The impact of unsuccessful resuscitation and manikin death during simulation on nursing student's resuscitation self-efficacy: A quasi-experimental study

Guy Tucker, Claire Urwin, John Unsworth

PII: S0260-6917(22)00323-9
DOI: https://doi.org/10.1016/j.nedt.2022.105587
Reference: YNEDT 105587

To appear in: Nurse Education Today

Received date: 19 January 2022
Revised date: 18 September 2022
Accepted date: 29 September 2022


This is a PDF file of an article that has undergone enhancements after acceptance, such as the addition of a cover page and metadata, and formatting for readability, but it is not yet the definitive version of record. This version will undergo additional copyediting, typesetting and review before it is published in its final form, but we are providing this version to give early visibility of the article. Please note that, during the production process, errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

© 2022 Published by Elsevier Ltd.
The impact of unsuccessful resuscitation and manikin death during simulation on nursing student’s resuscitation self-efficacy: a quasi-experimental study

Dr Guy Tucker, Head of Nursing, Midwifery & Allied Health Professions Education, South Tyneside and Sunderland NHS Foundation Trust, Sunderland, UK – ORCID - https://orcid.org/0000-0001-7857-0095

Claire Urwin, Senior Lecturer in Nursing, University of Sunderland, Sunderland, UK https://orcid.org/0000-0002-0859-9156

Professor John Unsworth, Professor of Nursing, University of Northumbria, Newcastle-upon-Tyne, UK – ORCID - https://orcid.org/0000-0002-4150-6113

Corresponding Author:
Professor John Unsworth
Faculty of Health & Life Sciences
Northumbria University at Newcastle
Faculty Executive
Coach Lane Campus
Benton
Newcastle-upon-Tyne
United Kingdom

Acknowledgements: Thank you to Dr José Manuel Hernández-Padilla from the University of Almeria for permission to use the BRS-SES.

Author statement: Guy Tucker conceptualisation, methodology, investigation, data curation, formal analysis, and writing (original draft / review edit). John Unsworth conceptualisation, methodology, investigation, data curation, formal analysis, and writing (original draft / review edit). Claire Urwin conceptualisation, methodology, investigation, and writing (review edit).

Conflicts of interest: None.

Funding Source: None.

Ethical approval: University of Sunderland Ethics Committee 002223.
The impact of unsuccessful resuscitation and manikin death during simulation on nursing student’s resuscitation self-efficacy: a quasi-experimental study

Abstract

**Background:** There has been considerable debate about whether it is appropriate to let the manikin die during simulation teaching. Simulations are used in high-risk industries to recreate rare and potentially catastrophic events. In healthcare, there has been a reluctance to allow scenarios to progress to a catastrophe because of the potential impact on the individual if they were to then encounter the situation in real life. In healthcare, witnessed resuscitation has an overall success rate of around 23.9%, therefore making every simulation situation successful results in an altered perception of reality.

**Objective:** The researchers aimed to examine whether the manikin’s death during a simulation adversely affects the resuscitation self-efficacy of nursing students.

**Design:** Quasi-experimental design.

**Setting:** [redacted] University, United Kingdom.

**Participants:** Students were invited to participate (n = 120) and 106 consented to take part in the study.

**Methods:** A pre-and post-test of the nursing student’s self-efficacy during a resuscitation scenario. The scenario related to a patient admitted to the emergency room with chest pain who then went into cardiac arrest. The experimental group’s resuscitation was unsuccessful, and the control group’s resuscitation was successful. Self-efficacy was measured using the validated Basic
Resuscitation Skills Self-efficacy scale (BRS- SES). The data were analysed using a paired sample t-test.

**Results:** Overall, both groups showed improved self-efficacy as a result of the simulation session and the death of the manikin in the experimental group did not result in a reduced level of self-efficacy related to resuscitation.

**Conclusion:** The death of the manikin during the simulation involving resuscitation had no impact on student resuscitation self-efficacy.

**Key Words:** Resuscitation skills, Nursing students, Manikin death, Simulation, Self-efficacy, Quasi-experimental
1. **Introduction**

There has been a considerable debate about whether it is appropriate to let the manikin die during simulation teaching around cardiac arrest (Calhoun & Gaba, 2017). Simulation is used in high-risk industries as a means of recreating rare and potentially catastrophic events. There is a perception amongst some health professional educators that allowing scenarios to progress to a potentially poor outcome could impact the individual if they were to then encounter the situation in real life (Corvetto & Taekman, 2013). However, other safety-critical professions, such as aviation, ensure that the simulation has high levels of fidelity with scenarios that follow through to the consequences of acts or omissions. This ensures that the scenarios are taken to their natural conclusion (Craig, 2009).

