



Efficacy of a video during bed bath simulation on improving the performance of psychomotor skills of nursing undergraduates: A randomized clinical trial



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ABSTRACT

Background: Studies have shown the efficacy of videos used in isolation to retain knowledge, acquire skills, and establish students' self-confidence. A few studies have investigated the efficacy of videos associated with simulations, while none of these studies have addressed bed bathing, one of the first procedures learned by nursing students.

Objective: To test the efficacy of a video-assisted bed bath simulation on improving the performance of psychomotor skills of undergraduate nursing students.

Design: A randomized clinical trial.

Setting: A Teaching Skills and Simulation Center at a Federal University in Brazil.

Participants: All students regularly enrolled in the second year of the nursing undergraduate program at a Federal University, aged 18 years old, who had never performed a bed bath and had attended a theoretical class addressing the procedure (n = 56).

Methods: The students were randomized into two groups: the Control group (n = 28) simulated a bed bath with the instructions of a tutor, while the Intervention group (n = 28) watched a video during the bed bathing simulation, under the supervision of a tutor. The performance of students concerning bed bathing was assessed twice (before and after the simulation) using a previously validated instrument.

Results: The psychomotor skills of both groups significantly improved in the second assessment, and the Intervention group scored higher (p = 0.003).

Conclusions: The use of a video during bed bath simulations was efficacious for improving the performance of psychomotor skills of undergraduate nursing students.

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What is already known about the topic?

- Simulation is one of the teaching strategies that has been tested in randomized clinical trials in order to develop critical thinking among undergraduate nursing students.
- Simulations with the use of a video enable representing reality under controlled conditions involving the practical skills of a given procedure.

What this paper adds

- Nursing students' psychomotor skills are improved after bed bath simulation using medium-fidelity manikins.

- The video can be combined with bed bath simulation performed by various students simultaneously in different institutions in a controlled and safe environment.

1. Introduction

In order to make adequate, timely decisions and provide safe care, nurses and nursing students are required to develop psychomotor skills and critical thinking. These skills can be improved through active educational methods, such as simulations that replicate a real healthcare setting (Crossetti et al., 2009; Mould et al., 2011).

A systematic review reports that simulation is one of the teaching strategies that has been tested in randomized clinical

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trials in order to develop critical thinking among undergraduate nursing students (Oliveira et al., 2016). The advantages of simulations include improvement of critical thinking and retention of content, increasing opportunities to practice certain procedures in a safe and controlled environment, and connecting theory to practice (Prescott and Garside, 2009; Sanford, 2010; Eppich et al.,

2011; Teixeira and Felix, 2011). Additionally, studies show that simulation consistently decreases anxiety and stress of students when they have their first clinical experience (McGraw et al., 2013; Szpak and Kamed, 2013; Khalaila, 2014), which are feelings that can affect the effectiveness of care and the therapeutic relationship established with patients (Szpak and Kameg, 2013).

Table 1
Comparison of baseline psychomotor skill scores of the Intervention and Control groups.

