

## Clinical simulation in nursing in the light of experiential learning: systematic review

*Simulação clínica em enfermagem à luz da aprendizagem experiencial: revisão sistemática*

*Simulación clínica en enfermería a la luz del aprendizaje experiencial: revisión sistemática*

### ABSTRACT

**Objective:** to identify the effectiveness of clinical simulations based on experiential learning as a theoretical-methodological framework in comparison with different pedagogical strategies in nursing education. **Method:** systematic review carried out using the sources: Medical Literature Analysis and Retrieval System Online; Scopus, Web of Science, Latin American and Caribbean Literature in Health Sciences, Cumulative Index to Nursing and Allied Health Literature, and Educational Resources Information Center. Instruments were used to evaluate the methodological path. **Results:** 268 studies were identified and four made up the sample. Experiential learning in the simulation was compared to case study; expository class; problem solving and simulation without framework. The studies obtained good quality by the JBI instrument and moderate by the Medical Education Research Study Quality Instrument. **Conclusion:** experiential learning is effective for simulation-based nursing education. **Descriptors:** Nursing Education; Training by Simulation; Learning; Teaching; Effectiveness.

### RESUMO

**Objetivo:** identificar a efetividade da simulação clínica baseada na aprendizagem experiencial, como referencial teórico-metodológico, em comparação com diferentes estratégias pedagógicas no ensino em enfermagem. **Método:** revisão sistemática, realizada nas fontes *Medical Literature Analysis and Retrieval System Online*; *Scopus*, *Web of Science*, *Literatura Latino-Americana e do Caribe em Ciências da Saúde*, *Cumulative Index to Nursing and Allied Health Literature* e *Educational Resources Information Center*. Utilizou-se instrumentos de avaliação do percurso metodológico. **Resultados:** identificaram-se 268 estudos, e quatro compuseram a amostra. Comparou-se a aprendizagem experiencial na simulação com o estudo de caso; aula expositiva; resolução de problemas e a simulação sem referencial. Os estudos obtiveram boa qualidade pelo instrumento do JBI e moderada pelo *Medical Education Research Study Quality Instrument*. **Conclusão:** a aprendizagem experiencial sinaliza efetividade para o ensino em enfermagem baseado em simulação. **Descritores:** Educação em Enfermagem; Treinamento por Simulação; Aprendizagem; Ensino; Efetividade.

### RESUMEN

**Objetivo:** identificar la efectividad de la simulación clínica basada en el aprendizaje experiencial, como marco teórico-metodológico, en comparación con diferentes estrategias pedagógicas en la educación en enfermería. **Método:** revisión sistemática, realizada en las fuentes *Medical Literature Analysis and Retrieval System Online*; *Scopus*, *Web of Science*, *Literatura Latinoamericana y del Caribe en Ciencias de la Salud*, *Cumulative Index to Nursing and Allied Health Literature* y *Educational Resources Information Center*. Se utilizaron instrumentos para evaluar la trayectoria metodológica. **Resultados:** identificaron 268 estudios, y cuatro compusieron la muestra. El aprendizaje experiencial se comparó con estudio de caso; clase expositiva; resolución de problemas y simulación sin referencia. Los estudios obtuvieron buena calidad por el instrumento del JBI y moderados por el *Medical Education Research Study Quality Instrument*. **Conclusión:** el aprendizaje experiencial señala la eficacia de la educación en enfermería basada en simulación. **Descritores:** Educación en Enfermería; Entrenamiento Simulado; Aprendizaje; Enseñanza; Efectividad.

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## INTRODUCTION

Learning based on clinical simulation has become a preferred pedagogical path for many undergraduate nursing courses around the world, as it is able to develop the learner's critical thinking, intensify the preparation for professional practice, and positively impact patient outcomes<sup>(1)</sup>.

Defined as a teaching and learning strategy that replicates real situations, in a safe and controlled environment, a clinical simulation requires a previous theoretical-methodological basis which allows proper planning and execution in order to achieve the desired learning objectives<sup>(2)</sup>. The theory of experiential learning has stood out among the possible references capable of supporting the development of simulations. Experiential learning is characterized by a four-stage learning cycle: concrete experience (acting); reflective observation (reflecting); abstract conceptualization (conceptualizing); and active experimentation (applying)<sup>(3)</sup>.

