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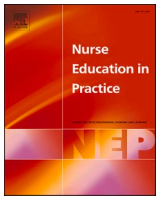

Mindfulness for stress and anxiety management in nursing students in a clinical simulation: A quasi-experimental study

Alba Torné-Ruiz [a,1], Mercedes Reguant [b,2], Judith Roca [c,d,*,3]

[a] Department of Nursing and Physiotherapy, Faculty of Nursing and Physiotherapy, University of Lleida, 2 Montserrat Roig, St, 25198 Lleida, Spain
[b] Department of Research Methods and Diagnosis in Education, University of Barcelona, 171 Passeig de la Vall dHebron, St, 08035 Barcelona, Spain
[c] Department of Nursing and Physiotherapy, University of Lleida, 2 Montserrat Roig, St., 25198 Lleida, Spain
[d] Health Care Research Group (GRECS), Biomedical Research Institute of Lleida, 80 Alcalde Rovira Roure, St., 25198 Lleida, Spain

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ABSTRACT

Aim: To determine the efficacy of an online mindfulness intervention in reducing anxiety and stress levels in nursing students during clinical simulations.
Background: Clinical simulation as a learning strategy has many benefits but the high levels of stress and anxiety it produces in participants can compromise learning, motivation or performance.
Design: A quasi-experimental study with a non-equivalent control group design is presented. Forty-two undergraduate nursing students from a natural group were divided into: an experimental group (n = 21) and a control group (n = 21).
Methods: Before conducting a clinical simulation, the experimental group followed a 10-day intensive online mindfulness intervention. All students received the same information and training. Instruments used were: Self-administered Analogue Stress Scale, State-Trait Anxiety Inventory and Five Facet Mindfulness Questionnaire. In addition, physiological data (blood pressure and heart rate) were collected at baseline, pre-briefing and debriefing.
Results: Physiological variables increased in the prebriefing phase but remained statistically significantly lower in the experimental group (diastolic blood pressure p = .032 and heart rate p = .048). Levels of stress (p = .029) and anxiety (p = .016) were also managed better. Both groups in the debriefing session showed a statistically significant decrease in the different physiological variables, stress and anxiety. No changes in mindfulness were observed.
Conclusions: The clinical simulation is indicated to generate stress and anxiety in nursing students. Therefore, measures must be adopted to control it. The intensive online mindfulness intervention proposed in this study reduced physiological parameters, stress and anxiety in the clinical simulation.

1. Introduction

Clinical simulation is being increasingly used as a learning strategy in professional healthcare training due to its multiple benefits in fostering learning (Amsalem et al., 2020; Cant and Cooper, 2017; Shin et al., 2015). However, clinical simulation also poses challenges, including elevated levels of stress and anxiety in students, which can compromise learning, performance, motivation, or decision-making (Labrague et al., 2019; Al-Ghareeb et al., 2019; Cantrell et al., 2017; Wang et al., 2019). Furthermore, Judd et al. (2016) reported that students experience more anxiety in a clinical simulation than in a hospital setting.

2. Background

It is worth noting that clinical simulation consists of three sequential phases referred to as: prebriefing, scenario and debriefing (INACSL Standards Committee, 2016). Some studies (Dileone et al., 2020;

* Corresponding author at: Department of Nursing and Physiotherapy, University of Lleida, 2 Montserrat Roig, St., 25198 Lleida, Spain.
E-mail addresses: alba.tr@hotmail.es (A. Torné-Ruiz), mreguant@ub.edu (M. Reguant), judith.roca@udl.cat (J. Roca).
[1] ORCID: 0000-0002-8072-1953
[2] ORCID: 0000-0002-0830-7854
[3] ORCID: 0000-0002-0645-1668