In healthcare, witnessed resuscitation has an overall success rate of around 23.9% although this can vary based on the day of the week, time of day, and potential comorbidities of patients (National Cardiac Arrest Audit, 2020; Schluep et al., 2018; Robinson et al., 2016). This indicates that a policy of making every simulation situation successful in terms of resuscitation results in an altered perception of reality.

Survival following cardiac arrest is dependent on early recognition and effective resuscitation with appropriate Basic Life Support (BLS) and early defibrillation using an Automated External Defibrillator (AED) (Dick-Smith et al., 2021). The nature of nursing means that nurses are often involved in the early recognition of arrest or peri-arrest and instigating appropriate BLS (Onan et al., 2017). Therefore, all nursing students are taught BLS as part of undergraduate nursing studies (Onan et al., 2017).

2. **Background**

While clinical assessment, decision-making and psychomotor skills are important components of mastering BLS, self-efficacy - the perceived capability that the skill can be performed in real life - is also vitally important (Roh, 2014).
Niemi-Murola et al. (2007) conducted a study in Helsinki to ascertain the attitude of medical and nursing students toward cardiopulmonary resuscitation (CPR). They distributed a questionnaire to final-year medical (n = 100) and nursing (n = 120) students to examine their attitudes and beliefs about their skills related to CPR. A total of 59.1% of nursing students (n = 71) and 56.0% of medical students (n = 56) responded. While 85.8% of medical students felt confident enough to perform CPR, only 70% of nursing students reported confidence. The main area of concern amongst nursing students was related to defibrillation with only 22.7% of nursing students reporting confidence compared to 84.0% of medical students. The results of the survey are of concern because of the role that nurses play as first responders, with early defibrillation often being a key factor in successful resuscitation (American Heart Association, 2020).

Simulation represents a pedagogical approach that is used to expose learners to rare and potentially catastrophic events in a safe and supported environment. Simulation relies on the artificial recreation of reality with various aspects of fidelity playing a significant role including conceptual, physical, and psychological fidelity (Harder, 2018). Conceptual fidelity relates to the scenario and whether it makes sense to the students whereas physical fidelity relates to the appearance and look of the simulated setting. Finally, psychological fidelity relates to the students feeling that the scenario is real (Kim et al., 2016). All three forms of fidelity can be affected by a resuscitation scenario where every resuscitation event is successful given that resuscitation, in reality, is at best successful in around 23.9% of cases.

Several researchers have explored the issue of manikin death while examining the impact on technical and non-technical skills, as well as stress and self-efficacy. Across the studies (Tripathy et al., 2016; Leighton, 2009), manikin death during simulation falls into one of three categories - expected, unexpected or action determined during the simulation. Expected death is where the
students and the facilitator are aware that it is the expected outcome from the outset. Unexpected death is where the facilitator is aware that this is the outcome but the students are unaware. Finally, action determined is an outcome unplanned from the outset and chosen by the facilitator based on the actions taken or inaction during the simulation (Leighton, 2009).

Goldberg et al. (2017) undertook a study with a team of anesthesiology residents in the United States. They were randomised into one of three groups. The groups included one where the manikin always survived and where the manikin always died and a final group which had variable outcomes irrespective of the anesthesiologists’ performance. The researchers measured non-technical skills using the Anaesthetists’ Non-technical Skills Score (Rutherford et al., 2015) and their anxiety using the State-Trait Anxiety Index (Spielberger, 1989). The researchers found no difference in non-technical skills for the groups where the manikin always survived and where the manikin always died. The group with a variable outcome showed improved non-technical skills compared to the others (45.2 vs 41.5 and 42.9 respectively, P = 0.01). Anxiety was raised in all groups, most likely related to the simulation. There was no statistical difference between the manikin surviving and the manikin dying.

