Effectiveness of Basic Life Support Training for Faculty of Health, Humanities and Computing Students

By

Sudip Raj Pandey

2019000506

Research Project submitted in part fulfilment of the requirements for the Master’s in Applied Health Sciences (Wellness and Rehabilitation) WR 901 Project

In the Faculty of Health, Humanities and Computing At SOUTHERN INSTITUTE OF TECHNOLOGY INVERCARGILL, NEW ZEALAND

Supervisor: Dr. Phil Handcock

May 2020
DECLARATION

I, Sudip Raj Pandey, declare that the information contained in this Research Project is my own work, except where acknowledgment of the source is made. This research has not been previously submitted for academic examination towards any qualification. The ideas presented are my own opinions and not necessarily those of the Southern Institute of technology.

Signed by  

Date 17.05.2020

Sudip Raj Pandey
Abstract

Sudden Cardiac Arrest (SCA) continues to be a significant global problem. Basic Life Support (BLS) training programmes teach vital knowledge and skills in cardiopulmonary resuscitation, and the use of an automated external defibrillator needed during SCA. The effectiveness of BLS training has been a topic of interest for the past few decades. Moreover, the effectiveness of BLS training courses in terms of retention of knowledge, confidence, and willingness to step forward and help are still under evaluation. There is insufficient evidence that a BLS training programme improves retention of knowledge, confidence, and willingness to step forward and help in case of an out-of-hospital cardiac arrest (OHCA).

This research project sought to find the association between current BLS training and its immediate impact on the retention of knowledge, confidence, and willingness to step forward and help in the case of cardiac arrest. A BLS training programme which included pre-training questionnaires, BLS training, and post-training questionnaires were completed by 30 volunteers who gave their consent to participate.

This study showed that after the current BLS training, there was an immediate improvement in the participants’ knowledge, confidence, and willingness to step forward and help in case of a SCA. The immediate increase in the retention of knowledge in the current study significantly contributed to an immediate improvement in the confidence and willingness to initiate BLS among participants and vice-versa.

In conclusion, bystanders with recent BLS knowledge will have more confidence and willingness to step forward and assist in OHCA. Educators can incorporate simulated clinical scenarios into their curriculum to improve retention of knowledge, confidence, and willingness.
Acknowledgments

This research project would not have been possible without the help of many people. I would like to thank all those who have supported and inspired me during my research.

First and foremost, I would like to express my special thanks to my research supervisor Dr. Phil Handcock for giving me invaluable guidance. I would not be mistaken to say that he has the quality of a genius. I learned from him so many new things about the research. This research project would not have been completed without his constant encouragement and support.

My appreciation also extends to Duncan McKenzie, Programme Manager, for all his support and advice. Also, I would like to thank Dr. Michael Fallu and Hennie Pienaar for their support and advice at the initial stage of the research project. I would also like to show my gratitude to Will Payne, course coordinator, and Joanne Trezise, tutor, for their immense support. Additionally, I will like to thank Dean Lightenberg, the training team leader, for his tireless support in making this project a success.

I also wish to acknowledge the support and great love of my parents, and my deepest love goes to my wife, Vidya and my two dear sons. I would not have done this research without her. They kept me going on in both good and hard times, and this research would not have been possible without their support.
# TABLE OF CONTENTS