Items/Group	Intervention Group (n = 28)		Control Group (n = 28)		p-value
	Mean	SD	Mean	SD	
1.1 Introduced oneself to the patient	0.43	0.51	0.79	0.43	0.039*
1.2 Informed about the need to perform a bed bath, its procedure and duration	0.00	0.00	0.21	0.43	0.114 [†]
1.3 Verified the patient's preferences regarding time and professionals (men or women) who will perform the procedure	0.14	0.36	0.36	0.50	0.462 [†]
1.4 Asked whether the patient had any doubt about the bath	0.00	0.00	0.07	0.27	0.353
<i>Combined score for nursing instructions topic</i>	0.57	0.76	1.43	1.09	0.023
2.1 Washed hands	0.57	0.51	0.71	0.47	0.455 [†]
2.2 Put on gloves	0.71	0.47	0.79	0.43	0.691 [†]
2.3 Disinfected the accessory table, stainless basin and jug with alcohol at 70%	0.29	0.47	0.36	0.50	0.999 [†]
2.4 Removed the procedure gloves and discarded them in an infectious waste bag	0.29	0.47	0.57	0.51	0.129 [†]
2.5 Washed hands	0.29	0.47	0.36	0.50	0.712 [†]
2.6 Separated the material to perform the bed bath	0.43	0.51	0.43	0.51	0.999 [†]
2.7 Informed the patient before preparing the material	0.36	0.50	0.43	0.51	0.717 [†]
<i>Combined score for preparation of material topic</i>	2.93	1.90	3.64	1.60	0.292
3.1 Put the disposable apron on	0.43	0.51	0.43	0.51	0.711 [†]
3.2 Washed hands	0.29	0.47	0.14	0.36	0.978 [†]
3.3 Put the procedure gloves on	0.64	0.50	0.29	0.47	0.028 [†]
3.4 Protected the venous access with the plastic	0.14	0.36	0.00	0.00	0.260 [†]
3.5 Ensured the patient's privacy	0.14	0.36	0.14	0.36	0.759 [†]
3.6 Verified whether the water temperature was to the patient's satisfaction	0.14	0.36	0.14	0.36	0.999 [†]
3.7 Lowered the bed rails	0.29	0.47	0.07	0.27	0.461 [†]
3.8 Began with eyes hygiene – washed and dried them	0.43	0.51	0.36	0.50	0.578 [†]
3.9 Cleaned the face with clean water without soap – washed and dried it	0.29	0.47	0.50	0.52	0.204 [†]
3.10 Cleaned the scalp – washed, rinsed, and dried	0.00	0.00	0.14	0.36	0.165 [†]
3.11 Informed of the need to remove the gown, removed it and put it in the hamper	0.07	0.27	0.07	0.27	0.422 [†]
3.12 Cleaned upper limbs – washed, rinsed and dried them	0.14	0.36	0.57	0.51	0.022 [†]
3.13 Cleaned the hands – washed, rinsed, and dried them	0.14	0.36	0.57	0.51	0.018 [†]
3.14 Cleaned, washed and rinsed the chest	0.43	0.51	0.36	0.50	0.724 [†]
3.15 Covered the chest with a clean towel or sheet	0.43	0.51	0.57	0.51	0.599 [†]
3.16 Cleaned, washed and rinsed the abdomen	0.43	0.51	0.64	0.50	0.325 [†]
3.17 Covered the abdomen with a clean towel or sheet	0.50	0.52	0.50	0.52	0.880 [†]
3.18 Cleaned the lower limbs – washed, rinsed and dried them	0.36	0.50	0.50	0.52	0.470 [†]
3.19 Removed the dirty sheet and put it in the hamper	0.21	0.43	0.36	0.50	0.367 [†]
3.20 Cleaned the feet – washed, rinsed and dried them	0.14	0.36	0.29	0.47	0.468 [†]
3.21 Covered the lower limbs with a clean towel or sheet	0.29	0.47	0.36	0.50	0.511 [†]
3.22 Changed the water and the compress	0.29	0.47	0.07	0.27	0.411 [†]
3.23 Raised the rails on one of the bed sides	0.21	0.43	0.21	0.43	0.400 [†]
3.24 Instructed and positioned the patient in lateral decubitus	0.21	0.43	0.29	0.47	0.999 [†]
3.25 Cleaned the back and buttocks – washed, rinsed and dried them	0.57	0.51	0.43	0.51	0.520 [†]
3.26 Applied comfort massage on the back with moisturizing cream, avoiding bony prominences	0.29	0.47	0.29	0.47	0.824 [†]
3.27 Pushed the wet sheets close to the patient	0.57	0.51	0.50	0.52	0.939 [†]
3.28 Disinfected the uncovered portion of the mattress with 70% alcohol	0.07	0.27	0.43	0.51	0.038 [†]
3.29 Put a clean sheet over the bare side of the bed	0.57	0.51	0.50	0.52	0.959 [†]
3.30 Raised the bed rails on the other side of the bed	0.14	0.36	0.21	0.43	0.949 [†]
3.31 Positioned the patient in lateral decubitus on the other side of the bed over the clean sheet	0.50	0.52	0.43	0.51	0.879 [†]
3.32 Removed the dirty sheet and put it in the hamper	0.36	0.50	0.43	0.51	0.540 [†]
3.33 Disinfected the bare portion of the mattress with alcohol at 70%	0.14	0.36	0.29	0.47	0.152 [†]
3.34 Put the rest of the sheet, leaving no folds	0.57	0.51	0.43	0.51	0.782 [†]
3.35 Repositioned the patient in dorsal decubitus	0.64	0.50	0.50	0.52	0.640 [†]
3.36 Tied or made hospital corners with the bed sheets	0.07	0.27	0.14	0.36	0.649 [†]
3.37 Asked the patient if s/he would like to perform intimate hygiene and/or requested consent to perform it	0.43	0.51	0.57	0.51	0.305 [†]
3.38 Performed intimate hygiene Correctly from the less contaminated to the more contaminated areas	0.29	0.47	0.29	0.47	0.999 [†]
3.39 Helped or dressed the patient and covered him/her with the clean sheet	0.71	0.47	0.71	0.47	0.931 [†]
3.40 Kept the bed rails raised	0.43	0.51	0.21	0.43	0.442 [†]
3.41 Removed the plastic that protected the venous access	0.07	0.27	0.21	0.43	0.725 [†]
3.42 Gathered the material, washed the basin and jug with water and soap and disinfected them, together with the accessory table, with alcohol at 70%	0.21	0.43	0.14	0.36	0.416 [†]
3.43 Removed the procedure gloves and the apron and discarded them in the infectious waste bag	0.43	0.51	0.36	0.50	0.782 [†]
3.44 Washed hands	0.14	0.36	0.07	0.27	0.577 [†]
3.45 Verified the nursing prescription and made notes on the procedure	0.00	0.00	0.00	0.00	NA [‡]
<i>Combined score for procedure topic</i>	13.86	8.81	14.71	7.92	0.789
<i>Total Score</i>	17.36	10.13	19.79	8.63	0.501

