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Does Perceived Self-Confidence Predict Medical Student Simulation Performance?

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ABSTRACT

Objective: *The intent of this study is to assess the reliability of self-reported confidence levels as predictors of skill competence in a simulation-based medical student clinical skills course.*

Methods: *Two hundred and sixty-five(265) first-year medical students participated in the study. The study consisted of a pre-activity assessment and confidence survey, during which students had to accurately identify clinical skill findings on the high-fidelity simulation (HFS) manikins and complete asix-item confidence scale to determine their level of confidence in accurately identifying clinical skills. Following this, facilitators trained students on proper clinical skill evaluation techniques after which a post-activity assessment and confidence survey were administered. The study ended with completion of a satisfaction survey with a subsequent debriefing.*

Results: *From pre-activity to post-activity assessment, the mean skill competence scores increased from 63.80% to 88.82%. The mean self-confidence scores increased from 67.30% to 91.09%. Although increases in self-confidence and competence were statistically significant ($p < 0.01$), there was a very weak correlation present between both in pre- and post-activity values ($r = 0.06$ and $r = 0.32$, respectively).*

Conclusions: *This study shows that self-reported confidence is not reliable in predicting students' outcomes of a clinical skills assessment before- and after simulation activity.*

Keywords: *Medical education, simulation, self-confidence, competence, prediction, clinical skills*

INTRODUCTION

Mastery of clinical skills is an important prerequisite for transitioning from basic science to clinical rotations in the medical school curricula. Learning clinical skills on a human may be challenging due to the lack of available patients with physical findings of interest, such as specific heart sounds and/or murmurs, lung sounds, etc. Various simulation modalities are frequently used to create realistic frameworks for learning the patient physical exam. Simulation allows educators to create a low-stress environment for medical students to learn and practice clinical skills in a standardized and reproducible setting. The Lake Erie College of Osteopathic Medicine (LECOM) has developed and successfully implemented a simulation-based clinical skills course for first-year medical students. The focus of medical education has been to determine the most effective and efficient method to ensure the clinical skills of students are developed well. HFS is on the cutting edge of medical education allowing students to gain invaluable experience in developing clinical skills that are transferrable to realistic patient scenarios. Simulation-based assessment also gives educators the chance to assess and evaluate student performance in a reproducible environment that mimics real patient encounters [1]. While the use of simulation as a teaching modality has been steadily increasing, the findings in simulation studies have remained varied, as there is not a well-established standardized tool for simulation-based assessment of medical students. The effectiveness of simulation was assessed by using various outcomes, including skill performance, knowledge acquisition, self-confidence, and learner satisfaction [2-3].

Many studies have utilized and showcased simulation-based training as a tool that not only allows students to practice skill competence without compromising patient safety, but also improves confidence levels [4, 8-13]. However,

various studies showed inconsistent data regarding the correlation between confidence (self-ratings) and clinical skill performance after simulation [5-7].To further address this inconsistency, this study was designed to assess whether self-reported confidence can predict outcomes of clinical skills assessment.

MATERIALS AND METHODS

Study Context, Design, and Participants

Two hundred and sixty-five (265) Lake Erie College of Osteopathic Medicine (LECOM) first-year medical students (MS1) participated in the pilot study. Before the simulation activity, all students completed a didactic part of the course that consisted of a comprehensive review of normal and abnormal clinical findings and the pathophysiology behind them. A panel of clinical content experts assessed the quality and realism of clinical findings generated by the HFS (SimMan 3G and SimMan Classic, Laerdal), and found them realistic and similar in presentation. A 5-item clinical skills checklist, consisting of measuring blood pressure, lung auscultation, heart auscultation, palpation of centralpulse, and interpretation of heart rhythm, was developed to assess medical student competence.