A mixed methods study on psychological stress and its impact on student learning following manikin death during a simulation was conducted by Tripathy et al. (2016) in the United States. The researchers initially used focus groups with 11 students (3 groups) to identify the themes used in a subsequent survey. The researchers identified major themes around the emotional reaction to the death, preparation, and the value of debriefing in relation to supporting future engagement and learning. A survey consisting of multiple choice and Likert scale questions was then distributed to an unknown number of students, with 41 students completing the survey. A total of 69% of respondents felt that the simulation had enhanced their learning irrespective of manikin death. The statistical analysis revealed a correlation between manikin death and pre-session anxiety in terms of
advancing through the course (P < 0.001). However, debriefing immediately post scenario was found to significantly reduce the negative emotions while enhancing the level of student satisfaction with the simulation experience.

Recognising the controversy around manikin death during a simulation, Corvetto and Taekman (2013) conducted a narrative review of the literature published between 2002 and 2012. The researchers identified how manikin death can add realism to a simulation scenario as well as provide opportunities to explore issues around death and dying. Several researchers (Leighton, 2009; Nickerson & Pollard, 2009) reported psychological distress but the researchers recommended that this can be reduced by easing the students into the likelihood of death in a session pre-brief, by making the outcomes explicit in the session objectives, and by addressing concerns and issues in the simulation debriefing.

Weiss et al. (2017) conducted a study in France to examine the impact of unexpected manikin death on participant self-efficacy during a simulation. The study was a prospective observation design involving two groups of medical students. The students were randomised into one of two groups. In group 1 (n = 27), the students were warned of the manikin’s death and in group 2 (n = 29), the students had no warning about the planned death. Self-efficacy was measured using eight questions from the Motivated Strategies for Learning Questionnaire (MSLQ) developed by Pintrich et al. (1991). The researchers found no statistically significant difference between the groups. Both groups had higher self-efficacy post-simulation debriefing than they did at the start of the scenario.

There is a dearth of literature where researchers have identified the impact of manikin death during simulated resuscitation on the nursing students’ resuscitation self-efficacy. With this study, researchers specifically sought to identify if there was a negative impact when compared to a control
group where the manikin was successfully resuscitated. The research question was ‘Does manikin
death during simulated resuscitation reduce a nursing student’s resuscitation self-efficacy?’

3. Methods

3.1 Simulation scenarios and operation

All of the participants attended a simulation session based on a patient presenting to the emergency
room with chest pain. During the patient assessment and treatment, the patient (the manikin) has a
cardiac arrest and the students are expected to recognise cardiac arrest, call for help, start cardio-
pulmonary resuscitation, use an Automated External Defibrillator (AED), and follow the
(Laerdal® AED Trainer 2) is set to recognise a shockable rhythm. 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 UK (2021b)
guidelines for Adult Advanced Life Support.

Before each simulation, the students are given a debriefing which includes the session objectives
and manikin familiarisation. The manikins used in this study were Laerdal Sim Essential manikins
with patient monitors allowing for ECG and vital sign monitoring. The students were all given the
scenario but were unaware of the scenario progressing to cardiac arrest and the intended outcome
of resuscitation.

Regardless of the outcome, all students took part in a debriefing session immediately following the
simulation session. The debriefing session is based on the debriefing with a good judgement model
designed to enable the students to process information without becoming defensive about their
performance (Szyld & Rudolph, 2013).
3.2 Sample
The total study population was drawn from two cohorts of the Bachelor of Science Honours Degree in Adult Nursing programme (n = 120). The students were in their second year of the programme and had completed a variety of hospital and community placements. The students were in predetermined practical groups which were then split into two for the simulation session with one group being assigned to the scenario where the patient was successfully resuscitated and the other group going into the unsuccessful resuscitation scenario.

3.3 Ethics
Ethical approval for the study was obtained from the University’s Research Ethics Committee. The research was conducted in accordance with the Code of Ethics of the World Medical Association (Declaration of Helsinki). The students were invited to participate by an academic unconnected to their programme during a project presentation. The students then consented and agreed to participate. Participation without data collection was possible if the students did not wish to take part in the research study, meaning that their educational experience was unaffected.

3.4 Methods
The researchers utilised quasi-experimental methods in the pre and post-test design. Quasi-experimental methods resemble experimental research however they are not true experimental studies principally because there is non-random assignment of individuals to control and experimental groups (Shek & Wu, 2018). In this study, the dependent variable (BRS-SES scores) was measured across the same participants before the intervention and immediately after. The independent variable was therefore the periods before and after the intervention. The advantage of quasi-experimental methods is that they are easier to organise and less expensive. However, they are less reliable as potential confounding variables such as prior exposure to resuscitation in the clinical setting are not controlled for. Quasi-experimental methods were selected by researchers in
this study because of the issues around sample size and the inability to randomise the students as they were in pre-determined study groups.