* Mann-Whitney test, † Student's t test, ‡ Minimum and maximum scores achieved by each group.

Other tools can be used in association with simulation, such as software, case studies, clinical scenarios, manikins, actors, and videos (Mould et al., 2011). Videos have been consistently employed in training addressing cardiopulmonary resuscitation by the American Heart Association, one of the pioneers in the use of the technique called Watch then Practice. The use of this technique improves psychomotor development and acquisition of knowledge (Greif et al., 2015; Beskind et al., 2016; Wanner et al., 2016).

Additionally, video-assisted simulation has contributed to motivating students, improving their satisfaction and psychomotor skills (Hansen et al., 2011; Baptista et al., 2016). There are also other advantages, such as being a low-cost practical teaching method when compared to the large population it can reach (best cost-benefit); its scenes can be watched repeatedly; it can be used by one individual or a group of people; and it is widely accepted in the field of education (Arruda et al., 2012).

Studies have shown the effectiveness of videos used in isolation to retain knowledge, acquire skills, and establish students' self-confidence (Hansen et al., 2011; Arruda et al., 2012; Cardoso et al., 2012). The success of this association is due to the fact that teaching an adult is different from teaching a child. Adults retain 80% of what they learn by watching, listening and doing and need to be actively involved in the teaching-learning process (Peyton, 1998).

Bed bathing is one of the first procedures learned by nursing students, a hygiene task that involves various actions, including care of skin, hair, and nails, which promotes and maintains the health of patients and is recommended for dependent patients who require nursing care and those who are confined to bed rest (Lopes et al., 2013a). One is supposed to know the technique to perform this task, as well as possess the competencies to perform it (Lopes et al., 2013b).