List of Tables ............................................................................................................................ 6
List of Figures ............................................................................................................................ 6
List of Appendices .................................................................................................................... 6
GLOSSARY .............................................................................................................................. 7
 sectional ................................................................................................................................ 8
  introduction ........................................................................................................................... 8
  Purpose of the Research Project ............................................................................................. 9
  Research Questions ............................................................................................................... 10
section ..................................................................................................................................... 11
  literature review .................................................................................................................... 11
section ..................................................................................................................................... 26
  methods ................................................................................................................................. 26
  introduction .......................................................................................................................... 26
  Research Methodology ......................................................................................................... 26
  Ethics ..................................................................................................................................... 26
Methodology ........................................................................................................................... 27
  Customised Basic Life Support Questionnaire (BLSQ) ......................................................... 27
  Sampling Strategy ................................................................................................................ 27
  Data Collection ................................................................................................................... 28
  Data Analysis Method ........................................................................................................ 28
section ..................................................................................................................................... 29
  findings ................................................................................................................................. 29
  4.1 Retention of Knowledge ................................................................................................. 30
  4.2 Confidence to Step Forward and to Carry out Basic Life Support ................................... 36
  4.3 Willingness to Step Forward and To Carry Out Basic Life Support ................................. 36
  4.4 Participants’ Response to Training Effectiveness ............................................................... 37
section ..................................................................................................................................... 39
  discussion .............................................................................................................................. 39
section ..................................................................................................................................... 44
  conclusion .............................................................................................................................. 44
REFERENCE .......................................................................................................................... 46
Appendices ................................................................................................................................ 59
List of Tables

Table 1  Professional Background of the Participants ............................................................. 29
Table 2  Confidence Level in Initiating BLS Pre and Post Training ....................................... 36
Table 3  Major Factors for the Effectiveness of Training Attained ......................................... 37
Table 4  Factors Playing Key Role in the Retention of Knowledge and skills Attained from BLS Training ............................................................................................................. 38

List of Figures

Figure 1  Recency of BLS Training ......................................................................................... 30
Figure 2  First Step When Approaching an Unconscious Person: Percentage of Respondents ...................................................................................................................... Error! Bookmark not defined.
Figure 3  Next Step if the Person is not Responding (in %).................................................... 31
Figure 4  Next Appropriate Step if the Person is not Breathing Normally (in %).................... 32
Figure 5  Recommended Chest Compression (in %) ................................................................ 33
Figure 6  Proper Hand Position for One-Rescuer Chest Compressions (in %) ...................... 33
Figure 7  Changes on Correct Response Pre and Post Training in Several Stages of BLS (response in %) .......................................................................................................... 35

List of Appendices

Appendices 1: Research Questionnaire ................................................................................... 59
Appendices 2: Research Ethics Approval ................................................................................ 68
Appendices 3: Information Sheet ............................................................................................. 69
Appendices 4 : Consent Form .................................................................................................. 71
# GLOSSARY

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AED</td>
<td>Automated External Defibrillator</td>
</tr>
<tr>
<td>AHA</td>
<td>American Heart Association</td>
</tr>
<tr>
<td>BLS</td>
<td>Basic Life Support</td>
</tr>
<tr>
<td>BLSQ</td>
<td>Basic Life Support Questionnaire</td>
</tr>
<tr>
<td>CoSTR</td>
<td>Consensus on Science and Treatment Recommendations</td>
</tr>
<tr>
<td>CPR</td>
<td>Cardiopulmonary Resuscitation</td>
</tr>
<tr>
<td>ILCOR</td>
<td>International Liaison Committee on Resuscitation</td>
</tr>
<tr>
<td>OHCA</td>
<td>Out of Hospital Cardiac Arrest</td>
</tr>
<tr>
<td>PAD</td>
<td>Public Access Defibrillator</td>
</tr>
<tr>
<td>SCA</td>
<td>Sudden Cardiac Arrest</td>
</tr>
<tr>
<td>SD</td>
<td>Standard Deviation</td>
</tr>
<tr>
<td>VAS</td>
<td>Visual Analogue Scale</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
</tr>
</tbody>
</table>
SECTION 1

INTRODUCTION

Approximately six million cardiac arrests occur every year due to life-threatening ventricular arrhythmias and the survival rate from a cardiac arrest is less than 1% globally (Ali et al., 2019, p. 188). Out-of-hospital cardiac arrest (OHCA) is a significant public health issue in industrialized countries (Tsunoyama et al., 2017, p. 439). Although various factors predict the outcome of SCA, it is believed that bystander-initiated Cardiopulmonary Resuscitation (CPR) attempts immediately after the cardiac arrest, increases survival rates (Song et al., 2018, p.1). Basic Life Support (BLS) training courses prepare trainees to react to emergencies, and deliver immediate and effective management for a wide range of medical conditions such as cardiopulmonary arrest, choking, drowning, and electrocution (Anderson & Gaetz, 2008). As stated by Kose et al. (2019, p. 2252) the effectiveness of BLS training is based on the initiation of immediate high-quality CPR and early use of Automated External Defibrillator (AED) which is the first step in resuscitating a person experiencing cardiac arrest.

