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The impact of rapid cycle simulation deliberate practice on nursing student's resuscitation self-efficacy: A quasi-experimental study

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ABSTRACT

Background: Nursing students often report anxiety about the performance of resuscitation in a placement context. Rapid cycle deliberate practice which involves re-running the scenario after de-brief allowing for the correction of errors and improved practice has been widely used to develop skills in resuscitation. Few studies have examined the use of rapid cycle deliberate practice to improve resuscitation confidence and self-efficacy.
Objective: to assess if rapid cycle deliberate practice leads to improvements in resuscitation self-efficacy in pre-registration nursing students.
Design: Quasi-experimental pre and post-test design measuring self-efficacy using the Basic Resuscitation Skills – Self Efficacy Scale.
Setting: University, United Kingdom.
Participants: Students were invited to participate (n = 120) and 106 consented to take part in the study. Participants were in pre-determined practical groups with 56 in the experimental group and 50 in the control group.
Methods: A pre and post-test of nursing students' self-efficacy during a resuscitation simulation scenario. The scenario will relate to a patient admitted to the emergency room with chest pain who then goes into cardiac arrest. The control group undertake the simulation exercise and then received a de-brief whereas the experimental group participated in a rerun of the scenario following the de-brief (deliberate practice). Both groups completed the Basic Resuscitation Skills Self-efficacy scale pre and post the session. Data were analysed using a paired sample t-test.
Results: Both groups showed improved self-efficacy as a result of the simulation session. The difference in the post-test mean scores between the control and the experimental group was marginal and not statistically significant.
Conclusion: rapid cycle deliberate practice simulation does not lead to improved resuscitation self-efficacy amongst pre-registration nursing students when compared with a single session.
Abstract: Nursing students are often anxious about performing resuscitation in practice. Can rapid cycle deliberate practice improve resuscitation self-efficacy? Pre and post-test study (n=106) showed improved self-efficacy with no statistical difference between standard simulation and deliberate practice.

1. Introduction

Undergraduate nursing students often report anxiety about the performance of resuscitation in clinical placement (Hood and Copeland, 2021) this anxiety is compounded by a lack of experience in a real-life context. As frontline care staff nurses often play a pivotal role in the recognition of cardiac arrest and the instigation of basic life support (Finn, 1996). Despite regular training and practice, many nursing students continue to lack confidence in undertaking cardiopulmonary resuscitation (Tomas, 2009; Gutierrez-Puertas, et al., 2021) and similar studies among registered nurses have found a lack of confidence in initiating resuscitation (Hendy et al., 2023; Jaskiewicz, et al., 2022; Vincent et al., 2021). Lack of confidence may be associated with a fear of harming the patient, anxiety about making a mistake and a fear of litigation (van den Bos-Boon et al., 2022). It is important therefore that in addition to developing competence in basic-life support students are supported to develop their confidence and self-efficacy through training.

Simulation-based education is widely used to address such concerns

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to provide some experience and practice opportunities in a safe and controlled setting (Watson et al., 2021). The European Resuscitation Council Guidelines suggest a variety of approaches to the training of health professionals including the use of low and high-fidelity manikins (Greif et al., 2021). High-fidelity manikin-based simulation has been shown to increase knowledge and skills in resuscitation training when compared with teaching using demonstration and practice on a CPR manikin (Aqel and Ahmad, 2014). In both medical and nurse education the concept of Rapid Cycle Deliberate Practice (RCDP) has been suggested an as an approach to resuscitation skill development during simulation.

Perretta et al. (2020) describe how rapid cycle deliberate practice is a learner-centred simulation instruction strategy during which students have an opportunity to practice a scenario, receive feedback and then re-run the scenario to address areas for improvement. Rapid cycle deliberate practice was first described by Hunt et al. (2014) and while this technique was initially used in resuscitation skills training it is now widely used in a range of simulation scenarios.

Rapid cycle deliberate practice can enhance self-efficacy (self-belief that the person can perform a specific task or accomplish a goal) because it allows for practice, feedback and adjustment of the approach enabling an individual to gain confidence and increase their self-efficacy (McGaghie et al., 2014).

1.1. Background

The majority of existing studies on rapid cycle deliberate practice have concentrated on the performance of resuscitation in either children or adults. Studies have tended to use the time to first chest compression and time to first shock using an automated external defibrillator as outcome measures. There have also been reported differences in how rapid cycle deliberate practice has been delivered. Ng et al. (2021) identified variations in the approach to rapid cycle deliberate practice during simulation. They identified a range of approaches from running the first phase uninterrupted followed by a de-brief and then further practice to approaches involving a stop/start approach with or without rewinding to an early stage of the scenario.

