieve the required workload.[12-14] It is therefore incumbent on providers of pre-registration university-based physiotherapy education to ensure students are as prepared as possible for clinical placement to reduce the workload on their clinical educators.

The principles of safe, effective and high quality care[15] must be inculcated in students from the commencement of their training. In higher education there is also a drive to provide high quality and effective education opportunities with the introduction of the National Student Survey in the UK, the Student Experience Survey in Australia and the Canadian University Survey Consortium survey for example.[16-18] This has resulted in the development of an enhancement environment where staff are encouraged to think about the most effective ways of helping students learn. In many areas there has been a move from methods where knowledge is simply transmitted to students, to those supported by theories of Androgogy that encourage students to be active and engaged learners whose learning is facilitated through social interaction, something that simulation is well placed to provide.[7]

Within medical and nursing education simulated practice for learning clinical skills has long been in place as it has been suggested it provides an opportunity to better prepare for clinical practice.[19] Simulated learning is defined as:

'*An array of structured activities that represent actual or potential situations in education and practice. These activities allow participants to develop or enhance their knowledge, skills and attitudes or to analyse and respond to realistic situations in a simulated environment'* [20(pp32)]

In physiotherapy education simulation has always been evident, at a basic level, through classrooms replicating outpatient settings, skills practice on peers and students undertaking role play to mimic patients.[21] This should, in essence, facilitate the development of practical skills.[6]

There is a continuum of simulation from low to high fidelity[19] with 'fidelity' referring to the reality of the simulation.[22] Low fidelity simulation would equate to students undertaking role play or allowing peers to practice on each other, techniques traditionally used in physiotherapy education. High fidelity simulation however would require involvement of others to take on the role of patients, in simulation terminology standardized patients.[20] Alternatively, it could involve using computerized manikins or even virtual simulation where a student engages in computer games that simulate clinical situations.[20] An additional consideration is the authenticity of the situation that is utilized. This relates to the processes students go through during the simulation mirroring those encountered in actual practice as closely as possible.[22] An example would be the challenge of having to teach a technique such as active cycle of breathing to somebody who has no knowledge of what it entails.

Bland, Topping and Tobbell suggest that learning is enhanced when the situation is both realistic and authentic.[22] This would indicate that learning should take place in an authentic and realistic setting and situation. Additionally it implies that simulation methods beyond practicing on peers may be more beneficial. A belief in this approach is evidenced through the increased use of simulated learning activities in medical and nursing education.[23,24] This has been supported, certainly in the United Kingdom, by the Department of Health: The Chief Medical Officer indicated that simulation is an important method of learning for safer patient care and that it needs to be more fully integrated into health care education.[25] Internationally there is also support, for example the large scale project undertaken in Australia by Wright, Moss, Watson and Rue.[14] As Gaba indicates, simulation is a technique that "replaces or amplifies real experiences with guided experiences, often immersive in nature, that evoke or replicates substantial aspects of the real world in a fully interactive fashion."[26(pp126)] In this way learners are encouraged to apply and understand the cognitive and psychomotor skills required in professional practice.

A brief literature search will show a growth in literature pertaining to the use of high fidelity simulation in physiotherapy education. This is in relation to outcomes such as the development of practical skills, communication skills, confidence and decision making.[27-29] Simulation can be a time consuming learning method as high fidelity simulation requires high staff to student ratios and well equipped simulated learning environments. Before we can continue to develop the evidence base it is necessary to review what has already been established to identify future research priorities.

A search for systematic reviews relating to simulation use in physiotherapy education in the JBI Database of Systematic Reviews and Implementation Reports, PEDRO, CINAHL, Medline, PROSPERO and The Cochrane Database of Systematic Reviews indicated that three reviews have been undertaken to date.[30-32] The most recent review, by Pritchard et al., reported on the use of simulated patients in physiotherapy education. However, they excluded studies that utilized near peer role play (where senior students enact the role of the patient with portrayal of appropriate patient

presentation for more junior students to assess or treat) and consequently may have excluded information on a potentially beneficial method of learning.[30] A brief literature search also shows that there has been literature published since this systematic review and that alternative uses of simulated patients have also been investigated and yet not included in this review.[33]