A few studies have investigated the effectiveness of videos associated with simulations, but none of these studies has addressed bed bathing. In this context, simulations associated with videos addressing bed bathing can improve the development of skills that are difficult to teach exclusively in theoretical classes, greatly satisfying students and providing greater motivation to learn. Psychomotor skills are improved by the repeated practice of the procedure, enabling students to achieve the desired performance (Motola et al., 2013).

This study's hypothesis is that a group of students simulating a bed bath while watching a video will experience improved psychomotor skills when compared to a group simulating a bed bath while instructed by a tutor. Therefore, the aim of this study was to test the efficacy of video-assisted bed bath simulation on improving the performance of psychomotor skills of undergraduate nursing students.

2. Methods

2.1. Design and setting

A blind, randomized clinical trial performed in the Teaching Skills and Simulation Center at a Federal University in Brazil.

2.2. Participants

The population consisted of all students regularly enrolled in the second year of the baccalaureate nursing program at a Federal University, aged 18 years old, who had never performed a bed bath and had attended a theoretical class addressing the procedure (n = 56).

2.3. Data collection

2.3.1. Randomization

The students were invited to participate in the study during a class in May/2017. Those who manifested interest (n = 56) signed

free and informed consent forms and were assigned either to a control group (n = 28) or to an intervention group (n = 28). The students were randomly assigned by a faculty member who did not take part in any of the study's stages using the Random® system. This software generated a sequence of two numbers, 1 and 2: group 1 was the Intervention Group and group 2 was the Control Group. The students were assigned to one of the two groups according to the random sequence as determined by the system.

2.3.2. Intervention and control

The intervention consisted in a video-and-tutor-assisted bed bath simulation with a manikin under the supervision of a tutor. The Control consisted in a a tutor-assisted bed bath simulation with a manikin. The manikin was a full-size adult manikin without any device-controlled physiological responses (3B Scientific™ Basic Patient Care Manikin).

2.3.3. Outcome

The outcome was the performance of students' psychomotor skills in bed bathing as measured by a previously developed checklist, validated by expert nurses (Lopes et al., 2018b).

This instrument, called "*Instrumento para avaliação do banho no leito - IABL*" [Bed-Bathing Assessment Instrument] presented good internal consistency in a study of content validation (Cronbach's alpha = 0.896). It is composed of three topics: (1) nursing instructions, 2) preparation of materials, and 3) procedure, with 56 items. The score for the instrument ranges from 0 to 56 points; the higher the score, the better one's performance (See Table 1).

Each item of this instrument was determined to be appropriate, not appropriate, or not performed. The performance of each student was analyzed considering the total score: one point was assigned to each item properly performed and no points for any item not properly performed or not performed at all (Lopes et al., 2018b).

2.3.4. Data collection procedure

The students attended a theoretical class addressing bed bathing that was based on the literature. The class lasted approximately one hour and was administered by a professor of the Nursing Care Fundamentals course from a Federal University by following the same structured content of the simulation. The participants were asked, after the class, whether they wanted to participate in the study and to authorize data to be available for the research. Those who consented signed free and informed consent forms.

One day after the theoretical class, the students were then invited to attend the Teaching Skills and Simulation Center at a Federal University. After randomization, all students were instructed to simulate a bed bath on a manikin based on the theoretical class, without any further instructions in Room A. Their baseline psychomotor skills were assessed by a blinded, previously trained nurse professor by using a previously validated instrument (See Table 1) (Room A).

After baseline evaluation, students of the Intervention Group were directed to Room B and students of the Control Group were directed to Room C. Students in the Intervention Group performed a video-assisted bed bath with a manikin under the supervision of Tutor 1. Students in the Control Group performed a bed bath with a manikin while assisted by Tutor 2. Both tutors were experienced faculty members of the Nursing Care Fundamentals course in a Federal University.