Rapid cycle deliberate practice has been used to develop both resuscitation and procedural skills among medical and nursing staff. Overall, the studies suggest that rapid cycle deliberate practice improves performance on key measures of resuscitation and procedural skills, such as time to first compression (Hunt et al., 2014) and defibrillation (Lemke et al., 2021), team performance (Won et al., 2022; Lemke et al., 2021), and confidence in assessment and communication skills (Ozkara San et al., 2021). In addition, de Castro et al. (2022) also found improvements in chest compression fraction in terms of rate, depth and duration suggesting more effective chest compressions when compared with other methods of resuscitation training.

One of the limitations of many studies is that they fail to assess whether the gains in skills and confidence are retained over time. One study aimed to examine skill retention at retraining at three, six, nine and twelve months (Won et al., 2022) however the number of participants who returned to complete retraining dwindled over time to only 19% (n = 6) of the 32 participants in the original study. Additionally, rapid cycle deliberate practice was found to be an effective method of teaching procedural skills such as intubation skills (Gross et al., 2019) with improvements in preparation and aftercare as well as improvements in procedural choreography which can be essential during high-risk procedures like intubation (Whytock and Atkinson, 2021).

One study (Rosman et al., 2019) conducted in Rwanda found no significant differences between rapid cycle deliberate practice and traditional simulation approaches in terms of improving skills and confidence in medical residents, and both approaches were thought to be useful. However, contextually both the traditional approach and the simulation were relatively low-fidelity in this study.

Ozkara San et al. (2021) examined simulation-based rapid cycle deliberate practice instruction as an approach to continuing professional development of nursing staff. A total of 89 registered nurses participated in the study and underwent a two-hour rapid cycle deliberate practice simulation session. Data were collected using an adapted version of the Simulation Effectiveness Tool modified (Leighton et al., 2015) with five questions completed in both pre and post-simulation sessions. The results increased participants' knowledge of cardiac arrest and improved their confidence in both assessment and communication skills. The researchers concluded that rapid cycle deliberate practice simulation increased nurses' confidence and knowledge of cardiopulmonary resuscitation.

While most studies examining rapid cycle deliberate practice involve resuscitation, some have examined the use of the approach in other simulation scenarios. Platt, McMeekin and Prescott-Clements (2021) examined the use of rapid cycle deliberate practice in an undergraduate nursing programme. Students were tracked during a series of team-based scenarios based on the recognition and rescue of the deteriorating patient. Over time students showed an improvement in team performance using deliberate practice. Similarly, a review of simulation-based education in medicine (McGaghie et al., 2011) outlined how there was little evidence about the effectiveness of deliberate practice over a longer time period as opposed to rapid cycle deliberate practice used in a single scenario.

With the exception of Ozkara San et al. (2021), no studies have examined the use of deliberate practice simulation to improve resuscitation confidence or self-efficacy. This study seeks to address this knowledge gap by answering the question 'Does rapid cycle deliberate practice lead to improvements in resuscitation self-efficacy in pre-registration nursing students?'.

2. Methods

2.1. Simulation scenarios and operation

Prior to the high-fidelity simulation scenario, all participants were given a simulation pre-brief which included session objectives, identification of roles, equipment and manikin familiarisation and a hand-off (handover) using a written patient scenario.

All participants then completed a high-fidelity simulation scenario related to myocardial infarction and cardiac arrest in an emergency room setting. The session was run in a clinical simulation suite using a Laerdal SimMan 3 G manikin™. The setting was set up as a resuscitation bay with an emergency cart which included airways, a bag valve mask, mocked-up emergency drugs (Adrenaline 1 mg and Amiodarone 300 mg) and an automatic external defibrillator (Laerdal AED Trainer 2™). Academic staff role-played both the patient voice (via a separate control room), members of the clinical team and the resuscitation team.

Students working in groups of 5 rotated around chest compressions and operating the valve mask enabling each student to experience the various roles. However, only the first student had experience of AED pad placement and other students then had experience of following the AED voice prompts. On the second session students started from the same positions and rotated again through the various stations.

During patient assessment and treatment, the manikin has a cardiac arrest and students are expected to recognise cardiac arrest, call for help, start cardio-pulmonary resuscitation, use an automatic external defibrillator and follow the Resuscitation Council United Kingdom (2021a) basic life support guidelines. Following the cardiac arrest call the teacher, acting as a doctor, arrives and secures the airway and administers Adrenaline 1 mg and Amiodarone 300 mg intravenously after the third shock as per the Resuscitation Council United Kingdom (2021b) guidelines for adult advanced life support.

Each session for both the experimental and the control group was then followed with a structured de-brief based on the good judgement model which is designed to enable students to process information without becoming defensive about their performance (Szyld and

Rudolph, 2013). During de-brief students are supported to identify areas for improvement as well as to identify things they did well.

Participants from the experimental group were then facilitated to re-run the scenario from the beginning taking into consideration the areas to be improved. Once completed the deliberate practice re-run ended the session and participants completed the Basic Resuscitation Skills - Self-Efficacy Scale.

The simulation sessions and data collection activities took place over a one-week period in June 2019.