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Page-Cutrara and Turk, 2017) highlight prebriefing as a critical variable influencing the outcomes of the simulation experience. Prebriefing is also referred to as pre-simulation, briefing, orientation, pre-scenario or preparation. There are different criteria as to the components and/or activities a prebriefing should include (Guzmán Zambrano et al., 2019). Its primary purpose is to provide information, instructions or preparatory activities to help participants achieve the objectives of the clinical simulation (McDermott, 2016). These activities should promote a motivating and respectful learning environment (Janzen et al., 2016). Therefore, it is essential to create a psychologically safe context to increase student participation, satisfaction, confidence and reduce anxiety (McDermott, 2016; Tyerman et al., 2019). Thus, the use of mindfulness in the first phase of the clinical simulation can help create an atmosphere of trust and alleviate some of the adverse effects of the simulation like anxiety or stress. This anxiety and psychophysiological stress (self-reported anxiety and stress, heart rate, blood pressure among other parameters) are altered especially before and during the simulation scenario (Al-Ghareeb et al., 2019; Judd et al., 2016). The clinical simulation produces a subjective response and a physiological (blood pressure and heart rate) and psychological (stress, anxiety and motivation) effect on the participants (Mauriz, Caloca-Amber, Córdoba-Murga, and Vázquez-Casares, 2021). Anxiety is a common problem that affects learning during simulation (Yockey and Henry, 2019). Therefore, it is important to investigate interventions to reduce these effects during simulation and to improve the preparation of the student (Shearer, 2013).

Mindfulness, a Buddhist tradition whose name derives from the Sanskrit term "satti", was introduced to the West by Dr. Jon Kabat-Zinn, who defines this practice as awareness arising from paying purposeful and non-judgmental attention to the present moment without passing judgement on it, without analysing it or reacting to it (Kabat-Zinn, 2013). According to literature reviews (Vøllestad et al., 2011; Zeller et al., 2021), mindfulness is beneficial for coping with stress, anxiety and mental health issues. Protocols such as mindfulness-based stress reduction are described as improving quality of life, compassion and overall health (Foureur et al., 2013). In addition, breath-focused mindfulness is presented as an effective strategy for regulating emotions (Zhang et al., 2019). The practice of mindfulness has been shown to improve students' and health professionals' well-being (van der Riet et al., 2018). Specific studies in university students suggest that this technique combats stress and anxiety (Galante et al., 2018; Regehr et al., 2013), particularly in nursing students (Chen et al., 2013; Ratanasiripong et al., 2015). However, few studies (McKendrick-Calder et al., 2019; Pollard et al., 2020) were linked to clinical simulation.

The main hypothesis of this study is that a pre-clinical simulation mindfulness intervention can reduce stress and anxiety in students. The secondary hypothesis is that the intervention can increase mindfulness. Hence, the aim of this study was to evaluate the efficacy of a mindfulness-based intervention in nursing students to decrease levels of anxiety and stress during a clinical simulation. And as a secondary objective; assess whether the intervention produces an increase in mindfulness.

3. Methods

3.1. Design

A quasi-experimental study with a non-equivalent control group design was conducted.

3.2. Context and participants

The context of this study was the Faculty of Nursing and Physiotherapy of the University of Lleida. The study population consisted of a natural group of 45 s-year nursing students. Inclusion criteria were students enrolled in the two subjects covered by the clinical simulation: Adult Nursing Care I and General Pathophysiology II. Exclusion criteria were students who had not fully enrolled in the two subjects and in the case of the experimental group, students who did not comply with the 3.5 h of the mindfulness programme. The procedures for this study were based on the guidelines of Li et at., (2020). Only one participant who did not complete all the required information was counted as a loss. The rest of the students followed the planned intervention and completed the information. The final sample consisted of 42 students: 21 in the experimental group (EG) and 21 in the control group (CG). The groups were randomly assigned using computer software.