Kouwenhoven, Jude, and Knickerbocker (in 1960, as cited in Bolling, 1990, pp 154-156) claimed that they had achieved a 70% survival rate with a closed-chest cardiac massage technique in 20 cardiac arrest victims (Bolling, 1990, pp. 154-156). According to Bolling, this report marks the rise of contemporary CPR and the introduction of CPR to health care professionals. In 1962, defibrillator was introduced, and in 1966, the first guidelines for BLS were introduced by the American Heart Association (Owojuyigbe et al., 2015, p.164). Later in the year 1973, the American Heart Association (AHA)’s decision to approve CPR training among laypeople, gave support to the idea of large-scale teaching of CPR in many regions around the world (Song et al., 2018, p. 2). Subsequently, in 1992 the International Liaison Committee on Resuscitation (ILCOR) was founded to encourage international collaboration to endorse evidence-based CPR science that could be embraced by regional councils worldwide, and to formulate universal CPR guidelines (Owojuyigbe et al., 2015, p. 164). Despite significant advances in the prevention and treatment of cardiac arrest, it remains a critical health issue around the world. Even though the number of trained BLS rescuers has increased during the last few decades, the frequency of CPR initiated by bystanders remains very low.
To reinforce the chain of survival in a society, one must focus on the active and widespread BLS training programmes in communities (Wang et al., 2015, p.161). According to Semeraro et al. (2006, p. 102), health professionals should have adequate and updated BLS knowledge and skills because there is a significant obstacle with outdated information and lack of retention of knowledge and skills. Since the majority of treated Sudden Cardiac Arrest (SCA) occurs in public places and in private homes where immediate healthcare professionals’ help may not be available, early CPR, and early AED are highly reliant on community engagement for a majority of SCA events (Graham et al., 2015, p.1)

Several studies show that the importance of BLS skills is indisputable, however little is known about how BLS courses influence knowledge, confidence, and willingness to intervene during emergency situations. According to Hamilton (2005, p. 288) poor retention of knowledge following BLS training amongst health care professionals has been documented over the past few decades. Abolfotouh et al. (2017, p. 7) study shows long term retention of knowledge is quite demanding and thus requires holistic approach and refresher training. “However, saving lives is not just about the knowledge to know How, it’s also about the Will to save lives.” Abelesson et al. (2020, p. 2 para 1). Apart from knowledge, there is growing concern regarding confidence and willingness to step forward and help.

A study conducted by Avisar et al. (2013, p. 622) showed that confidence level, CPR knowledge, and skills of undergraduate medical students declined significantly within a year following BLS training and reached the lowest level in 2 years. Vorster and Beningfield (2019, p. 3), found evidence of a lack of confidence among participants in identifying cardiac arrest, securing an airway, delivering rescue breaths, and initiating chest compressions. Besides that, Son et al. (2017) also observed that the degree of CPR willingness varied greatly among participants who had received BLS training and were frequently exposed to CPR practice. To improve willingness among rescuers, the AHA and ILCOR have revised their standards several times, and have simplified CPR procedures to assist in the retention of knowledge and willingness to act (Cassan et al., 2016, p. 34).

**Purpose of the Research Project**

This study aimed to evaluate the effect of BLS training on the immediate impact on BLS knowledge, confidence, and willingness to help to perform CPR by healthcare professionals studying in the Faculty of Health, Humanities, and Computing. As graduates, these students
are likely to encounter cardiac arrest in their careers. This study focused on the effectiveness of BLS training by examining the relationship between CPR knowledge, confidence, and willingness to perform CPR in case of cardiac arrest. Also, the participants would be able to establish the training effectiveness by understanding the link between the BLS training course and the retention of knowledge, confidence, and willingness to help. The research design employed questionnaires to explore any association between new and existing BLS knowledge, and individual’s confidence, and willingness to perform CPR. Undertaking BLS training was hypothesized to be associated with immediately increased levels of knowledge, confidence, and willingness to perform CPR in a cardiac arrest.