2.2. Sample

The sample was drawn from two cohorts of the Bachelor of Science (Honours) Adult Nursing programme (n = 120). The students were halfway through the second year of their programme and had completed three clinical placements comprising 1036 hours of clinical experience in total. The students were in pre-determined practical groups which were then split into two sub-groups for the simulation practical. The pre-determined groups are formed at the beginning of the student's course, and they remain in the same study groups for all seminar and practical sessions throughout the 3-years. Each of the sub-groups was assigned to either the intervention rapid cycle deliberate practice or the control group high-fidelity standard simulation. Students were not aware of whether they had been assigned to the experimental (deliberate practice) or the control group until the end of the study. According to the sample size calculation, by considering an effect size of 0.50, a p-value of 0.05, and power of 0.80, a total sample size of 34 participants was required.

3. Ethics

Ethical approval for the study was obtained from the University of Sunderland [redacted for review] Research Ethics Committee (002223). Students were invited to participate by an academic unconnected to their programme during a project presentation. Informed consent was then obtained from each student who had agreed to participate.

3.1. Study design

This study utilised a prospective quasi-experimental pre and post-test design. Randomisation of the participants was not possible. In this study, participants were in pre-determined practical groups, so students were used to working alongside each other as they had been in these groups for more than one year.

This study focused on self-efficacy rather than resuscitation performance as the students had been formally assessed in terms of resuscitation performance earlier in the academic year (some four months prior to this study). The rationale for only examining self-efficacy in this study relates to both the continued anxiety amongst nursing students around resuscitation and the fact that students had previously been assessed as competent. Aqel and Ahmad (2014) identified that competency is maintained for between 3 and 12 months after training and initial assessment and it was therefore decided that there should be no further assessment of psycho-motor skills or knowledge in this research.

3.2. Measures

The outcome measure in this study was resuscitation self-efficacy which was measured pre and post-session using the Basic Resuscitation Skills – Self-Efficacy Scale (Hernández-Padilla et al., 2016). The scale was administered immediately prior to and immediately after completion of the simulation session. Basic Resuscitation Skills – Self-Efficacy Scale is a validated scale of resuscitation self-efficacy based on Bandura's (Bandura, 1977) self-efficacy theory and both the European (Nolan et al., 2010) and United Kingdom Resuscitation Guidelines (Resuscitation Council United Kingdom, 2011). Basic Resuscitation Skills – Self-Efficacy Scale consists of 18 items scored using a scale of 0–100. Initial Confirmatory Factor Analysis (Hernández-Padilla et al., 2016) confirmed that the items loaded onto three factor which were recognition and alert (6 items – Cronbach's alpha 0.85), Automated External Defibrillator [AED] use (8 items – Cronbach's alpha 0.96) and cardio-pulmonary resuscitation procedure (4 items – Cronbach's alpha 0.92). Hernández-Padilla et al., 2016 reported that the Basic Resuscitation Skills – Self-Efficacy Scale had good internal consistency with an overall Cronbach's alpha of 0.96, ranging from 0.85 to 0.96 among the factors. In this study the overall internal consistency of the Basic Resuscitation Skills – Self Efficacy Scale was 0.932 ranging from 0.780 to 0.916.

3.3. Data analysis

Data were analysed using a paired sample t-test to compare the means of two related groups. In addition, the internal consistency of the Basic Resuscitation Skills – Self-Efficacy Scale was assessed alongside the characteristics of the sample in both the experimental and the control group. While some of the demographic, qualification data was missing none of the scale items was missing. The means of the control and experimental groups are analysed using an independent sample t-test.

4. Results

4.1. Sample characteristics

A total of 106 pre-registration adult nursing students took part in the study. The characteristics of the sample are shown in Table 1. Prior exposure to resuscitation in the practice setting was relatively common with more than half of participants reporting this (n = 63) having witnessed resuscitation on a real patient (59.4%), a smaller number (n = 28) had actually taken an active role in that resuscitation rather than acting as an observer (26.4%). The majority of participants (n = 93) had never used an Automatic External Defibrillator (AED) or observed its use in the practice setting (87.7%).

Prior educational level did not differ by gender ($\chi^2(4) = 3.37$, p.498) and there was no statistically significant difference in age between the control (mean 28.5, SD 6.81) and the experimental (mean 29.3, SD 7.58) groups when analysed using a t-test $t(104)$ −0.582, p =.562.

No statistically significant difference in the Basic Resuscitation Skills – Self Efficacy Scale's scores was detected between each group pre-test (Table 2).

The overall internal consistency of the Basic Resuscitation Skills – Self Efficacy Scale pre-test was 0.932 ranging from 0.780 to 0.916.

Table 1
Sample Characteristics.