In the first stage, called concrete experience (acting), the learner participates in the simulated experience and absorbs the learning. During reflective observation (reflecting), he starts to reflect on the experience and reviews what he has learned and his feelings. In the conceptualization stage, the participant is already able to articulate the simulated experience with the theory, with the intention of explaining, based on scientific evidence, the events that occurred. Finally, in the active experimentation stage, the knowledge framework formed in the previous stages is used to make decisions, solve problems and actively exercise learning<sup>(3-5)</sup>.

Thus, it is believed that when a nursing student or a professional nurse goes through the four stages of experiential learning, in a clinical simulation, they are able to reflect on the experience, improve their knowledge, psychomotor skills and attitudes, and apply them in practice<sup>(3,5)</sup>.

In the meantime, despite being recommended as a theoretical framework to support learning in clinical simulation, it is not yet possible to identify in the literature conclusive outcomes about the effectiveness of experiential learning aimed at pedagogical contexts in nursing, configuring a scientific gap that aspires to deepen, with the intention of obtaining evidence regarding its potential, when compared to other strategies, to promote best practices in simulation<sup>(3-4,6-8)</sup>.

Thus, the lack of knowledge of the relevance of the use of existing theoretical frameworks for

teaching in nursing can negatively interfere with the achievement of the learning objectives proposed in a clinical simulation<sup>(6-8)</sup>. New studies in this area, which may culminate in the development of clinical skills of nursing students and professionals, are therefore necessary<sup>(1,3,5-6)</sup>. Given this context, the following question emerged: what is the effectiveness of clinical simulations based on experiential learning as a theoretical-methodological reference when compared to different pedagogical strategies aimed at teaching and learning of undergraduate nursing students and nurses? This study aimed to identify the effectiveness of clinical simulations based on experiential learning as a theoretical-methodological framework in comparison with different pedagogical strategies in nursing education.

## METHOD

This is a systematic literature review prepared according to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) strategy, in which the criteria are arranged in a 27-item checklist and a four-stages flowchart, which support the rigor in the development of this type of study<sup>(9)</sup>.

The following stages were taken: definition of the research question, specifying the population and intervention of interest; identification of databases, descriptors, keywords and search strategies; establishment of inclusion and exclusion criteria; search in the databases by two independent researchers; comparison of the examiners' searches and definition of the initial selection of studies; application of inclusion criteria and justification of possible exclusions, together with the critical analysis of all studies included in the review; elaboration of a critical summary, synthesizing the information provided by the articles included in the review and presentation of the conclusion, which informs the evidence on the effects of the intervention<sup>(10)</sup>.

The Patient-Intervention-Comparison-Outcomes (PICO) strategy was adopted to develop the research question. The acronym P (population) was represented by nursing students and nurses; the acronym I (intervention), the adoption of experiential learning as a theoretical-methodological framework in clinical simulations; the acronym C (comparison), for different pedagogical strategies or clinical simulation, not supported by this framework; and the acronym O (outcome), the effectiveness of teaching and

learning in nursing<sup>(11)</sup>. The following research question was defined: what is the effectiveness of clinical simulations based on experiential learning, as a theoretical-methodological framework, when compared to different pedagogical strategies aimed at teaching and learning of undergraduate nursing students and nurses?

The following inclusion criteria were considered: primary studies, only experimental and quasi-experimental, due to consistency with the research question<sup>(10)</sup> that sought to compare the effectiveness of clinical simulations, based on experiential learning, with other pedagogical alternatives in nursing, without limitation as to

language and time of publication, published in scientific journals and available electronically. Literature reviews, case studies, dissertations, theses, monographs and abstracts published in event proceedings were excluded.

The search for studies was carried out in April 2021, using the information sources: PubMed/Medline®, Scopus, Web of Science, Latin American and Caribbean Health Sciences Literature (LILACS), Cumulative Index to Nursing and Allied Health Literature (CINAHL) and Educational Resources Information Center (ERIC), through the descriptors and strategies, shown below, in Figure 1.

Figure 1 – Presentation of the information sources adopted for the selection of manuscripts included in the present research, respective descriptors, keywords and search strategies. Ribeirão Preto, São Paulo, Brazil, 2021.