**Research Questions**

The research questions for this project were:

i. Does the recency of BLS training influence the retention of BLS knowledge?
ii. Does recent BLS have an immediate influence on confidence levels?
iii. Does recent BLS have an immediate influence on willingness to help?
SECTION 2
LITERATURE REVIEW

Introduction
In this review of literature I am firstly going to contextualise basic life support (BLS) training by describing the extent of cardiac arrest and its significance in public health. Secondly, I will note the importance of BLS training and cardiopulmonary resuscitation procedure. I will explore the impact of BLS training on retention of BLS knowledge, and the effect of BLS training on confidence to initiate CPR. Finally, I will examine the impact of BLS training on individual willingness to step forward and help.

Context
Cardiovascular diseases cause a compelling number of deaths. According to the World Health Organization (WHO, 2017) cardiovascular diseases are responsible for the majority of deaths worldwide, claiming an estimated 17.9 million lives in 2016 and representing 31% of all deaths globally. Sudden death is most often caused by heart disease, causing life-threatening arrhythmias and interfering with the heart’s pumping function and disrupting blood flow to vital organs (Wellens et al., 2016, p. 1499). Out-of-hospital cardiac arrest is a medical emergency mostly caused by heart disease in which the heart suddenly stops performing. It can also be the result of other factors such as poisoning, drug overdose, and drowning (Karuthan et al., 2019, p. 2). Sudden cardiac arrest remains a significant public health problem worldwide. The majority of cardiac arrest cases are usually OHCA, making the part of bystander CPR very important (Ali et al., 2019, p. 188). Though there has been compelling scientific progress in the treatment of cardiac arrest patients, the survival rate for OHCA victims remains low (Farhan et al., 2015, pp. 561-573). A great number of lives could be saved if BLS measures such as CPR were applied properly until professional medical help became available (Jarrah et al., 2018, p. 1). CPR is a well-recognized emergency procedure consisting of chest compressions, often with artificial ventilation, to restore spontaneous blood circulation and breathing (Devi et al., 2017, p. 20). Numerous studies have established that survival rates are up to three folds higher when CPR is given in an early stage of a SCA (Ahn et al., 2016, p. 1). Therefore, effective CPR and early defibrillation are crucial for the reduction of deaths associated with SCA (Kose et al., 2019).
BLS Training

Training is a process to gain knowledge, skills, and competencies, and is effective when completed frequently (Ganesh & Indradevi, 2015, p. 334). Broomfield (as cited in Ehlers & Rajeswaran, 2014, p. 2) has defined competency in BLS as “having the cognitive knowledge and psychomotor skills that are necessary for the effective performance of CPR in cardiac arrest situations.” According to Cant and Cooper, (as cited in Nyström et al., 2016, p. 441), BLS training is taught by creating a simulated clinical scenario and using a technologically advanced mannequin to develop clinical knowledge and skills for participants in a safe environment. BLS training emphasises high-quality CPR and the use of an automated external defibrillator (AED) to manage a cardiac arrest victim. Jeffries and Morton (as cited in Bonacaro et al., 2014, p.100) have explained that a clinical simulation is any activity that resembles a real-life clinical situation or environment which helps to improve knowledge and confidence to apply learned skills without compromising patient safety. According to Rajab et al. (2011, p. 3) uninterrupted chest compressions except when providing ventilation and defibrillation is the key component of CPR. Benner (as cited in Halm & Crespo, 2018, p. 516) noted that proficient decision-making is a consequence of knowledge, skills, and experience.