Entry Qualifications	Percentage	Number
Further Education/Access to Nursing Qualification	49.1%	n = 52
Advanced Level (A-Level) Qualifications	20.8%	n = 22
Existing Degree	13.2%	n = 14
Vocational Qualifications	7.5%	n = 8
Missing values	9.4%	n = 10
Gender		**Number**
Experimental Group		n = 56
Female		54
Male		2
Control Group		n = 50
Female		48
Male		2
Age	**Mean**	**SD**
Experimental Group	29.3 years	SD 7.58
Control Group	28.5 years	SD 6.81

Table 2
Comparison between the pre-simulation scores for the control and experimental group participants.

Basic Resuscitation Skills – Self-Efficacy Scale items	Control Group Pre n=50		Experimental Group Pre n=56		
	Mean	S.D.	Mean	S.D.	Independent sample T-test
Assess the safety of myself and the victim, in this order, before approaching	62.3	20.20	61.2	15.96	t(104) =0.298, p =.383
Assess the victim's level of consciousness within 5 seconds	60.3	19.41	62.7	18.58	t(104) = −0.668, p =.505
Shout for help while continuing with the 'Primary Survey'	73.8	22.57	75.8	19.32	t(104) = −0.492, p =.312
Open the airway using the most effective manoeuvre, depending on the situation	59.3	21.09	69.9	57.22	t(104) = −1.238, p =.109
Assess for breathing and differentiate between effective & agonal respiration in no more than 10 seconds	56.1	22.50	58.5	19.27	t(104) = −0.631, p =.265
Alert the emergency services following set protocol and initial CPR without delay	80.7	134.3	66.7	20.65	t(104) = −1.128, p =.131
Perform CPR according to current European Resuscitation Council Guidelines	61.8	22.78	64.0	17.82	t(104) = −0.575, p =.283
Provide effective chest compressions (correct hand placement, depth, recoil and speed)	58.2	22.46	66.6	43.64	t(104) = −1.237, p =.109
Give effective rescue breaths with a pocket mask (correct volume of air and speed of breaths)	56.5	20.20	60.9	18.22	t(104) = −1.201, p =.116
Maintain correct CPR ratio of compression to breaths until I have a valid reason to stop	61.4	22.92	62.8	18.33	t(104) = −0.363, p =.359
Switch on the AED and start using it as soon as it is available without delay	55.4	24.32	56.9	20.17	t(104) = −0.362, p =.359
Follow the AED voice prompts in the right order without getting confused and/or distracted	60.9	24.31	70.3	57.58	t(104) = −1.069, p =.144
Attach AED pads in the correct positions taking into account possible contraindications	60.8	23.08	60.7	18.00	t(104) =0.021, p =.491
Ensure nobody touches the victim whilst rhythm is being analysed	71.6	22.27	71.6	20.02	t(104) = −0.023, p =.491
Deliver rapid and safe shock to the victim keeping visual check and giving verbal commands	59.1	25.90	62.7	19.16	t(104) = −0.834, p =.202
Resume, without hesitation, appropriate post-shock actions according to current guidelines	58.0	25.17	59.1	18.73	t(104) = −0.259, p =.398
Guarantee minimal interruptions in chest compressions during the resuscitation attempt	60.7	22.94	59.5	17.48	t(104) =0.291, p =.386
Continue as directed by voice and/or visual prompts from the AED	62.3	25.01	66.0	20.06	t(104) = −0.860, p =.196
Overall score	61.15	18.52	63.85	13.78	t(104) = −0.860, p =.392

4.2. *Self-efficacy scores in the control and experimental groups*

Table 3 shows the means, standard deviation and t-test results for each of the 18 items on the Basic Resuscitation Skills – Self Efficacy Scale pre and post the simulation session for both the control and experimental groups. All 18 items of the scale show an increase in mean self-efficacy scores. Of these 16 items show a statistically significant improvement in self-efficacy score. Two items have an increased mean which does not have a statistically significant difference. These are 'shout for help' (pre-mean 73.8 and post-mean 76.2) which is not statistically significant (p =.307) and 'alert the emergency services' (pre-mean 80.7 and post-mean 91.4) which again is not statistically significant (p =.679).

Table 3 also shows the means, standard deviation and t-test results for each of the 18 items on the Basic Resuscitation Skills – Self Efficacy Scale pre and post the simulation with deliberate practice for the experimental group. The means scores post deliberate practice are all higher than those in the control group. There is an increase in the means for all of the items in the scale and 16 of these have a statistically significant improvement except 'open the airway' which although it shows an increase in the mean score (from 69.9 pre-session to 80.5 after deliberate practice) the difference is not a statistically significant improvement (p =.089). In addition, 'following the Automatic External Defibrillator prompts shows a similar increase in the mean score (from 70.3 pre-session to 81.3 after deliberate practice) which again is not a statistically significant improvement (p =.075).

Overall, both groups showed improved mean scores for self-efficacy as a result of the simulation session. The mean values for the experimental group which engaged in deliberate practice post-de-brief are higher than those for the control group suggesting greater self-efficacy when deliberate practice is incorporated into the teaching of resuscitation skills amongst pre-registration nursing students.