3.3. Intervention

A high-fidelity immersive clinical simulation was conducted on standardised patients at the 4DHealth simulation centre (https://4dhealth.com/). For the simulation design, the Healthcare Simulation Standards of Best Practice$^{TM:}$ Simulation Design (INACSL Standards Committee, 2021) guidelines were used to achieve the proposed objectives and optimize the expected results. The clinical simulation consisted of 2 cases (a digestive medical and a respiratory pathology) developed using the Harvard-type case technique. This typology of cases contains detailed information but does not directly express the problem (Mendoza, 2006). For both of the cases, information was offered based on the patient's antecedents and the clinical nursing and medical situation (current status, pharmacological and non-pharmacological treatment, diagnostic tests) without directly addressing the situations that the students would have to solve in the simulation scenario. The students could prepare the case according to the baseline clinical situation, but they did not know its evolution, as happens in clinical reality. These cases were contextualized in two scenarios of the hospitalization area: the nursing station and the patient's room. The presented simulation experience was developed in two phases: the preparation phase; and the simulation phase.

In the preparation phase, all students received the same training and information. This preparation was done two weeks before the simulation. Instructors carried out two 1-hour online sessions to explain the cases and to clarify any doubts. A simulation dossier of the cases was also created in medical and nursing clinical history format. The purpose of the preparation was to give instructions on the clinical simulation and preparatory information to the student. Only the experimental group undertook a 10-day mindfulness intervention before the simulation. Attendance restrictions due to COVID-19 meant that the intervention was carried out online. The online intervention consisted of:

The online programme consisted of material specifically created for this study by an expert in mindfulness and yoga from outside the faculty who was also experienced in conducting courses and training. The material was developed in response to the objectives of the project and made available to teachers. It consisted of an audio-visual recording with which the participants practised relaxation exercises and conscious breathing in a session of 25 min.

- All students agreed and gave their consent to follow the intervention. A specific 30-minute session was held to introduce the intervention objectives and the materials to be used.
- The experimental group students practised the mindfulness sessions at home for 10 days. They were told that the optimal time of day to do it was in the afternoon or the evening, but that they were free to organise themselves accordingly. During this phase, the students were asked via email if they had any doubts or needed help to follow the sessions. There were no doubts or need for clarification.
- The students noted in a journal whether or not they had completed the simulation and the time spent.

In the simulation phase, the planning of a simulated session was coordinated by a simulation technician (ST). The ST reviewed the documentation prepared by the two teachers: clinical case, script for the

actors (standardised patients) and development script (sequences of the case according to clinical evolution) and then prepared the material and trained the actors according to the script established by the teachers. Two professors participated in the sessions as facilitators during the prebriefing and debriefing, with the support of the ST.

The 42 students were randomly distributed into 4 subgroups (2 groups of 10–11 students in the morning and 2 similar groups in the afternoon). The EG group consisted of a morning subgroup and another afternoon subgroup, as did the CG. The morning schedule was from 9 a.m. to 2 p.m. and the afternoon from 3 p.m. to 8 p.m. A student only attended a simulation session according to the assigned subgroup. The simulation sessions were scheduled identically so all groups used the same cases, scenarios, simulated patients and facilitators.

The simulation consisted of three sections:

- Prebriefing: was carried out in groups. The facilitators briefed and offered guidance to the students about the objectives, roles and condition of the patients. In addition, the students visited the location where the simulation would take place and time was set aside to clarify any questions they might have relating to the simulation. The main objective was to guide the students towards the immediate experience of clinical simulation. The duration of the prebriefing was 40–50 min.
- Simulation scenario: the scenario was done individually. The student developed his/her practice for 10–12 min. The other students could follow his/her performance through the camera in real time.
- Debriefing: at the end of the scenario, the debriefing was carried out immediately, for 15–20 min. To develop the debriefing, the guidelines of the Good Judgement Method (Maestre and Rudolph, 2015) were followed.

3.4. Variables under study, instruments and data collection

Table 1 shows the time point of data collection, the variables and the instruments used. Regarding the instruments used, the self-administered analogue scale (VAS) consists of a single question on the level of stress; "Indicate, between the two extremes, your current level of stress". The parameters range from 0 (no stress) to 10 (maximum imaginable stress). A single score is obtained with a.5 prospective precision (Barré et al., 2017).