Source of information	Descriptors and keywords	Search strategy
PubMed/Medline® and Scopus	Controlled descriptors, in English, identified in the <i>Medical Subjects Headings</i> (MeSH), <i>Nurses</i> ; <i>“Students, Nursing”</i> , <i>“Simulation Training”</i> , <i>“Education, Nursing”</i> , and the keyword <i>“Experiential learning Theory”</i> .	<i>(Nurses OR Nurse OR “Personnel, Nursing” OR “Nursing Personnel” OR “Registered Nurses” OR “Nurse, Registered” OR “Nurses, Registered” OR “Registered Nurse” AND “Students, Nursing” OR “Pupil Nurses” OR “Student, Nursing” OR “Nurses, Pupil” OR “Nurse, Pupil” OR “Pupil Nurse” OR “Nursing Student” OR “Nursing Students” AND “Simulation Training” OR “Training, Simulation” OR “Interactive Learning” OR “Learning, Interactive” AND “Experiential learning Theory” AND “Education, Nursing” OR “Nursing Education” OR “Educations, Nursing” OR “Nursing Educations”)</i>
CINAHL	Controlled descriptors, in English, identified in Titles/Subject: <i>Nurse</i> ; <i>“Students, Nursing”</i> ; <i>Simulations</i> ; <i>“Education, Nursing”</i> and the keyword <i>“Experiential learning Theory”</i> .	<i>(Nurse AND “Students, Nursing” AND Simulations AND “Experiential learning Theory” AND “Education, Nursing”)</i>
Web of Science	Descriptors, in English: <i>Nurses</i> ; <i>“Students, Nursing”</i> ; <i>“Simulation Training”</i> ; <i>“Education, Nursing”</i> and the keyword <i>“Experiential learning Theory”</i>	<i>(Nurses AND “Students, Nursing” AND “Simulation Training” AND “Experiential learning Theory” AND “Education, Nursing”)</i>
LILACS	Controlled descriptors present in the Health Sciences Descriptors (DeCS), in English: <i>Nurses</i> ; <i>“Students, Nursing”</i> ; <i>“Simulation Training”</i> ; <i>“Education, Nursing”</i> and the keyword: <i>“Experiential learning Theory”</i> ; In Portuguese, the terms were: <i>“Enfermeiras e Enfermeiros”</i> ; <i>“Estudantes de Enfermagem”</i> ; <i>“Treinamento por Simulação”</i> ; <i>“Educação em Enfermagem”</i> e a palavra-chave: <i>“Teoria da Aprendizagem Experiencial”</i> . In Spanish, the terms were: <i>“Enfermeras y Enfermeros”</i> ; <i>“Estudiantes de Enfermería”</i> ; <i>Entrenamiento Simulado</i> ; <i>“Educación en Enfermería”</i> . The keyword was <i>“Teoría del aprendizaje experiencial”</i> .	In English: <i>Nurses AND “Students, Nursing” AND “Simulation Training” AND “Experiential learning Theory” AND “Education, Nursing”</i> ; In Spanish: <i>“Enfermeras y Enfermeros” AND “Estudiantes de Enfermería” AND “Entrenamiento Simulado” AND “Teoría del aprendizaje experiencial” AND “Educación en Enfermería”</i> . In Portuguese: <i>“Enfermeiras e Enfermeiros” AND “Estudantes de Enfermagem” AND “Treinamento por Simulação” AND “Teoria da Aprendizagem Experiencial” AND “Educação em Enfermagem”</i> .
ERIC	Descriptors in English: <i>Nurses</i> ; <i>“Students, Nursing”</i> ; <i>“Simulation Training”</i> ; <i>“Education, Nursing”</i> . The keywords were <i>“Experiential learning Theory”</i>	<i>(Nurses AND “Students, Nursing” AND “Simulation Training” AND “Experiential learning Theory” AND “Education, Nursing”)</i>

Source: Prepared by the authors.

It is justified that the keyword entitled *“Experiential Learning Theory”* was adopted to

direct the search strategy, specifically for the intended object of study.

Two professionals independently read the titles and abstracts of the studies, with the help of a free, single-version web review program entitled Rayyan Qatar Computing Research Institute (Rayyan QCRI), found at [https:// rayyan.qcri.org](https://rayyan.qcri.org). This software ensures that researchers carry out the selection of studies in an organized and fast way, and export the articles from a database to the aforementioned software, with the blinding of the auxiliary researcher, which provides reliability to this process<sup>(12)</sup>.