Table 3 shows the post-test scores and the results of the independent samples t-test comparing the means of the control and experimental groups. In detail, 5 of the 18 items show a statistically significant improvement in the mean post-simulation score between the control and the experimental group. While every mean score is higher in the group who had deliberate practice following the de-brief only assessing the safety of the situation (p =.007), assessing the victim's consciousness level (p =.021), opening the airway (p =.003), assess for breath (p

Table 3
Comparison between the post-simulation scores for the control and experimental group participants.

Basic Resuscitation Skills – Self-Efficacy Scale items	Control Group Post n=50		Experimental Group Post n=56		
	Mean	S.D.	Mean	S.D.	**Independent sample T-test**
Assess the safety of myself and the victim, in this order, before approaching	73.1	17.31	81.1	12.96	t(104) = −2.730, p =.007
Assess the victim's level of consciousness within 5 seconds	71.1	19.38	79.0	15.26	t(104) = −2.348, p =.021
Shout for help while continuing with the 'Primary Survey'	76.2	19.23	81.3	14.72	t(104) = −1.554, p =.123
Open the airway using the most effective manoeuvre, depending on the situation	72.1	16.53	80.5	13.83	t(104) = −2.858, p =.003
Assess for breathing and differentiate between effective & agonal respiration in no more than 10 seconds	68.7	20.82	79.1	15.09	t(104) = −2.993, p =.002
Alert the emergency services following set protocol and initial CPR without delay	91.4	118.1	82.6	16.01	t(104) =0.552, p =.582
Perform CPR according to current European Resuscitation Council Guidelines	74.5	20.12	81.2	15.81	t(104) = −1.929, p =.057
Provide effective chest compressions (correct hand placement, depth, recoil and speed)	74.1	19.07	81.5	14.70	t(104) = −2.255, p =.026
Give effective rescue breaths with a pocket mask (correct volume of air and speed of breaths)	74.7	17.59	81.0	16.28	t(104) = −1.919, p =.058
Maintain correct CPR ratio of compression to breaths until I have a valid reason to stop	77.8	16.63	83.5	13.87	t(104) = −1.920, p =.058
Switch on the AED and start using it as soon as it is available without delay	75.8	19.07	81.1	15.28	t(104) = −1.580, p =.117
Follow the AED voice prompts in the right order without getting confused and/or distracted	77.8	17.67	81.3	15.25	t(104) = −1.118, p =.266
Attach AED pads in the correct positions taking into account possible contraindications	75.1	18.88	80.7	15.93	t(104) = −1.659, p =.100
Ensure nobody touches the victim whilst rhythm is being analysed	82.1	16.00	84.5	15.88	t(104) = −0.780, p =.437
Deliver rapid and safe shock to the victim keeping visual check and giving verbal commands	79.1	18.25	82.6	15.40	t(104) = −1.094, p =.236
Resume, without hesitation, appropriate post-shock actions according to current guidelines	78.5	16.90	80.9	14.84	t(104) = −0.773, p =.442
Guarantee minimal interruptions in chest compressions during the resuscitation attempt	76.6	17.76	81.1	15.07	t(104) = −1.429, p =.156
Continue as directed by voice and/or visual prompts from the AED	78.4	18.08	82.5	15.22	t(104) = −1.267, p =.208

=.002) and provide chest compressions (p =.026) are statistically significant.

5. Discussion

The results indicate that simulation improves nursing students' resuscitation self-efficacy. The improvement in mean self-efficacy scores following rapid cycle deliberate practice was slightly higher than in the control group who participated in the high-fidelity standard simulation. However, the difference in scores was not statistically significant. This suggests that single-session rapid cycle deliberate practice may not be more effective than high-fidelity standard simulation delivery in terms of developing resuscitation self-efficacy. Several studies with medical practitioners have found similar results with single episode rapid cycle deliberate practice. Parsons et al. (2023) found no statistically significant difference in performance when using rapid cycle deliberate practice when compared with traditional simulation. While Knipe et al. (2020) found that resuscitation performance could be maintained using weekly rapid cycle deliberate practice when compared with single episode sessions. There is a dearth of research exploring the impact of multiple episode rapid cycle deliberate practice on resuscitation self-efficacy although one study by Karageorge et al. (2020) found improved confidence and team working in paediatric resuscitation with four episodes of rapid cycle deliberate practice when compared with the single episode control group.

In this study the majority of the Basic Resuscitation Skills - Self-Efficacy Scale items show a statistically significant difference in the control group except for calling for help and alerting the emergency services. It could be argued that these items already had quite high self-efficacy scores (a mean of 73.8 for shout for help and a mean of 80.7 for alert emergency services) when compared to other elements on the scale. However, more technical skills such as opening the airway (a mean of 69.9) do not show a statistically significant difference in the experimental group.