Mori et al. undertook a systematic review of the use of simulated learning experiences in physiotherapy entry-to-practice curricula however they excluded studies that focused on communication and interpersonal skills, an essential part of physiotherapy training.[31] They also undertook their literature search in 2013 and as a consequence any subsequent publications with alternative simulation methods were not included. The final review focused solely on the effectiveness of online technology in physiotherapy education but again the search was undertaken in 2013.[32]

This suggests that an up to date systematic review addressing the use of simulation across physiotherapy education is required. This should consider whether high fidelity simulation provides any advantage to the traditional low fidelity simulation learning methods in the development of practical skills and communication skills in addition to clinical reasoning and any other professional level skills such as time management.

Inclusion criteria

Types of participants

Studies that include pre-registration physiotherapy students will be considered for this review. Pre-registration courses may confer licensure or a Diploma, Honours, Masters (pre-registration) or doctoral degree. The level of qualification required for entry to the profession varies from country to country and consequently any studies that have used pre-registration students during their entry level training will be considered. Published research investigating the learning achieved by physiotherapy students during interprofessional learning activities will be included only where data specifically relating to physiotherapy students can be extracted.

Types of intervention(s)

This review will consider studies that evaluate high fidelity simulation. The definition of simulation to be used is that defined in the Healthcare Simulation Dictionary: “An array of structured activities that represent actual or potential situations in education and practice” that enable students to “enhance their knowledge, skills and attitudes or to analyze and respond to realistic situations in a simulated environment”.[20(pp31)]

As this review aims to be comprehensive a wide range of simulated activities will be included:

- Simulated person - ' a person portraying a patient' [20(pp32)]
- Manikin-based simulation – 'the use of manikins to represent a patient '[20 (pp21)]
- Virtual simulation – 'the recreation of reality depicted on a computer screen' [20(pp40)]

Simulated person will encompass standardized patients, volunteer patients and near peer role play. These interventions may be supplemented by on-line study/skills packages, video demonstrations and by reflection on skills performance through video analysis. The simulated activities may be uni- or inter-professional but it must be possible to extract data specifically relevant to the physiotherapy students. Interventions included will be classed as high fidelity but this will be used in a broad way to encompass anything beyond the traditional low fidelity simulation methods used in physiotherapy education (peer practice/role play and paper patients). If a study has used both low and high fidelity methods they will be included only if the dominant component is high fidelity or if it is possible to separate information relating to the two methods.

Methods of portraying patients such as video clips may be incorporated into virtual learning resources or even in classroom activities to replace paper case studies. Consequently video case studies will be included. Additionally simulations of any frequency and/or intensity will be included.

Comparator

The comparator is low fidelity simulation. Traditionally pre-registration physiotherapy education requires peers to take on the role of 'patient' in the form of role play and for skills to be practiced on peers wherever this is appropriate, activities which are low fidelity simulation. More invasive techniques such as endotracheal suction would not traditionally be practiced**.** As a consequence peer practice and peer role play will be the comparators in this systematic review. Paper patients/case studies will be a further comparator.

Outcomes

Primary outcomes will be standardized objective measures of skills performance including but not limited to, peak force, force amplitude, oscillation frequency and the Assessment of Physiotherapy Practice.[34] Measures of clinical reasoning, self-efficacy, confidence, communication skills and professional skills such as team working and prioritization will be included. Any methods of measuring these outcomes will be included such as, but not limited to, standardized measures (for example Student Perception of Effective Teaching in Clinical Simulation (SPETCS), Attitudes Towards Health Care Teams Survey, Readiness for Interprofessional Learning (RIPL), Arizona Clinical Interviewing Rating Scale and Assessment of Physiotherapy Practice tool (APP)). Additionally measures developed by researchers specifically for their study will be included.

Secondary outcomes will be aspects such as perception of impact where the change is not actually measured but is reported by students in questionnaires using categorical data.

Outcomes may be measured pre and post intervention or only post intervention. This will be influenced

by the type of study.