The State-Trait Anxiety Inventory (STAI) is a 40-item self-reported instrument that assesses anxiety through two dimensions of 20 items each: state (transitory emotional state) and trait (relatively stable anxious propensity) (Spielberger et al., 2015). Each dimension is scored from 0 to 60 (state and trait), with a total of 120. Each question is scored from 0 (not at all) to 3 (a lot), in a Likert-type response. It should be noted that higher scores reflect more anxiety. In Spanish, it was validated in a university population, with Cronbach´s alpha of.93 for the total score and > .80 for the two dimensions (Fonseca-Pedrero, Paino, Sierra-Baigrie, Lemos-Giráldez, and Muñiz, 2012).

Table 1
Data collection, variables to be studied and instrument.

Time point	Variables	Instrument
Pre-intervention: baseline	- **Socio-demographic data**: age, sex, university access route and work experience in healthcare. - **Physiological values**: BP, HR - **Level of stress, anxiety and mindfulness**	- VAS -STAI -FFMQ
Prebriefing	- **Physiological values**: BP, HR - **Stress and anxiety level**	-VAS -STAI (only State score)
Debriefing	- **Physiological values**: BP, HR - **Level of stress, anxiety and mindfulness**	-VAS -STAI (only State score) -FFMQ

*BP: blood pressure, HR: heart rate, VAS: self-administered stress analogue scale, STAI: State-Trait Anxiety Inventory, FFMQ: Five Facet Mindfulness Questionnaire

The Five Facet Mindfulness Questionnaire (FFMQ) is a 20-item self-reported instrument that measures 5 mindfulness dimensions: Observing, Describing, Acting with Awareness, Non-Reactivity and Nonjudging. Each question is scored from 0 (never or almost never) to 5 (often or always) with a maximum overall score of 100. Therefore, higher scores are better in relation to mindfulness. Cronbach´s alpha was.84 in a validated, Spanish version (Coo Calcagni and Salanova Soria, 2016). Permission was obtained via email from the authors of the different measurement instruments.

Data were collected from October to December 2020. The questionnaires were self-administered online at three data collection time points using Google Forms. The pre-intervention baseline data were collected at the end of October 2020 and the pre-briefing and debriefing data during the simulation session in December 2020. Data were collected from the two (experimental and control) groups simultaneously.

3.5. Data analysis

Data were analysed using descriptive statistics (Mean and standard deviation (SD), frequency/percentage) and inferential statistics (Mann-Whitney U for two independent samples and Wilcoxon for two related samples), due to non-normality of the data as identified by the Kolmogorov-Smirnov test. The non-parametric effect size r was used as an estimate of effect size for the Mann-Whitney and Wilcoxon tests using the convention of 0.10 (small), 0.30 (medium) and 0.50 (large) (Field, 2017). A small effect size between Baseline and Debriefing would indicate a return to Baseline levels and hence the stability of the measure.

Statistical significance was set at p-value < 0.05. All statistical analyses were performed using SPSS (IBM SPSS Statistics V22.0, Armonk, NY: IBM Corp.).

3.6. Ethical considerations

This study was funded as a teaching innovation by the Spanish Association of Deans of Nursing Faculties (CNDE) and approved by the research study approval committee of the Department of Nursing and Physiotherapy of University of Lleida.

Student participation was entirely voluntary, and they did not receive any compensation. The research team, which was part of the teaching staff who carried out the clinical simulation, explained the project to all the students orally and in writing, after which all agreed to participate. All participants gave their informed consent. An alpha-numeric code was assigned to each participant to ensure confidentiality and anonymity throughout the process, in compliance with Anon (2018) on the protection of personal data. The primary researcher created the codes for each student and only this person had access to them.