The sample characteristics show that more than half of participants (n = 63) had witnessed resuscitation on a real patient (59.4%), but the majority (n = 93) had never used an Automatic External Defibrillator (AED) or observed its use in the practice setting (87.7%). This may appear surprising but as many cardiac arrests occur in specialist settings like the emergency room and critical care students are more likely to see the cardiac arrest team use an Advanced Life Support (ALS) manual defibrillator in use rather than an AED.

This study sought to measure self-efficacy among nursing students as despite ongoing training and education in relation to resuscitation skills both nursing students and registered nurses report considerable anxiety about performing basic life support (Hendy et al., 2023; Jaskiewicz, et al., 2022; Gutierrez-Puertas, et al., 2021; Vincent et al., 2021; Tomas, 2009).

Bandura (1977) derived the concept of self-efficacy from his psychological research and defined it as the individual's perception of their own ability to perform a particular behaviour. Bandura, Ramachaudran, (1994) suggested that self-efficacy develops through four processes, these are cognitive, motivational, affective and selection processes. Cognitive processes include understanding, processing and thinking through how to achieve something. Closely linked to the cognitive process are motivational processes this includes setting goals and planning a course of action to achieve a particular task or goal. Affective processes include managing anxiety, stress and low mood which can impact on performance whereas selection processes relate to making choices to practice or indeed to avoid a particular task.

In terms of learning Bandura, Ramachaudran, (1994) emphasised four sources of increased self-efficacy. He found that mastery experiences were fundamental to overcoming obstacles and helped build coping skills. Such mastery appears to require periods of practice and re-practice of skills. In addition, mastery skills include practice, feedback and verbal validation all of which are present in high fidelity simulation. Mastery together with social experiences of seeing people similar to themselves performing a task helps an individual to conceptualise themselves as being successful. Both of these sources help build an individual's belief that they too have what it takes to succeed. This self-belief is the key to improved self-efficacy and at the same time the final source involved controlling negative emotions which can impact on performance.

One possible explanation for the finding of no statistical difference between the control and experimental groups self-efficacy scores, is that mastery as a source of improvement in self-efficacy is dependent not only on practice but on verbal feedback and validation. While there was feedback and validation of performance after the simulation run through there was no further feedback after the second deliberate practice session.

It is suggested that students with low self-efficacy tend to avoid situations which have in the past led to failure (Bandura, 1993). Given that an early response and effective basic life support is required in an arrest situation we need to ensure that nurses have good levels of self-efficacy to ensure both a timely and appropriate response.

5.1. Limitations

This study has several limitations. Firstly, randomising participants to the experimental and control groups was impossible as students were already allocated to practical groups and timetabled to attend the sessions. Secondly, the study explores the use of a single episode of rapid cycle deliberate practice and follows up student perceptions of resuscitation self-efficacy immediately after the simulation session. It is unclear whether any gains in self-efficacy are maintained over time or if repeated sessions of deliberate practice might produce a wider effect on self-efficacy. Thirdly, this study only measures self-efficacy which whilst important in resuscitation high levels of self-efficacy can only be achieved through mastery and practice. Finally, the study relates to reported self-efficacy and not a measure of resuscitation skill and competence. There is evidence that self-efficacy is weakly associated with skill level (Riggs et al., 2019). In addition, self-efficacy is by its very nature self-reported by participants and therefore subject to the limitations of self-reporting with potential desirability bias. Future research examining rapid cycle deliberate practice and resuscitation skill and self-efficacy may provide a more comprehensive overview of the value, or otherwise, of the approach.

6. Conclusions

This research suggests that rapid cycle deliberate practice during simulation may lead to no statistically significant increase in resuscitation self-efficacy when compared with high-fidelity standard simulation. However, caution should be exercised on drawing a conclusion about the value of rapid cycle deliberate practice based on a single study and there may be other benefits from such an approach in relation to confidence building, anxiety reduction and skill development.

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CRediT authorship contribution statement

Guy Tucker: Conceptualization, Methodology, Formal analysis, Investigation, Writing – original draft, Writing – review & editing.**Claire Urwin:** Conceptualization, Investigation, Writing – review & editing. **Marco Tomietto:** Validation, Formal analysis, Writing – review & editing.**John Unsworth:** Conceptualization, Methodology, Formal analysis, Investigation, 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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References

Aqel, A.A., Ahmad, M.M., 2014. High-Fidelity Simulation Effects on CPR Knowledge, skills, acquisition, and retention in nursing students. World Evid. -Based Nurs. 11 (6), 394–400. https://doi.org/10.1111/wvn.12063.

Bandura, A., 1977. Self-efficacy: toward a unifying theory of behavioural change. Psychol. Rev. 84 (2), 191–215. https://doi.org/10.1037//0033-295x.84.2.191.

Bandura, A., 1993. Perceived self-efficacy in cognitive development and functioning. Educ. Psychol. 28 (2), 117–148. https://doi.org/10.1207/s15326985ep2802_3.