Victims of OHCA are more likely to benefit if their conditions are immediately recognized, an early emergency medical team is activated, early CPR is initiated by bystanders, and if available prompt defibrillation and adequate post-cardiopulmonary resuscitation are given as part of the chain of survival (Hess & White, 2010, p. 590). Although there are various factors that predict the outcome of sudden cardiac arrest, it is well known that bystander-initiated CPR attempts immediately after the cardiac arrest increases the survival rates (Song et al., 2018, p.1). Bystanders refer to spectators of OHCAs with or without healthcare backgrounds, trained, and untrained lay rescuers (Song et al., 2018, p. 2). It is possible to provide BLS training for both healthcare professionals and non-medical personnel. BLS is usually implemented in pre-hospital settings and can be administered with or without medical equipment. Medical professionals are seldom present at many OHCA. Alfsen et al. (2015, p.7) showed that bystanders have a central role in identifying and acting upon OHCA and inactivating dispatchers. He also noted that the dispatcher’s chances of correctly handling the situation depend on the caller’s (bystander) emotional and physical state as well as the caller’s professional background. According to Birkun et al. (2020, p.138) a recent survey in the UK
revealed that almost 60% of adults had received CPR training and bystander CPR was provided in 61% of OHCA incidents. Bystander CPR interventions in a state of India were only around 2%, and a lack of training was stated to be the main reason for up to 98% of cases not obtaining CPR. Therefore having a well-trained individual with BLS knowledge and skills and ready to act is an important public health initiative.

CPR has gradually progressed from a comparatively crude practice to its present refined form. In 1889, John McWilliam of Scotland, was the first to describe the mechanism of sudden cardiac arrest saying that ventricular fibrillation, and not cardiac standstill was the cause of cardiac arrest (Cakulev et al., 2009, p.2). Hurt (2005, pp. 330-331) explains that Kouwenhoven, in 1960, published his landmark paper on CPR, stating that anyone, anywhere can commence cardiac resuscitation technique with chest compressions and breathing. Although medical professionals were aware of these techniques as early as the 18th and 19th centuries, they had been discarded as being ineffective. Hurt states that in 1960 standard CPR was introduced to physicians. The year 1972, witnessed the world’s first mass public training in CPR (Bhatnagar et al., 2018, p.7). The International Liaison Committee on Resuscitations (ILCOR) was established in 1992 to provide an opportunity for the majority of organisations in resuscitation to collaborate globally (Timerman et al., 2006, p. 201). According to Cassan et al. (2016, p. 34), in 2008, the AHA and Emergency Cardiovascular Care Committee revised new recommendations for CPR with cardiac compressions only, for those bystanders who may be reluctant to perform mouth to mouth ventilation to help an adult who suddenly collapsed. In 2015, Public Access Defibrillation (PAD) programmes were recommended by the AHA and the European Resuscitation Council (ERC) guidelines (Baekgaard et al., 2017). According to Birkeland (2014, p.1) the AHA has modified standard CPR many times over the last 50 years with the aim of improving patient outcomes and to involve more bystanders. This has included increasing compression rates and depth, changing the sequence of resuscitation from Airway, Breathing, and Circulation (ABC) to Circulation, Airway, and Breathing (CAB), and using AEDs in public places.

According to Rogal et al. (2009, p. 15), although CPR had been described initially in the 1960s, the percentage of patients surviving a cardiac arrest remained poor, with only 7% to 11% in OHCA and 17% of in-hospital cardiac arrests surviving. According to Espina and Varon (2011, p. 28), unfortunately, only 20 to 30% of the SCA episodes received the intervention with initial
CPR by bystanders. Having more of the population trained in BLS would improve survival rates. Efficient training of lay people in CPR is currently considered as a key factor of survival in an OHCA and a basic educational objective in resuscitation (Birkun et al., 2020, p.133). BLS training should be structured in accordance with up-to-date recommendations and contain theoretical knowledge alongside practical skills. The principal objectives of BLS training, as mentioned by Soar et al. (2010, p.1434), are firstly to ensure that trainees acquire and retain the knowledge and skills that will enable them to perform correctly in real-life scenarios and improve patient outcomes. Secondly, the syllabus for BLS training should be designed according to the audience and kept as simple as possible. Finally, the reliability of the training interventions should be assessed periodically to confirm that they accomplish the learning objectives.