Types of studies

This review will consider experimental study designs including randomized controlled trials (if available), non-randomized controlled trials, quasi-experimental, before and after studies, prospective cohort studies, case control studies and analytical cross sectional studies. Additionally studies which have used questionnaires to investigate student views and perceptions of learning will be included but only where quantitative data is available. Inclusion of this data may provide information about the value students place on high fidelity simulated activities which may be interesting to relate to actual impact on skills performance.

Search strategy

The search strategy aims to find both published and unpublished studies. A three-step search strategy will be utilized in this review. An initial limited search of Medline and CINAHL will be undertaken followed by analysis of the text words contained in the title and abstract, and of the index terms used to describe articles. A second search using all identified keywords and index terms will then be undertaken across all included databases. Thirdly, the reference list of all identified reports and articles will be searched for additional studies. Studies published in a language other than English will only be included if a translation is available as translation services are not available to the authors. Studies published between 1978 (when physiotherapy first became an autonomous profession in the UK) to the present will be considered for inclusion in this review.

The databases to be searched include:

CINHAL, Medline, Eric and AMED

The search for unpublished studies will include:

EThOS Networked Digital Library of Theses and Dissertations

Google Scholar

Initial keywords to be used will be:

Student, physiotherap*, physical therap*, educat*, learn*, teach*, skill* develop*, simulat*, patient simulat*, standard* patient*, high fidelity simulat*, computer simulat*, on-line skills, virtual patient, part practice, feedback, role play.

Assessment of methodological quality

Papers selected for retrieval will be assessed by two independent reviewers for methodological validity prior to inclusion in the review using standardized critical appraisal instruments from the

Joanna Briggs Institute (JBI-SUMARI) (http://joannabriggs.org/research/critical-appraisal-tools.html. As appropriate, check lists for the following will be utilized: cohort studies (JBI Critical Appraisal Checklist for Cohort Studies), case series (JBI Critical Appraisal Checklist for Case Studies), case reports JBI Critical Appraisal Checklist for Case Reports), case control studies (JBI Critical Appraisal Checklist for Case Control Studies), randomized controlled trials studies (JBI Critical Appraisal Checklist for Randomized Controlled Trials) , quasi-experimental studies studies (JBI Critical Appraisal Checklist for Quasi-Experimental Studies). Any disagreements that arise between the reviewers will be resolved through discussion, or with a third reviewer.

Data extraction

Data will be extracted from papers included in the review by two independent reviewers using the standardized data extraction tool from JBI-MAStARI (Appendix I). The data extracted will include specific details about the interventions, populations, study methods and outcomes of significance to the review question and specific objectives.

Where data reported in primary studies is unclear or information is missing authors will be contacted to request clarification. For data that has only been reported in abstract, for example conference presentations, authors will again be contacted and requests made for full reports.

Data will be extracted by two reviewers. Where differences in data from both reviewers is identified differences will be discussed. Where agreement is not reached a third, independent reviewer will be review the data source. Their decision on data to be included will be final.

Data synthesis

Quantitative data will, where possible, be pooled in statistical meta-analysis using JBI-MAStARI. All results will be subject to double data entry. Effect sizes expressed as odds ratio (for categorical data) and weighted mean differences (for continuous data) and their 95% confidence intervals will be calculated for analysis. Heterogeneity will be assessed statistically using the standard Chi-square and also explored using subgroup analyses based on the different study designs included in this review. Where statistical pooling is not possible the findings will be presented in narrative form including tables and figures to aid in data presentation where appropriate.

Conflicts of interest

Nil

Acknowledgements

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315 Appendix I: **MAStARI data extraction instrument**

JBI Data Extraction Form for Experimental / Observational Studies

Reviewer _____ Date _____

Author _____ Year _____

Journal _____ Record Number _____

Study Method

RCT ☐ Quasi-RCT ☐ Longitudinal ☐

Retrospective ☐ Observational ☐ Other ☐

Participants

Setting _____

Population _____

Sample size

Group A _____ Group B _____

Interventions

Intervention A _____

_____

Intervention B _____

_____

Authors Conclusions:

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_____

Reviewers Conclusions:

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Study results

Dichotomous data

Outcome	Intervention ( ) number / total number	Intervention ( ) number / total number

Continuous data

Outcome	Intervention ( ) number / total number	Intervention ( ) number / total number

318