The data was collected using the BRS-SES (Hernandez-Padilla et al., 2016) immediately before and immediately after the simulation debriefing. BRS-SES is a validated scale of resuscitation self-efficacy based on Bandura’s (1977) self-efficacy theory and both the European (Nolan et al., 2010) and United Kingdom Resuscitation Guidelines (Resuscitation Council UK, 2011). BRS-SES consists of 18 items scored using a scale of 0-100. The items relate to recognition and alert, Automated External Defibrillator (AED) use, and the cardio-pulmonary resuscitation procedure. The BRS-SES scale has good internal consistency and reliability with an overall Cronbach’s alpha of 0.96.

3.5 Data analysis
The data were entered into the Statistical Package for the Social Sciences version 25 (SPSS) with descriptive statistics being produced alongside a paired sample t-test to compare the means of the two related groups in relation to the same dependent variable.

4. Results
The results revealed that 106 pre-registration adult nursing students took part in the study. The gender breakdown was 102 female students and 4 male students with an average age of 28 years and a standard deviation of 7.21. The participants were divided into groups with a control group (n = 50) and an experimental group (n=56). Of the participants, the majority (49.1%) had entered nursing with a further education diploma usually via access to nursing courses (n=52), with Advanced Level (A-Level) qualifications being the next most common entry qualification at 20.8% (n=22). A total of 14 students had an existing degree (13.2%) and a small number (7.5%) of students had a National
Vocational Qualification (n=8). The remainder of the students (9.4%) failed to complete the question.

Prior exposure to resuscitation in the practice setting was relatively common with over half of the students (n = 63) having witnessed resuscitation on a live patient (59.4%). A smaller number (n = 28) had taken an active role in resuscitation rather than acting as an observer (26.4%). The majority of students (87.7%) had not used an Automated External Defibrillator (AED) or observed its use in the practice setting (n = 93).

Table 01 shows the descriptive statistics for each item on the BRS-SES pre- and post-simulation session for the control group. There is a significant difference in the means for almost all of the items on the scale with all items showing an improvement between the pre-and post-simulation scores. The exceptions are for ‘shout for help’ (pre-mean 73.3 and post-mean 76.2 which is not significant p = .307) and ‘alert the emergency services’ (pre-mean 80.7 and post-mean 91.4 which is not significant p = .679).

[insert Table 01 here]

Table 02 shows the descriptive statistics for each item on the BRS-SES pre- and post-simulation session for the experimental group. The means scores post-simulation are slightly lower than those in the control group. There is an increase in the means for most of the items on the scale except ‘open the airway’ which shows a slight reduction in the mean post-simulation (pre-mean 69.9 and post-mean 68.8 p = .898) and ‘shout for help’ which also shows a reduction in the means pre- and post-simulation (pre-mean 75.8 and post-mean 73.9 p = .396).

[insert Table 02 here]
A paired samples t-test was conducted to compare the means of the student scores (BRS-SES) both before and after the simulation session. The data from the control group shows that the difference in the means was statistically significant for all of the components of the BRS-SES (Table 01) except for ‘shout for help’, $t(49) = -1.032$, $p = .307$ and ‘alert the emergency services’ $t(49) = -.416$, $p = .679$. Both of these components still show a slight improvement in the mean score although not to the point of being statistically significant.

Similarly within the experimental group, the difference in the means was statistically significant for the following components: ‘assess the safety of myself and others’ $t(55) = -3.116$, $p = .003$, ‘assess for breathing’ $t(55) = -2.284$, $p = .026$, ‘perform CPR’ $t(55) = -2.849$, $p = <.001$, ‘effective rescue breaths’ $t(55) = -3.762$, $p = <.000$, ‘ratio of compression to breaths’ $t(55) = -5.443$, $p = <.001$, ‘switch on AED’ $t(55) = -4.547$, $p = <.001$, ‘attach AED pads’ $t(55) = -5.311$, $p = <.001$, ‘deliver rapid and safe shock’ $t(55) = -4.119$, $p = <.001$, ‘resume without hesitation’ $t(55) = -4.834$, $p = <.001$, ‘guarantee minimal interruptions’ $t(55) = 4.962$, $p = <.001$ and ‘continue as directed’ $t(55) = -3.022$, $p = .004$. All of the other components showed no statistical difference (Table 02).