Inadequate BLS training among health professionals has been found in most parts of the world, including developed and developing countries. Yunus et al.’s (as cited in Poudel et al., 2019, p. 22) study found that better average skills and knowledge were linked with previous training in BLS. Hopstock (2008, p. 4) found that some nursing staff and doctors at three Norwegian hospitals had no prior exposure to any CPR training. In contrast, BLS training has been compulsory for all US health professionals since 1966, especially for those who are likely to face medical emergencies (Roshana et al., 2012, p.141). According to Abella et al. (2008) some investigations show that poor outcomes in cardiac arrest were due to the low quality of CPR performed by trained healthcare professionals. A study conducted in a Nepalese hospital showed that paramedical and medical professionals lacked essential BLS knowledge and skills (Saquib et al., 2019, p. 2). Similarly, numerous studies conducted in different parts of the world continue to describe a poor state of knowledge of BLS amongst healthcare professionals (Irfan et al., 2019, p. 2). An evaluation of junior doctors from the UK by Phillips and Nolan (as cited in Irfan et al., 2019, p.2) found them not competent enough to perform effective resuscitation even though they had undertaken prior BLS training. Similarly, numerous other studies conducted among healthcare professionals in different parts of the world (e.g. South Africa, India) showed poor BLS knowledge among healthcare individuals (Irfan et al., 2019). According to these authors, it is a disturbing finding as health care professionals are expected to have BLS knowledge and skills to be able to perform CPR since they are considered as the leaders when a life-threatening medical situation arises (Irfan et al., 2019). Likewise, Kavalc et al. and Ozdogan, et al. (as cited in Terzi et al., 2017, p. 71). Stressed that BLS knowledge and skills are considered among the essential duties of all healthcare professionals. Inter-
professional cooperation and teamwork between health care professionals have not only been highlighted as one of the resources, but also a necessity in order to achieve a safe, sustainable, and competent future healthcare professional (Frenk et al., 2010; WHO 2010; as cited in Nyström et al., 2016, p. 441).

**Lack of BLS Training**

Several studies have shown that the demand for BLS training courses continues to rise internationally, yet many countries have reported low bystander CPR rates (Birkun & Kosova, 2018, p. 238). Numerous studies have shown that the lack of inadequate training has been highlighted as a contributory factor for poor knowledge in many regions of Nepal (Poudel et al., 2019, p. 22). A study conducted by Anderson et al. (2014) across the United States regions found that low CPR training among rural and lower-income areas had disproportionately higher deaths from OHCA. Differences in CPR training in rural and lower-income communities may contribute to the inequalities in bystander CPR intervention and OHCA survival, and offer prospects for future community involvement (Anderson et al., 2014, p.7). According to a recent Kuwaiti study carried out by Al-Hasan et al. (2020, pp. 2-3), survival to hospital discharge was as low as 0.3 % when compared to western countries where it was between 10 to 26 percent. They claimed that the main reason for poor survival rate in OHCA was low early recognition of OHCA in communities and delayed bystander CPR. Deakin et al. (as cited in Renshaw et al., 2018, p. 2) found that bystander-initiated CPR remains unacceptably minimal within the UK, and fewer than 2% of all cases used public access defibrillator. Training everyone in the community would be a major challenge. Wang et al. (2015, p. 161) concluded that it is important to identify the obstacles and address the need for optimal resuscitation based on community characteristics. They also identified three main barriers in learning CPR included informational, motivational, and financial factors.