There was divergence of assessment between the researchers in twenty-six studies; in these cases, the studies were delivered to a third party, who evaluated their inclusion or exclusion. After that, the articles were read in full to define the final sample. The information was extracted from the selected articles, using a validated and adapted instrument<sup>(13)</sup>, which considered the criteria: authorship, year and country, objectives, type of study and results/conclusion, in addition to the classification of the level of evidence<sup>(14)</sup>.

The methodological assessment of the studies was performed according to the critical appraisal instruments of the JBI and the Medical Education Research Study Quality Instrument (MERSQI)<sup>(15-16)</sup>. We chose to adopt both in order to obtain a broad scenario for evaluating the methodological quality of the articles, since these instruments have different perspectives and assessment criteria. The JBI instrument has nine

methodological assessment items, aimed at quasi-experimental studies and 13 for experimental studies, classified as present, absent, if there is clarity or not applicable<sup>(15)</sup>.

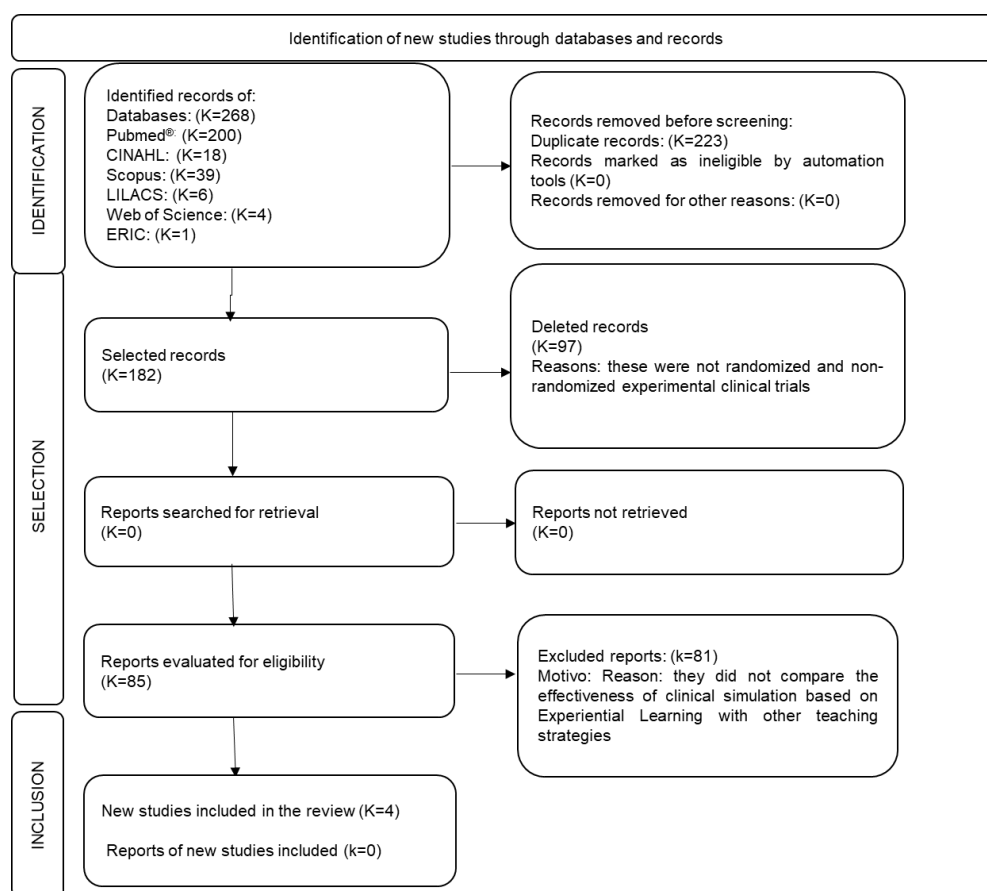
The MERSQI is made up of six domains, composed of criteria that assess the methodological quality of studies, namely: (1) study design; (2) sample; (3) data type; (4) validity of the assessment instrument; (5) data analysis and (6) results. The maximum score is 18 and studies with scores  $\leq 10$  are considered of low quality; from  $>10$  to  $<15$ , of moderate quality; and  $\geq 15$ , high quality<sup>(16)</sup>.