Overall, both groups showed improved self-efficacy as a result of the simulation session and the death of the manikin in the experimental group did not result in a reduced level of self-efficacy related to resuscitation.

5. Discussion

The researchers found that the death of the manikin did not have a significant impact on the nursing students’ perceived self-efficacy when performing basic life support. The experimental and control groups showed improved self-efficacy for almost every indicator post-simulation than at the outset of the session. This suggests that the death of the manikin when combined with a structured
debriefing session and a supportive approach does not have a negative impact on the student’s perception of their ability to perform resuscitation. This is useful as the replication of unsuccessful resuscitation may serve to improve the fidelity of the simulation scenario. As highlighted earlier, the fidelity of simulated learning is important to ensure that the success rate of resuscitation in clinical practice is not misrepresented. As a result of the findings of this and other studies (Goldberg et al., 2017; Tripathy et al., 2016), it should now be possible to more realistically represent the common outcomes for patients and staff of interventions such as resuscitation.

The researchers of this study suggest that many of the components that have a statistically significant difference between the pre-and post-test scores are those that involve either psychomotor skills or those associated with AED use. The performance of a skill is often highlighted as the area that produces the greatest anxiety among student nurses (Aldridge, 2017). Demiray et al. (2016) identified that students often describe that skill as not fully learned until it has been practised on real people in a clinical setting. Students often report a reluctance to use an AED and this is often a result of the local health service policies which prevent nurses from using defibrillators. Only a few researchers have looked at the reluctance of nurses to use an AED compared to other groups. Taniguchi et al. (2008) found that only 78% of nurses would use an AED compared with 94% of medical students. The researchers in this study suggest that pre-simulation anxiety about psychomotor skills and a lack of familiarity with AEDs may go some way to explaining why participants in both groups showed a statistically significant improvement in self-efficacy for these components. This compares with components which showed no statistically different improvement such as arrest recognition and calling for help, which students may have fewer concerns about.

Finally, the researchers suggest that simulation may be a useful method of improving student self-efficacy when teaching resuscitation skills. Other researchers have highlighted the value of high fidelity and immersive simulations in connection to the confidence of paramedics and midwives.
when compared with conventional approaches (McKelvin & McKelvin, 2020). Ahmad and Ahmad (2014) also found there to be improved retention of resuscitation knowledge and improved skills when using high-fidelity simulations compared with lower-fidelity approaches. They found that this reduced significantly after three months with only 85% of students being able to perform to the same level. Regarding self-efficacy measures and perceived ability, Roh and Issenberg (2014) found a correlation between higher self-efficacy scores and the performance of the psychomotor skills associated with resuscitation. Further research is needed to compare the effectiveness of high-fidelity manikin-based simulation versus more traditional methods of teaching resuscitation skills with low-fidelity manikins.

5.1 Limitations

This study has several limitations that should be taken into consideration. Firstly, this was a quasi-experimental study as the students were taught in their existing groups and not randomised individually to either the control or experimental arm of the study. As a result, the student’s prior experience of resuscitation on a live patient was not evenly distributed throughout the groups. Other variables such as previous AED use were also not considered as part of the randomisation. The fact that the students undertook the simulation scenario in well-established groups where the students were comfortable with each other and used to working together may have impacted the results obtained. Finally, the study measured self-efficacy as a sole concept whereas self-efficacy is likely to be one component of wider capability. The lack of an assessment of competence among the students also limited this study.

6. Conclusions

The researchers in this study examined the impact of manikin death during simulated resuscitation on nursing students’ self-efficacy. The researchers found that irrespective of whether the resuscitation was successful or unsuccessful, the students perceived self-efficacy either remained
the same or showed some statistically significant improvement in almost every indicator on the BLS-SES. Allowing manikin death is likely to improve the fidelity of the simulation scenario and reflect the reality of resuscitation outcomes in clinical practice.
References


American Heart Association (2020). International guidelines – Part 4: The automated external defibrillator key link in the chain of survival. Circulation, 102(Suppl_1), Pages 60-76. https://doi.org/10.1161/circ.102.suppl_1.I-60


motivated strategies for learning questionnaire (MSLQ). University of Michigan (National Center for Research to Improve Postsecondary Teaching and Learning).