**Lack of Retention of BLS Knowledge**

Several studies (Alotaibi 2015; Ilyas 2014; & Federico 2006; as cited in Poudel et al., 2019, p. 22) have documented poor retention of knowledge within a few days of training, which they argue can be overcome by more regular training and practical experiences. Roshana et al. (2012, p.144) have stated that the major obstacle in retaining knowledge is that the standard guidelines are revised and updated frequently, leading to confusion amongst participants with
previously attained knowledge and skills. Ahmed et al. (2017) explain that another obstacle in implementing successful standard CPR is due to its complexity which is difficult for the majority of the population to retain, especially in rural areas where there is a high rate of illiteracy. Birkun and Kosova (2018, p. 243) showed that a lack of CPR skills, knowledge, and fear of causing harm to a victim were some of the more common barriers to implementing CPR. According to Frank and Kluge (2019, p. 215), to maintain and retain learned knowledge and skills from training is known to be more challenging where an individual might not be required to practice for extended periods.

**Lack of Confidence**

Adequate knowledge and understanding about the components of BLS training are crucial to ensure that individuals can provide necessary life-saving procedures in cases of emergency (Bhanji et al., 2015, pp. 561-573). Theory alone is argued to be inadequate for applying successful CPR. According to Kose et al. (2019, p. 2253), in order to effectively apply CPR, there should be a combination of existing knowledge, practical skills, and sufficient self-confidence. Numerous international studies, (e.g. Cummins et al., 1991; Filgueiras et al., 2006.; Kimaz et al., 2006; Howell et al., 2014; Chandrasekaran et al., 2010; as cited in Vorster & Beningfield, 2019, p. 4) have found that a lack of confidence in applying BLS is not only common among general healthcare professionals, but also within emergency care staff when confronted with cardiac arrest. Study by Hopstock (2008, p. 4) presents the time frame of retention of knowledge and mentions that healthcare professionals tend to be self-confidence on their CPR skills for up to 2 years post training and confidence tend to reduce after this. Botha et al. and Chaudhary (as cited in Poudel et al., 2019, p. 19) found that pre-training confidence to initiate CPR was inadequate even in regular CPR performers and that both skills and attitudes to CPR improved with training. Another recent South African study showed a lack of confidence in applying BLS technique among hospital radiological department staff. They indicated that regular BLS training would increase their confidence levels and also their skills (Vorster & Beningfield 2019, p. 1). A study conducted by Quraishi et al. (2018, p. 3) demonstrated that there was a lack of confidence among medical students in handling pediatric cardiac arrests; however, a significant improvement in average confidence level was recorded following the completion of a single one-day training programme.
Lack of Willingness

According to Riggs et al. (2019, p. 260), “Willingness is defined as a person’s perceived likelihood (or probability) of performing CPR in a future scenario.” The level of attitude and willingness to initiate CPR appears to vary among populations as evidenced by numerous surveys conducted in different regions of the world (Chen et al., 2017; Axelsson et al., 2006; & Kuramoto et al., 2008; as cited in Birkun & Kosova, 2018, p. 238). Studies have revealed that a variety of reasons including medico-legal issues, individual characteristics, lack of knowledge and lower income are known to influence willingness in implementing bystander CPR (Huang et al., 2018, p. 573). Numerous studies have revealed that both laypersons as well as healthcare providers show unwillingness to perform CPR due to the need for close physical contact such as mouth-to-mouth breathings (Karuthan et al., 2019, p. 2). In another study among youths conducted by Berthelot et al. (in 2013, as cited in Abelsson et al., 2020. P. 3) showed that their willingness to implement mouth to mouth rescue breathing to a person in a cardiac arrest were 64 in the pre-training and the number improved to 86 in the post-test. According to them, in real-life scenarios there is a possibility of decreasing this score due to the psychological barrier to initiate mouth-to-mouth ventilation resulting in poor ventilation of the patient. Kobras et al. (2016, p. 261) showed in their study that people from non-healthcare related work fields are reluctant to touch unconscious victims what may be the prime reason for poor outcomes in OHCA. Additionally, this hesitation to touch victims in a cardiac arrest could be a barrier to attending a BLS training programme. Moreover, bystanders’ unwillingness may be due to insufficient knowledge or confidence. For example, agonal breathing, an early sign in cardiac arrests, can be mistakenly interpreted as a sign of life by a bystander (Tsunoyama et al., 2017, p. 439). In order to increase bystander CPR rates in public, it is necessary to address their CPR knowledge and skills, willingness, and limitation through regular BLS training programme (Birkun & Kosova, 2018, p. 238).