4. Results

The participants were 42 nursing students aged between 18 and 42 years, with a mean age of 21.3 years (SD=4.19), of whom 81 % (34 of 42) were women. More than half (57.14 %, n = 24/42) of the participants had entered the university with a secondary school diploma; 95.23 % (n = 40/42) had participated in a clinical simulation in previous courses and only 33.33 % (n = 14/42) had prior work experience in health care.

4.1. Physiological data results: baseline, prebriefing and debriefing

Table 2 shows the mean physiological data, blood pressure (BP), heart rate (HR) and mean arterial pressure (MAP) at baseline, prebriefing and debriefing. Baseline BP and HR data were within normal parameters but rose in prebriefing and fell during debriefing. However, it should be noted that the HR and diastolic blood pressure (DBP) parameters in the prebriefing session remained lower in the EG versus CG, showing statistically significant differences between the groups (P = .032 and P = .048, respectively). In all cases the effect size is small but in favor of the EG.

Between baseline and prebriefing there was a statistically significant increase in each of the groups for HR (EG P < .001, CG P = .007) and MAP (EG P = .001, CG P < .001). Between prebriefing and debriefing there was a statistically significant decrease in each group in HR parameters (EG P = .007, CG P = .005) and MAP (EG=.016, CG P = .001). When comparing the final situation (debriefing) to the initial situation (baseline) in each of the measurements, the tendency is to return to baseline levels. Thus, stability is shown in HR and MAP (Table 3).

4.2. Self-perceived stress score results: baseline, prebriefing and debriefing

The level of perceived stress as measured by the VAS is reported in Table 4. In each group, VAS scores showed statistically significant changes from baseline to prebriefing and from prebriefing to debriefing, with scores increasing at prebriefing compared with baseline and then decreasing from prebriefing to debriefing. Between the groups, a statistically significant difference in stress was found in the prebriefing phase only (P = .029) and was associated with a medium effect size (r = .33).

Table 2
Results of physiological data analysis by time points.

Physiological Data				
Baseline				
	SBP M(SD)	DBP M(SD)	HR M(SD)	MAP M(SD)
EG	108.85 (10.99)	68.47(9.22)	71.92 (10.03)	88.66(8.67)
CG	111.38(7.29)	74.14(6.45)	77.28 (14.38)	95.26(4.75)
Prebriefing				
	SBP M(SD)	DBP M(SD)	HR M(SD)	MAP M(SD)
EG	121.9(11.98)	78.05(8.45)	90.66 (19.83)	99.97(9.07)
CG	127.28 (12.02)	80.35(6.63)	96.62 (27.83)	105.31 (8.37)
P	.141	.032	.048	.076
Effect size (r)* *	.22	.15	.12	.29
Debriefing				
	SBP M(SD)	DBP M(SD)	HR M(SD)	MAP M(SD)
EG	106.57 (36.73)	66.42 (24.17)	77.52(28.6)	86.5(29.98)
CG	114.28 (27.49)	72.43 (18.88)	84.57 (24.38)	93.36 (22.56)
P	.434	.314	.413	.345
Effect size (r)* *	.12	.14	.13	.13

*Mean (M) and standard deviation (SD); EG: experimental group; CG: control group; DBP: diastolic blood pressure (millimetre of mercury, mmHg); SBP: systolic blood pressure (millimetre of mercury, mmHg); HR: heart rate (beats per minute, bpm), MAP: mean arterial pressure (millimetre of mercury, mmHg); normal values in adults between: 60–89 mmHg DBP, 100–139 mmHg SBP, 70–105 mmHg MAP and 60 and 100 bpm HR. * *The size of the effect is calculated based on the CG since; in this case, the results are better to the extent that the values of SBP, DBP, HR, MAP decrease.

Table 3
P values and effect size for the differences between time points.

	P values and effect size for the differences between Baseline and Prebriefing				P values and effect size for the differences between Prebriefing and Debriefing			
	HR	r	MAP	r	HR	r	MAP	r
EG	< .001	.51	.001	.53	.007	-.25	.16	-.29
CG	.007	.40	< .001	.76	.005	-.22	.001	-.33

*EG: experimental group; CG: control group; HR: heart rate; MAP: mean arterial pressure * *In taking measurements between time points, the return to baseline levels is observed in the debriefing

Table 4
Analysis of self-perceived stress by time points.