Bandura, A. 1994. Self-efficacy. In: Ramachaudran VS, editor. Encyclopedia of human behaviour. New York: Academic Press; 1994. p. 71–81.

de Castro, L.T., Coriolano, A.M., Burckart, K., Soares, M.B., Accorsi, T.A.D., Rosa, V.E.E., de Santis Andrade Lopes, A.S., Couto, T.B., 2022. Rapid-cycle deliberate practice versus after-event debriefing clinical simulation in cardiopulmonary resuscitation: a cluster randomized trial. Adv. Simul. 7 (1), 43 https://doi.org/10.1186/s41077-022-00239-8.

van den Bos-Boon, A., van Dijk, M., Adema, J., Gischler, S., van der Starre, C., 2022. Professional assessment tool for team improvement: an assessment tool for paediatric intensive care unit nurses' technical and nontechnical skills. Aust. Crit. Care 35 (2), 159–166. https://doi.org/10.1016/j.aucc.2021.03.002.

Greif, R., Lockey, A., Breckwoldt, J., Carmona, F., Conaghan, P., Kuzovlev, A., Pflanzl-Knizacek, L., Sari, F., Shammet, S., Scapigliati, A., Turner, N., Yeung, J., Monsieurs, K.G., 2021. European resuscitation council guidelines 2021: education for resuscitation. Resuscitation 161, 388–407. https://doi.org/10.1016/j.resuscitation.2021.02.016.

Gross, I.T., Abrahan, D.G., Kumar, A., Noether, J., Shilkofski, N.A., Pell, P., Bahar-Posey, L., 2019. Rapid cycle deliberate practice (RCDP) as a method to improve airway management skills - a randomized controlled simulation study. Cureus 11 (9), e5546. https://doi.org/10.7759/cureus.5546.

Gutiérrez-Puertas, L., Márquez-Hernández, V.V., Gutiérrez-Puertas, V., Rodríguez-García, M.C., García-Viola, A., Aguilera-Manrique, G., 2021. Are you prepared to save a life? nursing students' experience in advanced life support practice. Int. J. Environ. Res. Public Health 18 (3), 1273. https://doi.org/10.3390/ijerph18031273.

Hendy, A., Hassani, R., Ali Abouelela, M., Nuwayfi Alruwaili, A., Abdel Fattah, H.A., Abd elfattah Atia, G., Reshia, F.A.A., 2023. Self-assessed capabilities, attitudes, and stress among pediatric nurses in relation to cardiopulmonary resuscitation. J. Multi-Discip. Healthc. 16, 603–611. https://doi.org/10.2147/JMDH.S401939.

Hernández-Padilla, J., Suthers, F., Fernández-Sola, C., Granero-Molina, J., 2016. Development and psychometric assessment of the basic resuscitation skills self-efficacy scale. Eur. J. Cardiovasc Nurs. 15 (3), e10–e18. https://doi.org/10.1177/1474515114562130.

Hood, T.L., Copeland, D., 2021. Student nurses' experiences of critical events in the clinical setting: a grounded theory. J. Prof. Nurs. 37 (5), 885–893. https://doi.org/10.1016/j.profnurs.2021.07.007.

Hunt, E.A., Duval-Arnould, J.M., Nelson-McMillan, K.L., Bradshaw, J.H., Diener-West, M., Perretta, J.S., Shilkofski, N.A., 2014. Pediatric resident resuscitation skills improve after "rapid cycle deliberate practice" training. Resuscitation 85 (7), 945–951. https://doi.org/10.1016/j.resuscitation.2014.02.025.

Jaskiewicz, F., Kowalewski, D., Kaniecka, E., Kozlowski, R., Marczak, M., Timler, D., 2022. Factors influencing self-confidence and willingness to perform cardiopulmonary resuscitation among working adults-a quasi-experimental study in a training environment. Int. J. Environ. Res. Public Health 19 (14), 8334. https://doi.org/10.3390/ijerph19148334.

Karageorge, N., Muckler, V.C., Toper, M., Hueckel, R., 2020. Using simulation with deliberate practice to improve pediatric ICU nurses' knowledge, clinical teamwork, and confidence. J. Pediatr. Nurs. 54, 58–62. https://doi.org/10.1016/j.pedn.2020.05.020.

Knipe, Fox, S.D., Donatello, R.A., 2020. Deliberate practice in simulation: evaluation of repetitive code training on nursing students' BLS team skills. Clin. Simul. Nurs. 48, 8–14. https://doi.org/10.1016/j.ecns.2020.08.001.

Leighton, K., Ravert, P., Mudra, V., Macintosh, C., 2015. Updating the simulation effectiveness tool: item modifications and Re-evaluation of psychometric properties. Nurs. Educ. Perspect. 36 (5), 317–323. https://doi.org/10.5480/15-1671.

Lemke, D.S., Young, A.L., Won, S.K., Rus, M.C., Villareal, N.N., Camp, E.A., Doughty, C., 2021. Rapid-cycle deliberate practice improves time to defibrillation and reduces workload: a randomized controlled trial of simulation-based education. AEM Educ. Train. 5 (4), e10702 https://doi.org/10.1002/aet2.10702.