The bed bath simulation in both groups lasted around 20 min. In both groups, Tutors 1 and 2 facilitated the teaching-learning process in an individualized manner with each student according to the students' needs during simulation. Hence, the tutor provided extra information when necessary or if requested by the students

in regard to: instructions provided before the procedure; the preparation of material; or the sequence in which the technique is performed (Fig. 1).

The video consisted on images, scenes, and descriptive phrases, it lasted 21 min 21 s and addressed the following topics: bed bath concept (36 s), bed bath indication (21 s), procedure: patient instructions, preparation of materials and the technique itself (17 min and 24 s), and possible related complications, such as falls (3 min). The bed bath was performed by two nurses using the same manikin mentioned above (Lopes et al., 2018a).

After completion of simulation in Rooms B (Intervention Group) and C (Control Group), the students returned to Room A, where they performed a bed bath again while being evaluated by the same trained professors by using the same instrument (See Table 1). All professors were blinded to the group of students' allocations. The procedures used for data collection are shown in Fig. 2.

2.4. Ethical aspects

The study project was submitted to the Institutional Research Ethics Committee (Protocol 1.025.890) and data collection was initiated only after receiving its approval. This clinical trial is registered in the clinical.trials.org (Use of Bed Bath Video During Simulation in Developing Student Skills, NCT03318848).

2.5. Data analysis

Data were entered into a spreadsheet in Microsoft Excel for Windows, version 2007. One researcher typed coded data and another researcher checked the data. Neither of these two researchers had any contact with the study's stages and were

unaware of the codes used for the Intervention and Control groups. The software used for data analysis was the R3.1.2. The normality of the sample means of the scores obtained by the students was verified using the Anderson-Darling test. The statistical tests used to compare the scores obtained by the students assigned to the Control and Intervention groups included Student's t test, when the distribution of variables was normal, and the Mann-Whitney test, otherwise; $p < 0.05$ was considered statistically significant.

3. Findings

Table 1 shows the performance of the Control and Intervention Groups, showing that the psychomotor skills of students were homogeneous in the first assessment, except for items 1.1, 3.12, 3.13, 3.28 and the nursing instructions topic, in which the Control Group scored higher than the Intervention group, and item 3.3, in which the Intervention Group scored higher than the Control group.

The comparison of difference scores (posttest-pretest) of the students' psychomotor skills shows that both groups obtained significant improvement in all topics (nursing instructions, preparation of material and procedure) and this improvement was greater in the Intervention group than in the Control group (Table 2).

4. Discussion

Students should have the opportunity to develop and practice clinical competencies in safe and controlled environments to protect patients and decrease the number of errors in procedures performed in a clinical setting (Willians et al., 2009). The use of videos can help students learn new skills and improve the