Self-perceived stress (VAS)					
	Baseline M (SD)	Prebriefing M (SD)	Differences between Baseline and Prebriefing (P)	Debriefing M (SD)	Differences between Prebriefing and Debriefing (P)
EG	4.38 (2.20)	5.52(2.27)	.003	3.28 (2.17)	.001
CG	4.57 (1.69)	7.05(2.04)	< .001	3.43 (1.86)	< .001
P	.602	.029		.472	
Effect size (r)		-.33		-.04	

*Mean (M) and standard deviation (SD); EG: experimental group; CG: control group; P valour

4.3. Mindfulness results: baseline and debriefing

The result of the Five Facet Mindfulness Questionnaire (FFMQ) (Table 5) showed that the global baseline scores were slightly higher in the control group. However, they were equal in the debriefing, with the same score. There were no statistically significant differences between the groups for the global score or the domain scores at Baseline or

Table 5
Result of mindfulness analysis by time points.

Mindfulness (Five Facet Mindfulness Questionnaire)						
	Awareness	Non-react	Non-judge	Observe	Describe	Global
	M(SD)	M (SD)	M(SD)	M(SD)	M(SD)	M(SD)
	Baseline					
EG	14 (3.75)	12.28 (3.49)	13.57 (2.18)	11.14 (3.58)	11.71 (1.79)	62.71 (9.37)
CG	13.71 (2.57)	12.33 (2.61)	13.48 (1.81)	12.48 (3.33)	13.10 (2.43)	65.09 (6.15)
P	.485	.859	.799	.119	.071	.614
Effect size (r)	.047	-.008	.022	-.19	-.31	-.148
	Debriefing					
EG	13.86 (3.38)	13.05 (3.07)	13.61 (2.31)	11.52 (2.87)	12.33 (2.15)	64.38 (8.95)
CG	14.05 (3.39)	12.05 (3.09)	13.57 (1.99)	12.19 (3.57)	12.52 (1.83)	64.38 (6.28)
P	.544	.470	.859	.527	.663	.96
Effect size (r)	-.028	.16	.009	-.103	-.047	0

*Mean (M) and standard deviation (SD); EG: experimental group; CG: control group

Debriefing.

4.4. Anxiety results: baseline, prebriefing and debriefing

Table 6 shows the results of the State-Trait Anxiety Inventory (STAI) scale by dimension (state and trait) and globally. The mean scores for state and level of anxiety were slightly higher in the control group at all time points except debriefing. These differences were only statistically significant in prebriefing (P = .016). A medium effect size of r = .35 was obtained.

Analysis of correlations between state anxiety and self-perceived stress of the control group vs experimental group were as follows: baseline: r = .509 (P = .019) vs r = .060 (P = .797) pre-simulation r = .813 (P = <.001) vs r = .528 (P = .014); debriefing: r = .625 (P = .002) vs r = .682 (P = .001). State anxiety and self-perceived stress were therefore strongly correlated except in the experimental group at baseline.

5. Discussion

The purpose of this study was to determine the efficacy of an educational intervention based on an intensive online mindfulness programme in the preparatory phase to reduce the level of anxiety and stress level for undertaking a clinical simulation and to secondarily assess if the programme improved mindfulness. The findings indicated the need for actions to minimise the high impact of stress or anxiety towards clinical simulation, as demonstrated in both study groups, in line with other research (Beischel, 2013; Boostel et al., 2018; Wang et al., 2019).