In line with the ethical and legal aspects of resolution 466/2012, the research was not submitted to the Research Ethics Committee, as it is a literature review and does not involve human beings. This study was duly registered on the PROSPERO platform – International prospective register of systematic reviews, and obtained number 222863.

## RESULTS

*A priori*, the selection of studies following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) recommendations is shown in Figure 2. It is noteworthy that, in this updated version of the PRISMA Flowchart<sup>(9)</sup>, the number of studies identified at any stage of the selection is represented by the letter K.

Figure 2 – Presentation of the selection of studies to compose the integrative review sample according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). Ribeirão Preto, São Paulo, Brazil, 2021.



\*CINAHL: Cumulative Index to Nursing and Allied Health Literature; LILACS: Latin American and Caribbean Literature in Health Sciences.

Source: survey data, 2021.

Of the 268 studies identified, four were included in the sample of the present research and are characterized in Figure 3, below.

Figure 3 – Characterization of the studies included in the review. Ribeirão Preto, São Paulo, Brazil, 2021.

Author and origin	Objective	Study type, sample, intervention and level of evidence	Main results and conclusion
Chmil et al. <sup>(17)</sup> USA	To identify how the Experiential Learning framework applied to clinical simulation affects the development of clinical judgment in nursing.	Quasi-experimental study, carried out with 144 nursing students. Experimental group (n=72) was submitted to a simulation based on Experiential Learning. Control group (n=72) was submitted to clinical simulation without a theoretical-methodological framework to support it. Level of Evidence 3	The clinical judgment score of the experimental group (27.81) was higher than the control group (20.75). The relationship between clinical judgment and simulation performance was also statistically significant in the experimental group (p<0.001). Clinical simulation based on experiential learning is more effective for developing clinical judgment when compared to simulation not supported by this framework.
Kuo et al. <sup>(18)</sup> Taiwan	To examine the effects of clinical simulation with the support of Experiential Learning, against the pedagogical problem-solving strategy, on medication errors.	Experimental, randomized study carried out with 93 nursing students. Experimental group (n=66) was submitted to simulation with emphasis on experiential learning. The control group (n=27) problem solving. Level of Evidence 2.	The number of times participants identified medication errors in the experimental group was significantly higher (p<0.001) compared to the control. It was concluded that simulation, with experiential learning, is more effective to develop knowledge about medication than problem solving in this area.

(continue)

Author and origin	Objective	Study type, sample, intervention and level of evidence	Main results and conclusion
Stayt et al. <sup>(19)</sup> United Kingdom	To identify the effectiveness of clinical simulation based on Experiential Learning, to recognize a deteriorating adult patient.	Randomized clinical trial, carried out with 98 nursing students. The Intervention Group was submitted to a simulation, based on Experiential Learning. The control group was submitted to a traditional expository class (lecture). Level of Evidence 2.	The intervention group performed better in the objective structured clinical examination. The simulation based on Experiential Learning was more effective than the traditional class to develop nursing knowledge about clinical deterioration.
Herrona et al. <sup>(20)</sup> USA	To determine whether the use of a clinical simulation, based on experiential learning is more effective than the case study.	Quasi-experimental study carried out with 165 nursing students. The control group underwent a case study. The Intervention Group, to clinical simulation, based on Experiential Learning. Level of Evidence 3.	The percentage of questions answered correctly was higher in the intervention group. The results suggest that the clinical simulation, based on experiential learning, was more effective than the case study to develop knowledge and satisfaction in nursing.

Source: Prepared by the authors.

The manuscripts that made up the sample were balanced between randomized clinical trial and quasi-experimental studies, with the first publication in 2015 and the most recent in 2019 and 2020<sup>(17-20)</sup>. It is noteworthy that all studies were international, half were from the USA<sup>(17,20)</sup> and the others from Asia<sup>(18)</sup> and the UK<sup>(19)</sup>.

The adoption of experiential learning, as a framework, articulated with clinical simulation, showed signs of potential for teaching and learning in nursing, superior to the following pedagogical strategies: (1) case study, (2) traditional

lecture/expository class, (3) problem solving, and (4) clinical simulation not supported by a framework<sup>(17-20)</sup>.

The skills that experiential learning was able to enhance and that were valued in the included studies are: clinical judgment in nursing, knowledge and satisfaction with learning<sup>(17-20)</sup>.