During 60-minute simulation sessions, students were assessed on their abilities to measure the 5-item clinical checklist both before and after simulation-based training with their instructor. Students were also asked to fill out confidence surveys before and after the simulation activity (Likert scale from 1 to 5, 6 items), which included the following:

1. I developed a better understanding of the pathophysiology of heart murmurs, rhythms and lung sounds
2. I am confident of my taking blood pressure skill
3. I am confident that I can distinguish systolic and diastolic heart murmurs
4. I am confident that I can distinguish various lung sounds
5. I am confident that I can evaluation/arterial pulse for strength
6. I more confident that I can distinguish different heart rhythms

Students then completed a satisfaction survey (Likert scale from 1 to 5, 13 items). All simulation sessions were facilitated by the same instructors. The clinical skill checklist and confidence scale results were converted to percentage values out of 100 to allow for comparisons. This study was exempted from IRB approval as it was part of the curriculum for a History and Physical course at the medical college

Procedure

Students were randomly assigned into groups of five to seven individuals for 60-minute clinical skills simulation sessions. Four LECOM faculty members were trained on the HFS manikins and facilitated all of the clinical skills simulation sessions. The clinical skills simulation sessions were divided into the following four components:

1. Pre-Activity Assessment and Pre-Activity Confidence Level Questionnaire: for fifteen minutes, students attempted to accurately identify clinical skill findings on the HFS manikins and then completed the six-item confidence scale to determine their pre-simulation training activity level of confidence in accurately identifying clinical skills.
2. Simulation-Based Training Activity with Instructor: for twenty minutes, students were trained by the facilitators in proper clinical skill evaluation technique on the HFS manikins and exposed to normal and abnormal clinical skill presentations for each of the five clinical skills being tested.
3. Post-Activity Assessment and Post-Activity Confidence Level Questionnaire: for fifteen minutes, the students repeated the task of accurately identifying clinical skill findings and completed another six-item confidence scale to determine their post-simulation training activity confidence.
4. Debriefing and Satisfaction Surveys: for ten minutes, at least two facilitators were involved in providing feedback and students completed a satisfaction survey. Also included was a feedback questionnaire to gather information on how to improve the simulation sessions during future iterations.

Analysis

Data analysis was performed using R Studio version 1.2.1335 with R version 3.6.0. Two-sided paired t-test was used for statistical analysis of the same subjects' Pre- and Post-Assessment means. Pearson’s correlation coefficient was used to measure statistical relationship between competence and confidence means.

RESULTS

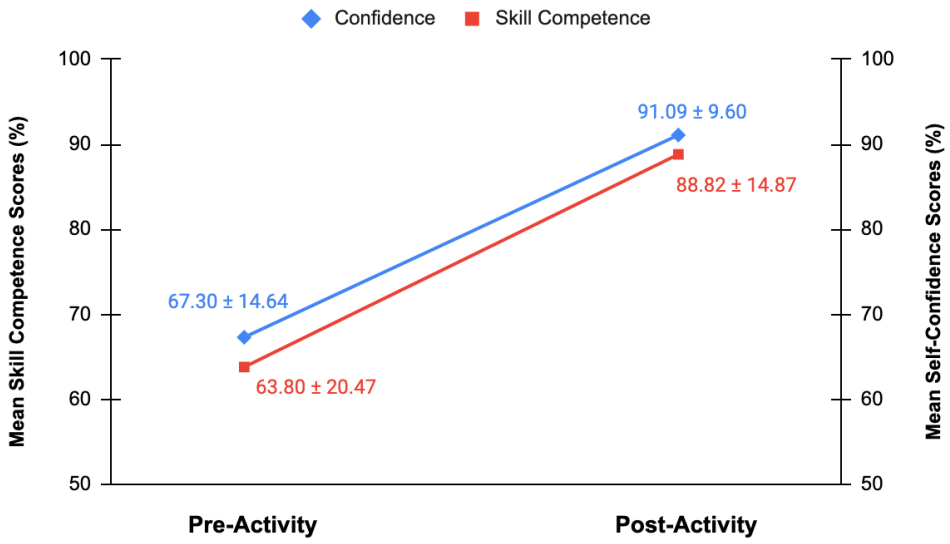

Figure1. *Mean Skill Competence and Self-Confidence scores at Pre-Simulation and Post-Simulation Activity*

The participants' pre-activity and post-activity clinical skills scores and self-confidence scores are presented in Figure 1. There was a significant increase ($p < 0.01$) from the pre- to post-activity scores in competency and self-confidence.