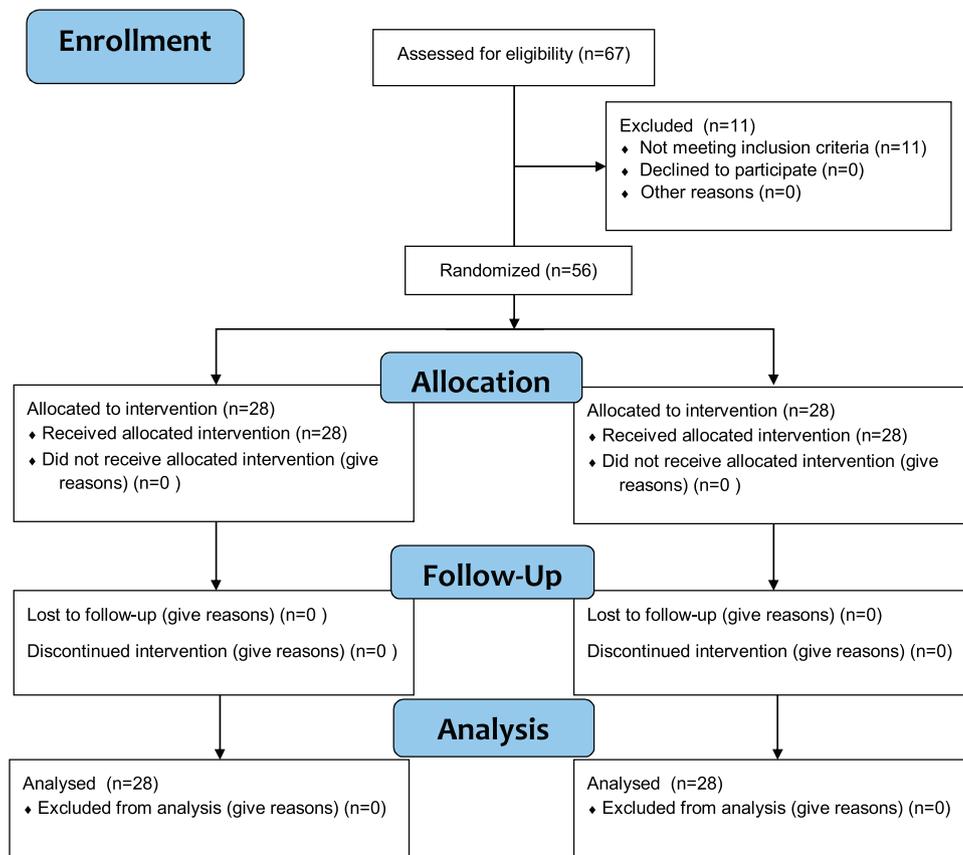


Fig. 1. CONSORT flow diagram.

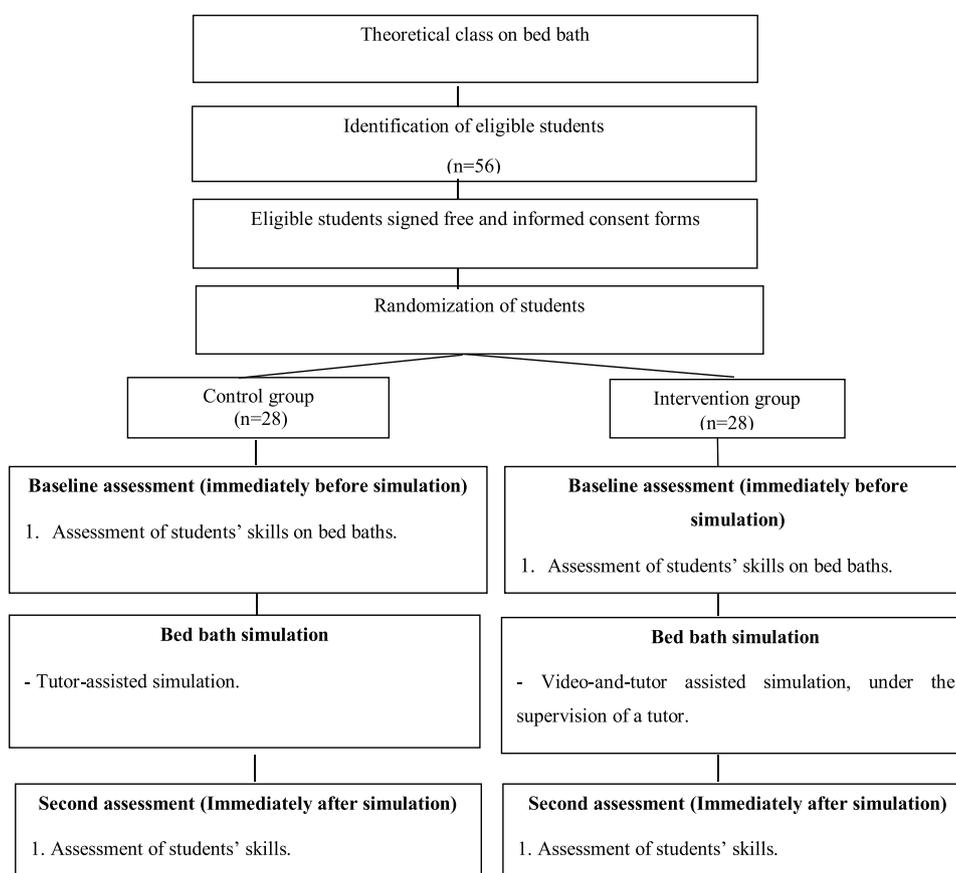


Fig. 2. Data collection procedures.