Next, a critical appraisal of the methodological quality of the selected studies was made, *a priori* of those with a quasi-experimental design, according to the JBI instrument, as shown in Figure 4, below.

Figure 4 – Critical assessment of the methodological quality of quasi-experimental studies according to the JBI appraisal instrument. Ribeirão Preto, São Paulo, Brazil, 2021.

Question	Chmil et al.(17)	Herrona et al.(20)
1. Is it clear in the study what is the "cause" and what is the "effect"?	Yes	Yes
2. Were the participants included in any comparisons similar in characteristics?	Yes	Yes
3. Did the participants receive similar treatment?	Yes	Yes
4. Was there a control group?	Yes	Yes
5. Were there multiple measurements of the outcome both pre and post the intervention/exposure?	No	No
6. Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed?	Yes	Yes
7. Were the outcomes of participants included in any comparisons measured in the same way?	Yes	Yes
8. Were outcomes measured in a reliable way?	Yes	Yes
9. Were appropriate statistical analyses used?	Yes	Yes

Source: JBI<sup>(15)</sup>.

Figure 5 presents the critical appraisal of the methodological quality of randomized clinical trials, according to the JBI assessment instrument.

Figure 5 – Critical appraisal of the methodological quality of experimental, randomized studies, according to the JBI instrument. Ribeirão Preto, São Paulo, Brazil, 2021.

Questions	Kuo et al.(18)	Stayt et al.(19)
1. Was true randomization used for assignment of participants to treatment groups?	Yes	Yes
2. Was the investigator responsible for allocating treatment groups blinded?	Unclear	Yes
3. Were the treatment groups similar?	Yes	Yes
4. Were participants blind to treatment assignment?	Unclear	Unclear
5. Were those delivering treatment blind to treatment assignment?	Unclear	Yes
6. Were outcomes assessors blind to treatment assignment?	Unclear	Unclear
7. Were treatment groups treated identically other than the intervention of interest?	Yes	Yes
8. Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed?	Yes	Yes
9. Were participants analyzed in the groups to which they were randomized?	Yes	Yes
10. Were outcomes measured in the same way for treatment groups?	Yes	Yes
11. Were outcomes measured in a reliable way?	Yes	Yes
12. Was appropriate statistical analysis used?	Yes	Yes
13. Was the trial design appropriate, and any deviations from the standard randomized clinical trial design accounted for in the conduct and analysis of the trial?	Yes	Yes

Source: JBI(15).

The quasi-experimental studies included in the present review met most of the quality assessment criteria indicated by the JBI instrument and were therefore considered of good quality. Only the criterion referring to the use of multiple measurements of the outcome both pre and post the intervention/exposure was not met in two studies<sup>(17-20)</sup>.

In the experimental studies, despite the fact that most of the criteria indicated for the quality

assessment were met, methodological weaknesses were identified regarding the criterion of blinding the researcher, the participants, those responsible for delivering the treatment and the outcome evaluators, as well as the allocation of treatment<sup>(18-19)</sup>. MERSQI was also used to assess the methodological quality of the studies included in the sample, as shown in Figure 6.

Figure 6 – Assessment of the methodological quality of the studies according to the Medical Education Research Study Quality Instrument. Ribeirão Preto, São Paulo, Brazil, 2021.

Domains	Chmil et al.(17)	Kuo et al.(18)	Stayt et al.(19)	Herrona et al.(20)
Study design	Non-randomized: 2 points	Randomized: 3 points	Randomized: 3 points	Non-randomized: 2 points
Number of study centers and response rate	A single institution: 0.5 >75% response rate: 1.5 points	A single institution: 0.5 points. >75% response rate: 1.5	Two institutions: 2.0 >75% response rate: 1.5 points	A single institution: 0.5. >75% response rate: 1.5 points
Type of assessment	Objective assessment: 2.0 points	Objective assessment: 2.0 points	Objective assessment: 2.0 points	Objective assessment: 2.0 points
Validity of the assessment instrument	Internal structure, content, relationships with other variables: 0 points	Internal structure, content, relationships with other variables: 0 points	Reported internal structure and content: 1 Relationships with other variables: 0 points	Internal structure and reported content: 1 point. Relationships with other variables: 1 point
Validity of the assessment instrument	Internal structure, content, relationships with other unreported variables: 0 points	Internal structure, content, relationships with other unreported variables: 0 points	Internal structure and reported content: 1 point Relationships with other unreported variables: 0 point	Internal structure and reported content: 1 point Relationships with other unreported variables: 1 point
Data analysis	Appropriate for study design: 1 point In addition to descriptive analysis: 2 points	Appropriate for study design: 1 point In addition to descriptive analysis: 2 points	Appropriate for study design: 1 point In addition to descriptive analysis: 2 points	Appropriate for study design: 1 point In addition to descriptive analysis: 2 points
Results	Knowledge and Skills: 1.5 point	Knowledge and Skills: 1.5 point	Knowledge and Skills: 1.5 point. Satisfaction, attitudes, perceptions and trust: 1 point	Knowledge and Skills: 1.5 point Satisfaction, attitudes, perceptions and trust: 1 point
Total score	10.5	11.5	15.0	13.5