Table 01: Statistics for the Control Group Pre and Post Simulation session

<table>
<thead>
<tr>
<th>BLS-SES item</th>
<th>Control Group Pre</th>
<th>Control Group Post</th>
<th>Paired t-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>Std. Deviation</td>
<td>N</td>
<td>Mean</td>
</tr>
<tr>
<td>Assess the safety of myself and the victim, in this order, before approaching</td>
<td>62.3</td>
<td>20.20835</td>
<td>50</td>
</tr>
<tr>
<td>Assess the victim’s level of consciousness within 5 seconds</td>
<td>60.3</td>
<td>19.41517</td>
<td>50</td>
</tr>
<tr>
<td>Shout for help while continuing with the ‘Primary Survey’</td>
<td>73.8</td>
<td>22.5776</td>
<td>50</td>
</tr>
<tr>
<td>Open the airway using the most effective manoeuvre, depending on the situation</td>
<td>59.3</td>
<td>20.3125</td>
<td>50</td>
</tr>
<tr>
<td>Assess for breathing and differentiate between effective &amp; agonal respiration</td>
<td>56.1</td>
<td>22.0374</td>
<td>50</td>
</tr>
<tr>
<td>in no more than 10 seconds</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alert the emergency services following set protocol and initial CPR without delay</td>
<td>80.7</td>
<td>134.35261</td>
<td>50</td>
</tr>
<tr>
<td>Perform CPR according to current European Resuscitation Council Guidelines</td>
<td>61.8</td>
<td>22.78471</td>
<td>50</td>
</tr>
<tr>
<td>Provide effective chest compressions (correct hand placement, depth, recoil and speed)</td>
<td>58.2</td>
<td>22.46903</td>
<td>50</td>
</tr>
<tr>
<td>Give effective rescue breaths with a pocket mask (correct volume of air and speed of breaths)</td>
<td>56.5</td>
<td>20.20936</td>
<td>50</td>
</tr>
<tr>
<td>Maintain correct CPR ration of compressions to breaths until I have a valid reason to stop</td>
<td>61.4</td>
<td>22.92490</td>
<td>50</td>
</tr>
<tr>
<td>Switch on the AED and start using it as soon as it is available without delay</td>
<td>55.4</td>
<td>24.32434</td>
<td>50</td>
</tr>
<tr>
<td>Follow the AED voice prompts in the right order without getting confused and/or distracted</td>
<td>60.9</td>
<td>24.31216</td>
<td>50</td>
</tr>
<tr>
<td>Attach AED pads in the correct positions taking into account possible contraindications</td>
<td>60.8</td>
<td>23.08723</td>
<td>50</td>
</tr>
<tr>
<td>Ensure nobody touches the victim whilst rhythm is being analysed</td>
<td>71.6</td>
<td>22.27930</td>
<td>50</td>
</tr>
</tbody>
</table>
Deliver rapid and safe shock to the victim keeping visual check and giving verbal commands | 59.1 | 25.90583 | 50 | 79.1 | 18.25807 | 50 | t(49) = -6.614, p = < .001
Resume, without hesitation, appropriate post-shock actions according to current guidelines | 58.0 | 25.17287 | 50 | 78.5 | 16.90429 | 50 | t(49) = -7.116, p = < .001
 Guarantee minimal interruptions in chest compressions during the resuscitation attempt | 60.7 | 22.94648 | 50 | 76.6 | 17.76950 | 50 | t(49) = -5.512, p = < .001
Continue as directed by voice and/or visual prompts from the AED | 62.3 | 25.01449 | 50 | 78.4 | 18.08258 | 50 | t(49) = -5.465, p = < .001
Table 02: Statistics for the Experimental Group Pre and Post Simulation session

