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**Does additional training using a human patient
simulator improve cardiorespiratory physiotherapy
clinical performance?**

Thesis submitted by

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For the degree of Doctor of Philosophy
In the School of Public Health, Tropical Medicine and
Rehabilitation Sciences
James Cook University

Declaration by author

This thesis is composed of my original work, and contains no material previously published or written by another person except where due reference has been made in the text. I have clearly stated the contribution by others to jointly authored works that I have included in my thesis.

I have clearly stated the contribution of others to my thesis as a whole, including statistical assistance, survey design, data analysis, significant technical procedures, professional editorial advice, and any other original research work used or reported herein. The content of my thesis is the result of work I have carried out since the commencement of my research higher degree candidature and does not include a substantial part of work that has been submitted to qualify for the award of any other degree or diploma in any university or other tertiary institution. I have clearly stated which parts of my thesis, if any, have been submitted to qualify for another award.

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Anne Jones

1 December 2010

Contributions to jointly authored works contained in the thesis

Jones, A., & Sheppard, L. (2007b). Physiotherapy education: a proposed evidence-based model. *Advances in Physiotherapy*, 4, 1–5.

Author contributions: AJ participated in the study concept and design, reviewing of the literature and preparation of the manuscript. LS participated in the study design and preparation of the manuscript.

Jones, A., & Sheppard, L. (2011a). Developing a measurement tool for assessing physiotherapy students self efficacy: a pilot study. *Assessment and Evaluation in Higher Education* (First published on: 18 March 2011). doi: 10.1080/02602938.2010.534765

Author contributions: AJ participated in the study concept and design, reviewing of the literature and preparation of the manuscript. LS participated in the study design and preparation of the manuscript.

Jones, A., & Sheppard, L. (2011b). Physiotherapy scenario development: a new approach. *Focus on Health Professional Education*, in press.

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Jones, A., & Sheppard, L. (2011c). Self efficacy and clinical performance: a physiotherapy example. *Advances in Physiotherapy* (Early online), 1-5.

Author contributions: AJ participated in the study concept and design, reviewing of the literature and preparation of the manuscript. LS participated in the study design and preparation of the manuscript.

Jones, A., & Sheppard, L. (2011d). Use of a human patient simulator to improve physiotherapy cardiorespiratory clinical skills in undergraduate physiotherapy students: a randomised controlled trial. *Internet Journal of Allied Health Science and Practice*, 9(1).

Author contributions: AJ participated in the study concept and design, reviewing of the literature and preparation of the manuscript. LS participated in the study design and preparation of the manuscript.

Contributions by others to the thesis as a whole

Dr Lorraine Sheppard (supervisor) contributed to the design of the trial. Dr Petra Buttner and Angela from the graduate research schools statistical support unit provided statistical consultation. Margaret Bowden provided professional editorial assistance with formatting the final thesis. This was limited to standards D and E of the Australian Standards for Editing Practice as per the JCU policy on proof reading and editing of theses and dissertations.

Parts of the thesis submitted to qualify for the award of another degree

None.

Published works by the author incorporated into the thesis

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Jones, A., & Sheppard, L. (2011d). Use of a human patient simulator to improve physiotherapy cardiorespiratory clinical skills in undergraduate physiotherapy students: a randomised controlled trial. *Internet Journal of Allied Health Science and Practice*, 9(1).

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Additional published works by the author relevant to the thesis but not forming part of it

Jones, A., & Sheppard, L. (2007a). Can human patient simulators be used in physiotherapy education, *The Internet Journal of Allied Health Sciences and Practice*, 5.

Declaration on ethics

The research presented and reported in this thesis was conducted within the guidelines for research ethics outlined in the *National Statement on Ethics Conduct in Research Involving Humans* (1999), the *Joint NHMRC/AVCC Statement and Guidelines on Research Practice* (1997), the *James Cook University Policy on Experimentation Ethics: Standard Practices and Guidelines* (2001), and the *James Cook University Statement and Guidelines on Research Practice* (2001). The proposed research methodology received clearance from the James Cook University Experimentation Ethics Review Committee (approval number H2384).