Source: Medical Education Research Study Quality Instrument (MERSQI)<sup>(16)</sup>.

Through the use of MERSQI, it was possible to affirm that the studies included in the sample obtained, in the majority, moderate methodological quality ( $10 < n < 15$ ), with a score above 10 points, a mean value of 12.62 points, a minimum value of 10.5 and a maximum of 13.5 points<sup>(17-18,20)</sup>. Only one study was considered of high quality with a score of 15 points<sup>(19)</sup>.

The criteria responsible for conferring methodological fragility to the studies, according to MERSQI, were: the execution of the studies in a single center/institution and the lack of clarification regarding the validity of the assessment instruments, highlighted by these manuscripts. It is worth considering that the meta-analysis was not carried out in the present research, given the lack of similarity between the studies and their outcomes, especially regarding the educational interventions adopted.

## DISCUSSION

Learning through experimentation is considered a valuable resource to establish relationships between practice and theory and to enhance the development of clinical skills in nursing<sup>(21-23)</sup>, and even though, the cultural variables that emerge in a study, according to with their origin, they can influence learning, even more so when it is based on the replication of real situations, as in clinical simulation<sup>(1-3,5)</sup>. American nursing students<sup>(17-20)</sup> have contact with the strategy of clinical simulation, based on experiential learning, from the first moments of the undergraduate course, which gives greater affinity with the teaching and safety strategy to transpose the simulated experience to real practice<sup>(17-20)</sup>. In other countries<sup>(18-19)</sup>, the adoption of the simulated experience as a pedagogical strategy is still expanding, as is also the case in the national context<sup>(2,23)</sup>, stimulating scientific deepening regarding the cultural relationship that comes from studies and its effects on teaching and learning through simulation.

The present study gives the science of nursing originality, as it presents, for the first time, the effectiveness of the use of experiential learning, as a framework for clinical simulation, compared to other pedagogical strategies, and also with the clinical simulation itself that did not adopt this model of learning. In addition, the main skills that the articulation of simulation and experiential learning are able to develop were synthesized, signaling potential for teaching and learning in

nursing, based on a rigorous methodological assessment.

Making use of experiential learning, a quasi-experimental study carried out with 144 nursing students compared the adoption of this framework to support the execution of a clinical simulation with the simulation that was not based on this learning model. The study found that the application of the four stages of experiential learning, during the execution of the simulation, proved to be more effective to improve skills, such as clinical judgment in undergraduate nursing students than the simulation, not supported by this pedagogical framework<sup>(17)</sup>.

A descriptive, exploratory study with a quantitative approach carried out in a hospital in Rio Grande do Sul, Brazil, corroborated the potential of experiential learning to support clinical simulation in nursing. This study aimed to understand and problematize the process of learning in nursing through experiential learning, in *in-situ* simulation, and showed that reflection on the experience, carried out in a systematic way had a positive impact on learning outcomes in nursing, such as the development of self-confidence, self-efficacy, critical thinking and motivation<sup>(5)</sup>.

The effectiveness of experiential learning, applied to clinical simulation, is possibly due to its differentiated operation, which seeks to instigate the learner's reflection, based on his actions and knowledge, going beyond the mere repetition of actions and valuing the cognitive aspects. (knowledge), motors (procedural skills) and relational (attitudes/behavior) in nursing, which is in line with what is proposed in a formative assessment process, necessary to develop clinical competence in this scope<sup>(2)</sup>.