Table1. *Correlation between skill competence and self-confidence scores*

	Pre-Activity Assessment	Post-Activity Assessment
Pearson r	0.06	0.32
p-value	0.28	< 0.01

As shown in Table 1, there was no correlation between the levels of clinical skills and self-confidence.

Table2. *Confidence levels comparing under performers and over performers (Likert scale values are presented in parentheses)*

	Low performers[1]	High performers[2]
Number of Students	28	234
Pre-Activity Confidence	66.19% (3.31)	67.56% (3.38)
Post-Activity Confidence	84.64% (4.23)	91.83% (4.59)
p-value	< 0.01	< 0.01

[1]*Scored 0-60% on post-activity assessment*

[2]*Scored 80-100% on post-activity assessment*

The students were further stratified based on their clinical assessment scores. Low performers were those who scored between 0-60% on the post-activity assessment and the high performers where those who scored between 80-100% on the post-activity assessment. The pre-activity to post-activity self-confidence levels significantly increased ($p < 0.01$) for both low performers and high performers.

DISCUSSION

The aim of the study was to assess whether self-reported confidence is predictive of skill competence. Based on the results, there was a very weak correlation present in mean pre- and post-activity assessment scores of self-confidence and clinical competence despite there being a significant increase in mean scores of both, as seen in Figure 1 and Table 1. This result is consistent with multiples studies indicating that self-confidence levels are not predictive of competence, especially when approaching and interacting with real patients [15-16]. The importance of self-confidence is critical, especially when translating the learned clinical skills to clinical clerkships. Although the results presented with a significant increase in self-reported confidence levels, it does not accurately describe observed behavior with students resulting in under- or over-estimating

their abilities [2]. Furthermore, this problem is not only limited to medical students, as it has been observed in physicians independent of level of training or specialty [14, 17]. Given the findings, it is vital to recognize that perceived self-reported confidence is not the most accurate indicator of clinical competence.

The students in the study who underperformed on post-simulation activity were of greater concern. As shown in Table 2, these students' increase in self-confidence level was not reflected by similar increases in their assessment scores. Similarly, Laschinger et al. demonstrated that self-assessment can be an inaccurate and possibly inappropriate predictor of actual performance [3].

A possible explanation could be that underperformers entered the simulation sessions with a lesser knowledge base in comparison to their peers [18].Another possibility could be that the environment placed further pressure on the student to perform. It is critical to recognize such students who have weaknesses in their knowledge of clinical skills. The Matthew effect states that pre-existing knowledge correlates with higher educational success [19], which could be attributed to the high performers in this study. Our results suggest that simulation sessions should be tailored to the knowledge levels of individual students. Students may also benefit from a spaced repetition approach by incorporating multiple sessions throughout their medical training [18]. These aspects warrant further investigation as there is an inadequate body of evidence related to the impact of individually tailored recurrent simulation sessions.

Our study emphasizes the need to place an importance on the knowledge of each student to prevent poor outcomes during clinical clerkships. Although only a minority of students (10.69% (28/262)) were low performers, even these numbers are unacceptably high when treating patients. Other studies have shown a decrease in confidence levels when students transitioned into the clerkships [15, 20-21]. Ensuring that a proper clinical foundation has been established during the didactic portion of medical school for each student will set up for a smooth transition into clinical clerkships.

Limitations

Our study has several limitations. First, although students responded that their understanding of pathophysiology of abnormal clinical findings improved, it was based on a subjective evaluation. The use of an objective assessment of pathophysiology of normal and abnormal clinical findings would permit a more precise assessment of baseline knowledge prior to simulation. This may help to tailor the stimulation according to the students' needs. Second, the study does not follow-up on how confidence changed after simulation training beyond the students' first year of medical school. Our future study aims to assess confidence levels among the same cohort of students two-years after simulation to examine whether clinical skills have transferred into their clinical clerkships. Additionally, simulation training was limited to a single sixty-minute session, but future curriculum will involve multiple simulation training sessions within the more robust curriculum.

CONCLUSION

This study shows that self-reported confidence before and after the simulation-based training is not accurate in predicting students' clinical skills performance, as there was no strong relationship between self-confidence and competence. Therefore, it is important to develop assessment tools that can better predict competence.

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