Table 2

Comparison of difference scores (posttest-pretest) concerning the students' psychomotor skills after video-and-tutor-assisted simulation (Intervention group) or tutor-assisted simulation (Control).

Topic	Intervention Group (n = 28)					Control Group (n = 28)					Statistic score	p-value (Intervention vs Control)
	Mean	SD	SE	Med	IQ	Mean	SD	SE	Med	IQ		
Nursing instructions	2.79	1.37	0.37	3	2	0.93	1.21	0.32	1	1.75	31.5	0.002*
Preparation of material	2.93	2.53	0.68	3	3.5	1.29	1.14	0.3	1.5	2	52.5	0.036*
Procedure	24.71	9.1	2.43	23.5	13	14.14	10.97	2.93	15.5	19	-2.775	0.010
Combined scores	30.43	11.51	3.08	30	14.25	16.36	11.11	2.97	19	18.75	-3.291	0.003

Legend: SD: standard deviation, SE: Standard error, Med: Median, IQ: interquartile range; * Mann-Whitney test, Student's t-test

teaching-learning process (Salina et al., 2012) and is considered a valid tool for teaching, though few experimental studies have shown its effectiveness (Kluge and Glick, 2006).

The opportunity to perform a first bed bath in a simulation can prepare students and help them feel self-assured and comfortable in interacting with patients during the procedure, improving the development of practical skills and communication, as well as the ability to ensure the privacy of patients (Akhun-Zaheya et al., 2013; Miranda et al., 2017).

One study implemented the training of skills regarding bed bathing with a simulated scenario to assess knowledge, performance, and satisfaction of students. The results show that students who participated in a simulated bed bath scenario significantly improved knowledge when compared to a group who only trained in bed bathing skills; this knowledge was maintained 30 days after the intervention (Miranda et al., 2017). Such a simulated scenario can be also visualized through videos, the tool used in this study.

To the best of our knowledge, this is the first clinical trial that evaluated the efficacy of video-assisted bed bath simulation on improving the performance of psychomotor skills of undergraduate nursing students. The students' psychomotor skills were improved after two types of tutor-assisted simulation, but this improvement was greater when they simulated the procedure while watching a video addressing the procedure.

These results agree with a meta-analysis reporting that the use of simulation associated with technology is effective for health education (Cook et al., 2011). Cardoso et al. (2012) show that the use of an educational video during a simulation on how to handle a port-a-cath by undergraduate nursing students improved both technical and cognitive knowledge. Another study comparing a video-and-tutor-assisted simulation with a self-learning tutorial simulation found that the assistance of a video and a tutor was the most effective learning strategy for practical assessment concerning semi-implanted central venous catheter dressing (Marmol et al., 2012).

Our results are possibly associated with the integration of knowledge acquired in the theoretical lecture with practice while simulating the bath, security provided by the tutor presence and also because the video helps identify and correct baseline deficits (Liaw et al., 2012; Marmol et al., 2012; Kaddoura et al., 2016; Kunst et al., 2017).

The results of this study are limited by the small number of students eligible to participate, which can impair the generalizability of data. This study should be replicated by nurse educators with larger samples in order to confirm the consistency of the results. Despite this limitation, the rigorous method adopted is a strength that allows for its replication and evidence-based teaching practice.

5. Conclusion

A bed bath simulation with the aid of a tutor improved the psychomotor skills of baccalaureate nursing students. Video-assisted bed bath simulation is associated with additional improvement of psychomotor skills. Thus, this video can be combined with a simulation performed by various students simultaneously in different institutions in order to provide a controlled and safe environment where they can perform the procedure as many times as needed to improve psychomotor skills.

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