The opposite situation is observed in exclusively traditional teaching, where the pedagogical strategies adopted are still linked only to the summative assessment, which generates anxiety and fear in the learner, barriers and difficulties for the development of learning<sup>(2)</sup>. In this context, a randomized clinical study carried out in the United Kingdom explored the effectiveness of experiential learning to support clinical simulation, compared to traditional lectures to improve clinical performance in recognizing and treating a deteriorating adult patient in the hospital. The group submitted to simulation with experiential learning performed significantly better than the group submitted to the traditional strategy, for the acquisition of the proposed skills, mainly due to the possibility of



reflecting on the learning and not just receiving the knowledge in a passive way<sup>(19)</sup>.

In the present study, constructs capable of evaluating the methodological quality of the included articles were adopted, such as the JBI instrument, which revealed the good quality of quasi-experimental and experimental research, and indicated weaknesses in aspects such as the absence of multiple measurements of results over time and blinding of those involved in the studies<sup>(15-16)</sup>.

The importance of carrying out multiple measurements of results, over time, in intervention studies, is to minimize threats to the validity of the data and verify the retention of knowledge or a skill that is intended to be developed<sup>(15)</sup>. On the other hand, the absence of blinding, in an experimental research, can harm its methodological course, by favoring biased behavior of those involved and causing research bias. However, it is necessary to highlight the difficulty in achieving blinding in educational experiments, due to the impossibility of avoiding the exchange of information between students or others involved<sup>(24)</sup>.

Even so, it is recommended that the participants of a clinical study and members of the research team, as well as those responsible for evaluating the results, are not aware of the allocation of participants in the experimental and control groups. Blinding is considered as important as randomization, as it eliminates the confusion generated by co-interventions and reduces bias in the assessment and attribution of outcomes<sup>(15)</sup>.

The MERSQI was also useful to assess the methodological quality of the studies, considered moderate in most of the studies that made up the sample. The execution of the studies in a single center and the absence of a description of the validity of the instruments adopted were pointed out as vulnerabilities in the research that composed the sample.

Even though multicenter clinical trials are considered the gold standard in research, as they serve different communities and reduce the time of the experiment, they are generally expensive and complex studies, with difficult execution, factors capable of justifying the fact that most of scientific publications on pedagogical interventions in nursing, to be carried out in a single center<sup>(24-25)</sup>. As a fundamental criterion for achieving the methodological quality of the studies, the validation of the adopted constructs,

on the other hand, supports its reliability in the conclusions obtained by these studies<sup>(24-25)</sup>.

Thus, it is important to obtain clarity during the description of the methodological path in clinical studies, on the validation of the collection instruments mentioned, to ensure the robustness and reliability of the results<sup>(24-25)</sup>. However, even in the face of these gaps, the studies that made up the sample of this research were able to demonstrate and sustain the effectiveness for the teaching and learning process in nursing, in opting for experiential learning, during the planning and execution of activities in a clinical simulation, as a theoretical-methodological framework, compared to other pedagogical modalities, based on methodologically well-designed research.

It is important to emphasize, however, that this finding does not disregard the adoption of a variety of strategies for teaching in nursing, but rather suggests the use of clinical simulation, based on experiential learning, as an excellent pedagogical possibility, capable of enhancing the development of clinical skills.

The main limitation of this research was the reduced number of manuscripts, which proposed to compare the adoption of experiential learning in a clinical simulation, in the scope of nursing, with other pedagogical strategies, or even with the clinical simulation not supported by this learning model.

## CONCLUSION

The use of experiential learning as a guiding framework for learning in clinical simulation shows effectiveness for teaching in nursing when compared to other pedagogical strategies, mainly to develop clinical judgment, knowledge and satisfaction in learners. The JBI's methodological appraisal instrument demonstrated the good quality of the studies included in the present research and methodological weaknesses such as the absence of multiple measurements of results over time and the blinding of those involved. The Medical Education Research Study Quality Instrument, on the other hand, pointed to moderate quality for three studies and high quality for one study, and identified as weaknesses the execution of the studies in a single center and the lack of clarity regarding the validity of the instruments adopted.

This study contributes to teaching, research and nursing care by indicating the adoption of experiential learning to plan and execute clinical simulation in nursing, characterizing this

articulation as a valuable pedagogical resource. We suggest the development of randomized clinical studies that compare the effectiveness of existing theoretical frameworks for learning in nursing simulation in order to guide the best practices in this area.

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