McGaghie, W.C., Issenberg, S.B., Cohen, E.R., Barsuk, J.H., Wayne, D.B., 2011. Does simulation-based medical education with deliberate practice yield better results than traditional clinical education? A meta-analytic comparative review of the evidence. Acad. Med. 86 (6), 706–711. https://doi.org/10.1097/ACM.0b013e318217e119.

Ng, C., Primiani, N., Orchanian-Cheff, A., 2021. Rapid cycle deliberate practice in healthcare simulation: a scoping review. Med. Sci. Educ. 31 (6), 2105–2120. https://doi.org/10.1007/s40670-021-01446-0.

Nolan, J.P., Soar, J., Zideman, D.A., Biarent, D., Bossaert, L.L., Deakin, C., Koster, R.W., Wyllie, J., Böttiger, B., & ERC Guidelines Writing Group 2010. European Resuscitation Council Guidelines for Resuscitation 2010 Section 1. Executive summary. *Resuscitation*, 81(10), 1219–1276. https://doi.org/10.1016/j.resuscitation.2010.08.021.

Ozkara San, E., Maneval, R., Myers, P., 2021. Incorporating rapid cycle deliberate practice cardiac arrest simulation program into nursing staff continuing professional development. J. Contin. Educ. Nurs. 52 (6), 274–279. https://doi.org/10.3928/00220124-20210514-06.

Parsons, J., Tumminello, R., Pierce, D., Sielicki, A., Dash, J., Pacheco, Z., Siewers, C., 2023. Rapid cycle deliberate practice vs traditional simulation methods in trauma team resuscitations. West. J. Emerg. Med. 24 (3.1), S33. https://doi.org/10.5811/WESTJEM.61109.

Perretta, J.S., Duval-Arnould, J., Poling, S., Sullivan, N., Jeffers, J.M., Farrow, L., Shilkofski, N.A., Brown, K.M., Hunt, E.A., 2020. Best practices and theoretical foundations for simulation instruction using rapid-cycle deliberate practice. Simul. Healthc. 15 (5), 356–362. https://doi.org/10.1097/SIH.0000000000000433.

Resuscitation Council UK 2011 Learning outcomes for training in cardio-pulmonary resuscitation and the use of AEDs. Resuscitation Council: London.

Resuscitation Council UK 2021a Adult Basic Life Support. Resuscitation Council: London available online at https://www.resus.org.uk/library/2021-resuscitation-guidelines/adult-basic-life-support-guidelines [accessed 29.04.2023].

Resuscitation Council UK 2021b Adult Advanced Life Support. Resuscitation Council: London available online at https://www.resus.org.uk/library/2021-resuscitation-guidelines/adult-advanced-life-support-guidelines [accessed 29.04.2023].

Riggs, M., Franklin, R., Saylany, L., 2019. Associations between cardiopulmonary resuscitation (CPR) knowledge, self-efficacy, training history and willingness to perform CPR and CPR psychomotor skills: a systematic review. Resuscitation 138, 259–272. https://doi.org/10.1016/j.resuscitation.2019.03.019.

Rosman, S.L., Nyirasafari, R., Bwiza, H.M., Umuhoza, C., Camp, E.A., Weiner, D.L., Rus, M.C., 2019. Rapid cycle deliberate practice vs. traditional simulation in a resource-limited setting. BMC Med. Educ. 19 (1), 314 https://doi.org/10.1186/s12909-019-1742-4.

Szyld, D., Rudolph, J.W., 2013. Debriefing with Good Judgement in The Comprehensive Textbook of Healthcare Simulation (A.I. Levine et al Eds.). Springer,, New York.

Tomas, L., 2009. Starting Out: performing CPR on a patient banished some misconceptions, 28-28 Nurs. Stand. 24 (9). https://doi.org/10.7748/ns.24.9.28.s33.

Vincent, A., Semmer, N.K., Becker, C., Beck, K., Tschan, F., Bobst, C., et al., 2021. Does stress influence the performance of cardiopulmonary resuscitation? A narrative review of the literature. J. Crit. Care 63, 223–230. https://doi.org/10.1016/j.jcrc.2020.09.020.

Whytock, C.W., Atkinson, M.S., 2021. Increasing use of an endotracheal intubation safety checklist in the emergency department. BMJ Open Qual. 10 (4), e001575 https://doi.org/10.1136/bmjoq-2021-001575.

Won, S.K., Doughty, C.B., Young, A.L., Welch-Horan, T.B., Rus, M.C., Camp, E.A., Lemke, D.S., 2022. Rapid cycle deliberate practice improves retention of pediatric resuscitation skills compared with post-simulation debriefing. Simul. Healthc. 17 (1), e20–e27. https://doi.org/10.1097/SIH.0000000000000568.