Concerning the physiological data, baseline HR and BP in both groups increased statistically significantly during prebriefing and subsequently decreased in debriefing. This effect could be attributed to an increase in stress before beginning the clinical simulation phase. On completing this phase, the students' sense of relief led to a decrease in physiological values. This could also be explained because of the groups' being able to share their experience with their peers in the defusing phase, defined as the first stage of the debriefing where the emotional impact is assessed and relived (Zigmont et al., 2011). Such a statistically significant reduction in physiological values is consistent with observations in previous studies and is explained by a decrease in peripheral physiological arousal (Chen et al., 2013). It should be noted that in the prebriefing the physiological data increases compared with the baseline. The HR and DBP parameters in the prebriefing remained lower in the experimental group compared with the control group, with significant differences between the two groups, which is likely to be due to the intervention, thereby supporting the use of mindfulness.

According to Barré et al. (2017), the level of self-perceived stress shown by the two groups (experimental group 5.52 and control group 7.05) is within the range of average stress (4–7.5), although the control group came close to high stress (over 7.5). In line with Fernández-Ayuso et al. (2016), heightened stress could be attributed to a lack of knowledge of the clinical simulation procedure, the handling of the material or the sensation of being observed. The experimental group approached the scenario with less stress, although, in the subsequent debriefing, this level of stress fell statistically significantly in both groups. The same situation occurred in similar studies (Koren, 2017; Ratanasiripong et al., 2015; Spadaro and Hunker, 2016), where high preintervention stress scores fell during post-intervention in both the control group and the experimental group. It is worth noting that Spadaro and Hunker (2016) also attribute stress reduction to online mindfulness practice, although their results were limited as it was a single-group study. Finally, the baseline stress levels were observed to be moderate in both groups (above 4). Therefore, eradicating stress is not possible, although it is possible to improve the students' ability for emotional regulation (van der Riet et al., 2018).

In the present study, a mindfulness session was not incorporated into the immediate prebriefing session as it was considered that the face-to-face clinical simulation phases had to be identical for both groups (immediate prebriefing, scenario and debriefing). The incorporation of mindfulness in immediate prebriefing in other studies (McKendrick-Calder et al., 2019; Pollard et al., 2020; Wheeler et al., 2021) has shown a reduction in stress, anxiety, frustration and workload demands. The study by Cheung et al. (2020) shows that a brief preliminary video intervention may be associated with lower procedural stress (lower heart rate and less visible trembling) and fewer procedural errors.

According to the analysis of the FFMQ instrument, the intervention showed no differences between the groups and the time points, suggesting it had no bearing on increasing mindfulness. However, Zeidan et al. (2010) and Lu et al. (2019) showed that meditation sessions increase mindfulness scores. The findings of this study and the literature consulted appear to indicate that the results of that mindfulness intervention are explained by its brevity. Mindfulness has long-term psychological benefits, which may vary according to the experience of the meditation (Baer et al., 2008).

Regarding anxiety, the STAI scale is deemed a reliable and versatile questionnaire that can be used in clinical settings and in a variety of scenarios (Zsido et al., 2020). State anxiety is considered a transitory state consisting of feelings, tension and apprehension, as opposed to trait anxiety, which denotes a relatively stable and anxious propensity in perceiving situations (Spielberger et al., 2015). Thus, the participants described a degree of state anxiety in the prebriefing, although it was statistically significantly higher in the control group than in the experimental group. These levels decreased in the debriefing, even below the baseline.

The analysis of the variable about state anxiety in this study on a primarily female sample was for both experimental and control group, within the percentiles (p) proposed by Spielberger et al. (2015). Both groups were at baseline p65, which increased to p77 in the experimental group and to p95 in the control group at prebriefing. These variables are much higher compared with those found in other studies on a university student population (Fonseca-Pedrero et al., 2012), which seems to indicate that the clinical simulation produces anxiety. Studies such as

Table 6
Result of anxiety analysis by time points.