<table>
<thead>
<tr>
<th>BLS-SES item</th>
<th>Experimental Group Pre</th>
<th></th>
<th>Experimental Group Post</th>
<th></th>
<th>Paired T test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assess the safety of myself and the victim, in this order, before approaching</td>
<td>61.2 15.96160 56</td>
<td></td>
<td>69.0 17.09385 56</td>
<td></td>
<td>t(55) = -3.116, p = .003</td>
</tr>
<tr>
<td>Assess the victim’s level of consciousness within 5 seconds</td>
<td>62.7 18.58444 56</td>
<td></td>
<td>66.2 17.45774 56</td>
<td></td>
<td>t(55) = -1.367, p = .177</td>
</tr>
<tr>
<td>Shout for help while continuing with the ‘Primary Survey’</td>
<td>75.8 19.32443 56</td>
<td></td>
<td>53.9 16.99503 56</td>
<td></td>
<td>t(55) = -0.856, p = .396</td>
</tr>
<tr>
<td>Open the airway using the most effective manoeuvre, depending on the situation</td>
<td>69.9 57.22754 56</td>
<td></td>
<td>56.9 18.29036 56</td>
<td></td>
<td>t(55) = -0.129, p = .898</td>
</tr>
<tr>
<td>Assess for breathing and differentiate between effective &amp; agonal respiration in no more than 10 seconds</td>
<td>58.5 19.21052 56</td>
<td></td>
<td>64.8 18.41354 56</td>
<td></td>
<td>t(55) = -2.284, p = .026</td>
</tr>
<tr>
<td>Alert the emergency services following set protocol and initial CPR without delay</td>
<td>66.7 20.33801 56</td>
<td></td>
<td>69.7 19.78107 56</td>
<td></td>
<td>t(55) = -1.100, p = .276</td>
</tr>
<tr>
<td>Perform CPR according to current European Resuscitation Council Guidelines</td>
<td>64.3 17.82017 56</td>
<td></td>
<td>72.1 17.33526 56</td>
<td></td>
<td>t(55) = -3.849, p = &lt; .001</td>
</tr>
<tr>
<td>Provide effective chest compressions (correct hand placement, depth, recoil and speed)</td>
<td>66.6 43.64398 56</td>
<td></td>
<td>70.8 15.61198 56</td>
<td></td>
<td>t(55) = -0.650, p = .518</td>
</tr>
<tr>
<td>Give effective rescue breaths with a pocket mask (correct volume of air and speed of breaths)</td>
<td>60.9 18.22635 56</td>
<td></td>
<td>69.8 17.50232 56</td>
<td></td>
<td>t(55) = -3.762, p = &lt; .001</td>
</tr>
<tr>
<td>Maintain correct CPR ratio of compression to breaths until I have a valid reason to stop</td>
<td>62.8 18.33668 56</td>
<td></td>
<td>74.4 16.36733 56</td>
<td></td>
<td>t(55) = -5.443, p = &lt; .001</td>
</tr>
<tr>
<td>Switch on the AED and start using it as soon as it is available without delay</td>
<td>56.9 20.17376 56</td>
<td></td>
<td>69.6 18.99419 56</td>
<td></td>
<td>t(55) = -4.547, p = &lt; .001</td>
</tr>
<tr>
<td>Follow the AED voice prompts in the right order without getting confused and/or distracted</td>
<td>70.3 57.58675 56</td>
<td></td>
<td>73.0 17.25948 56</td>
<td></td>
<td>t(55) = -0.365, p = .724</td>
</tr>
<tr>
<td>Attach AED pads in the correct positions taking into account possible contraindications</td>
<td>60.7 18.00072 56</td>
<td></td>
<td>71.6 18.49096 56</td>
<td></td>
<td>t(55) = -5.311, p = &lt; .001</td>
</tr>
<tr>
<td>Ensure nobody touches the victim whilst rhythm is being analysed</td>
<td>71.6 20.02900 56</td>
<td></td>
<td>77.1 18.58291 56</td>
<td></td>
<td>t(55) = -1.959, p = .055</td>
</tr>
<tr>
<td>Deliver rapid and safe shock to the victim keeping visual check and giving verbal commands</td>
<td>62.7 19.16245 56</td>
<td></td>
<td>72.7 18.18890 56</td>
<td></td>
<td>t(55) = -4.119, p = &lt; .001</td>
</tr>
<tr>
<td>Resume, without hesitation, appropriate post-shock actions according to</td>
<td>59.1 18.73517 56</td>
<td></td>
<td>72.3 16.98868 56</td>
<td></td>
<td>t(55) = -4.834, p = &lt; .001</td>
</tr>
<tr>
<td>current guidelines</td>
<td>mean</td>
<td>std. dev</td>
<td>n</td>
<td>t(55)</td>
<td>p</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------------</td>
<td>-------</td>
<td>----------</td>
<td>----</td>
<td>---------</td>
<td>-------</td>
</tr>
<tr>
<td>Guarantee minimal interruptions in chest compressions during the resuscitation attempt</td>
<td>59.5</td>
<td>17.48446</td>
<td>56</td>
<td>4.962</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Continue as directed by voice and/or visual prompts from the AED</td>
<td>66.0</td>
<td>20.06159</td>
<td>56</td>
<td>-3.022</td>
<td>.004</td>
</tr>
</tbody>
</table>