Anne Jones

1 December 2010

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Abstract

Background

Simulation as an educational intervention is currently a discussion point around the world. It has been proposed that simulation may protect patient safety and reduce the time required by students in clinical practice. These reported benefits come from repeated practice in a safe environment, and the ability to modify patient cases and the complexity of those cases. One area in which physiotherapy may use simulation is in cardiorespiratory physiotherapy.

Physiotherapy education provides students with the skills and knowledge required to work in a clinical environment. According to Bandura, self efficacy is the link between how a person uses their skills and knowledge. Self efficacy may determine how well students perform in an academic and clinical setting. Therefore, it may be more useful to assess students' self efficacy as well as performance instead of just performance following an educational intervention.

Aim

This thesis aims to compare traditional training with traditional training plus an additional eight hours of simulation training in the area of cardiorespiratory physiotherapy. The primary outcome measure was improved clinical performance as assessed using the Assessment of Physiotherapy Practice (APP), a standardised physiotherapy clinical assessment tool. Self efficacy was also measured to determine

whether it correlated to pre-clinical academic performance or clinical performance, and thus whether it changed following the simulation intervention.

Method

A randomised controlled trial was undertaken in which physiotherapy students were allocated to either the control group, with no additional training, or the intervention group, with two four-hour additional training sessions using a human patient simulator. A self efficacy questionnaire was developed to assess students' self efficacy following traditional training or simulation training. Following the training period, participants commenced clinical placement. They were assessed weekly with the APP for six weeks to determine their clinical performance. Correlation was undertaken between self efficacy and pre-clinical cardiorespiratory academic performance, and self efficacy and cardiorespiratory clinical performance. Between group analysis was undertaken to determine whether participants who had additional training either:

- a. scored higher on clinical performance
- b. became competent one week earlier than those without additional training, or
- c. whether those who had a pass grade (50–64.99%) for their pre-clinical cardiorespiratory subjects improved more with additional simulation training.

Results

Participants who had two additional four-hour simulation training sessions did not have improved performance when assessed weekly on clinical placement and did not reach competence one week earlier. Those students with a pass grade did not have

improved performance with simulation training. Self efficacy had a moderate correlation with pre-clinical performance. Those students with no additional training had a positive correlation between self efficacy and clinical performance in a number of areas over a number of different weeks, but mainly in the area of performing treatment. Those students with additional simulation training had negative correlations in the area of written communication and performing treatment. It appears that the simulation training may have improved students' self efficacy but not their clinical performance. It was not possible to see whether self efficacy changed following the simulation training due to the lack of student responses prior to attending simulation training.

Conclusion

This research demonstrates that simulation training performed in this manner did not improve clinical performance. However, it may have had an effect on self efficacy. This is an important finding given the importance of self efficacy for a person's use of their skills and knowledge. This research highlights the need to develop evidence based education to determine when and how simulation may be best used in physiotherapy, and particularly in cardiorespiratory physiotherapy.

Keywords

Cardiorespiratory, Education, Physiotherapy, Self efficacy, Simulation

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Abbreviations used in the thesis

ACLS	Advanced Cardiac Life Support Skills
APA	Australian Physiotherapy Association
APC	Australian Physiotherapy Council
APP	Assessment of Physiotherapy Practice
CD ROM	Compact Disc Read Only Memory
CPR	Cardiopulmonary Resuscitation
CS	Competence Score
ECG	Electrocardiogram
HPS	Human Patient Simulators
ICU	Intensive Care Unit
IV	Intravenous
JCU	James Cook University
OSCE	Objective Structured Clinical Exam
PBL	Problem Based Learning
PEG	Percutaneous Endoscopic Gastrostomy
VR	Virtual Reality

Definitions

Australian Physiotherapy Council: The body which reviews all entry level physiotherapy programs in Australia to ensure that the Australian Physiotherapy Competency Standards are met, and thus graduates are competent and eligible for registration as physiotherapists.