		Anxiety (STAI): Trait, State and Global (Trait +State)					
	Baseline Trait M (SD)	Baseline State M (SD)	Baseline Global M (SD)	Prebriefing State M (SD)	Differences between Baseline and Prebriefing State	Debriefing State M (SD)	Differences between Prebriefing and Debriefing State
EG	19.43 (11.24)	23.52 (11.53)	42.95 (21.86)	29.23 (11.72)	.006	19.19 (11.11)	.001
CG	20.9(13.04)	24.61 (12.71)	45.52 (25.17)	38.00 (11.44)	< .001	18.57(9.45)	< .001
P	.840	.840	.744	.016		.990	
Effect size (r)				.35		.03	

*Mean (M) and standard deviation (SD); EG: experimental group; CG: control group

Piquette et al. (2014) or Stein (2020) also observed high scores in the STAI questionnaire. Much lower levels of state anxiety were recorded in the prebriefing stage in the experimental group that carried out mindfulness. It appears the mindfulness intervention has helped control anxiety in a prebriefing phase to clinical simulation. By contrast, Stinson et al. (2020) found no statistically significant differences between the groups they studied. Chen et al. (2013) reported that participants with moderate anxiety benefit the most from mindfulness programmes.

A correlation was found between the VAS (stress) and anxiety level, showing that higher levels of stress are accompanied by higher levels of anxiety and viceversa. The VAS is a relatively efficient and easy to use instrument for detecting stress and correlates with the level of anxiety (Lesage et al., 2012). However, this instrument cannot detect anxiety or other mood altering states.

Finally, the mindfulness intervention positively affected stress management and situational anxiety in a brief and intensive online intervention lasting 4 h and 16 min (25 min per day for 10 days before the clinical simulation). Other studies (Dos Santos et al., 2016; Sanko et al., 2016; Zeidan et al., 2010) point to immediate benefits for stress and anxiety after a short intervention. The meta-analysis by Li et al. (2020) concluded that mindfulness sessions in all studies of at least 3.5 h did produce statistically significant differences in nursing students. These results are consistent with findings from other studies, albeit not conducted in clinical simulation, where focused meditation training experiences and short programmes reduced anxiety traits (Menezes and Bizarro, 2015). While these brief interventions show promise for reducing stress and anxiety, their impact on the clinical simulation (Basler et al., 2020) and their influence on clinical practice (Zeller et al., 2021) have yet to be explored.

5.1. Implications for nursing education and future research

This study shows that a brief, intensive and online mindfulness intervention for nursing students prior to simulation can alleviate anxiety and psychophysiological stress caused by clinical simulation, one of the most popular and evidently useful teaching strategies today. This study and similar ones can offer nursing teachers complementary methods to prepare future generations of nurses by implementing educational strategies that allow for better performance of students and a smoother transfer to clinical practice, favoring safe and effective care for patients. The importance of continuing to investigate the effects of anxiety and stress on clinical simulation, its repercussions on student learning and the use of interventions to minimize them is clearly demonstrated.

5.2. Limitations

This main limitation of this study was related to its sample size. The group is natural, but its small size did not allow for generalisation. Similarly, it did not allow for analysis by age and sex, therefore further studies with larger samples are needed. Other lines to explore would include studies on the impact of learning and the possibility of complementing quantitative data with qualitative data and exploring students' experience to plan more adapted interventions.

6. Conclusions

Similar to other studies, the current study identified that clinical simulation is a teaching strategy that generates stress and anxiety in nursing students; therefore, it is necessary to take action to manage this. The data suggest that the intensive online intervention proposed in this study has been effective in reducing physiological parameters in debriefing and the level of stress and anxiety facing clinical simulation. On the other hand, this intervention does not influence mindfulness. These results should be interpreted with caution, assuming the limitations of the study and the need for more research. It also found a correlation between stress and anxiety.

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CRediT authorship contribution statement

Alba Torné-Ruiz: Conceptualization, Data curation, Methodology, Writing – review & editing. **Mercedes Reguant:** Methodology, Software, Formal analysis, Writing – original draft, Writing – review & editing. **Judith Roca:** Conceptualization, Data curation, Methodology, Formal analysis, Writing – original draft; Writing – review & editing, Supervision.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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