Assessment of Physiotherapy Practice: The clinical assessment tool used to assess students on their competence during and at the end of a clinical placement.

Cardiorespiratory physiotherapy: Physiotherapy assessment and treatment for people with both acute and chronic cardiac and respiratory conditions. It includes pre and post operative patients, especially following abdominal, cardiac and thoracic surgery, and patients with medical conditions that affect their respiratory and cardiovascular systems. Techniques are aimed at reducing pain, improving ventilation, removing secretions within the lungs, improving function, including increasing walking distance, exercise tolerance, activities of daily living, and joint movement and strength. As well, patients are provided with education regarding their condition and self management strategies to maintain or improve their quality of life.

Case scenario: Usually paper based cases that reflect some or all of a patient's condition and/or admission. Case scenarios can be skills based, problem based, issues based or speculative based. Case scenarios may form the basis of a simulation.

Clinical experience: A short period of time, usually hours, in which students get to experience the clinical environment with limited exposure to people with medical or surgical conditions.

Clinical placement: A set period, in this case six weeks, dedicated to a particular area of physiotherapy practice, such as cardiorespiratory physiotherapy. During this time, physiotherapy students assess and treat people under the supervision of a registered physiotherapist. As the placement progresses and the students' skills develop, less supervision is provided, and students increase their workload and become more independent. Students are provided with feedback throughout their placement but formal feedback is usually provided half way through and at the end of the placement, when the student receives a grade.

Computer programs: Software that allows learners to interact with the learning material.

Competence: One's ability to use knowledge, skills and attitudes to perform safely and effectively. Competence can be measured and correlates to job performance. In the discipline of physiotherapy within Australia entry level competence is has been set by the Australian Physiotherapy Competency Standards and can be measured by the Assessment of Physiotherapy Practice.

Competence score: The score gained by a student out of a total of 80 when assessed with the APP whilst on clinical placement.

Facilitator: The person who helps direct students during a simulated experience.

Fidelity: How well the experience or appearance matches the real environment it is mimicking. Fidelity ranges from low through to high. This term is used mainly for human patient simulators but can also be used for a situation.

Haptics: Touch feedback is used to provide actual feel to the experience. It is usually found in laparoscopic and endoscopy training.

High-fidelity simulator: Computerisation that aids sophisticated interaction between the simulator and the learners. This can include appropriate responses to drug administration. There is a high match with real life.

Human patient simulator: Also known as a mannequin, which looks and acts like a real body to some degree.

Low-fidelity simulator: One where there is limited interaction with the simulator and the environment, for example Resusci Anne® which ‘clicks’ when the chest is depressed. This means there is a low match with real life.

Mannequins: Also known as human patient simulators.

Medium-fidelity simulator: Some computerised programming that enables changes in physiological signs such as heart rate and rhythm, respiratory rate and auscultation findings. There is a moderate match with real life.

Part task trainer: A device that allows for learning of a specific skill. For example, it may be a forearm with simulated veins for practice of intravenous catheter insertion.

Pre-clinical training: Completion of all subjects prior to PS3005 Physiotherapy Theory and Application 1, which is the first clinical placement subject that occurs in second semester, third year at JCU.

Psychomotor: Movements of the body and the associated mental activity.

Self efficacy: A person’s judgement about their capability to organise and execute methods to achieve their goals.

Simulation: An educational exercise that mimics real life. Simulation ranges from case studies, through to part task trainers, through to full body mannequin simulators and standardised patients. Also includes computer and virtual reality systems.

SOAP: Subjective assessment, Objective assessment, Analysis, and Plan. This is a standard note writing format found in Australia that is used by physiotherapists for writing in medical records.

Standardised patients: Usually actors trained to portray a real patient.

Traditional training: Completion of PS2002 Physiotherapy 1 and PS3001 Physiotherapy 3, the two pre-clinical acute care subjects. The two subjects had a combined total of 52 hours of lectures, 92 hours of practical classes and 4 hours of clinical experience.

Virtual reality: An artificial environment produced by a computer in which a user can use real equipment to manipulate that environment.