BLS Training and Retention of Knowledge

Brannan et al. (as cited in Aqel & Ahmad, 2014, p. 394) stated that simulation is a clinical training method to develop critical thinking and learning skills over time. Qi et al. (2011, p. 552) conducted pre and post-training evaluations of a one-day training programme for undergraduate medical students without prior BLS training. They found that there was a considerable improvement in their performance immediately after the BLS training.
Nevertheless, they believed that there was a need for future research with more extended follow-up periods to evaluate the effect on long-term retention of knowledge. Healthcare professionals working in primary healthcare are an essential part of the team and have greater chances of contact with sudden cardiac arrest patients as they practice their professions. They are, therefore, likely to perform CPR when an emergency occurs and will be required to give support and assist other staff of the primary care team (Irfan et al., 2019, p. 2).

Early CPR and the use of AED are essential training components in all BLS as well as in advanced cardiac life-support training courses (Abolfotouh et al., 2017, p.1). According to Kose et al. (2019, p. 2253), receiving up-to-date information and training related to BLS knowledge and skills in nursing courses is essential for nursing students’ knowledge and professional development. They also found in their previous analyses that BLS training significantly improved nursing students’ knowledge, practical skills, attitudes, and self-efficacy. Another study conducted by Lee et al. (2016) indicated that relatively brief duration of BLS training helped the learners acquire CPR and AED related skills. However, their study also found that a longer duration of hands-on practice and training was needed to achieve a high quality of CPR and operation of AED. Similarly, Keenan, 2009 (as cited in Vorster & Beningfield, 2019, p. 4) established that nursing staff who joined a single BLS training course retained a limited amount of knowledge, highlighting that repetitive refresher courses are of utmost importance. A study conducted by Sankar et al. (2013, p. 6) among critical care nursing staff showed that knowledge and skills had improved immediately after training in pediatric CPR. However, knowledge and skills started to decline by six weeks, although these remained better than their initial values. Likewise, Govender et al.’s (2014, p. 462) research showed that with time there was some decline in knowledge and skills. However, this was not statistically important, and skills and knowledge retention remained fairly good after three months. Thus, the overall training programmes were effective in the short term but failed to show the same consistency in the long term.

Calicchia et al.’s (2016, p.1) study found that BLS training, when started early in school life, was more effective. However, concerns regarding the ability to retain the BLS skills in the medium and long term remain unanswered. Onyeaso’s (2016, p. 162) study showed that in New Zealand, CPR knowledge and skills are taught as an optional subject in both primary and secondary schools, which is easy to refresh in succeeding years and prepare them in OHCA care. According to Wang et al. (2015, p.161) frequent early training can build the base for a
sense of social responsibility and reinforce CPR knowledge and skills, making CPR knowledge and skills well-engrained by the time the student graduates. Furthermore, Calicchia et al. (2016, p. 4) also confirmed that research on memorising psychomotor skills indicated that early training helps in maintaining a high level of skills over time. They also observed that students who had received training were more eager to intervene in case of an emergency than their peers.

A study conducted in the USA by Girotra et al. (as cited in Renshaw et al. 2018 p. 2) among those patients who received early CPR and defibrillation from bystanders noted a significant difference in proportions of survival to discharge ranging from 3.4 to 22.0%, and survival with functional improvement ranging from 0.8 to 21.0%. Their study identified that immediate CPR and early use of an AED increases the survival rate in a cardiac arrest victim. A similar consistency in the possibility of survival was exhibited within Europe and the rest of the world (Perkins & Cooke, 2012; & Strömsöe et al., 2014; as cited in Renshaw et al., 2018, p. 2).

Roshana et al. (2012, p. 144) confirmed that prior CPR training and clinical experience influence the retention of knowledge and skills, and all health care professionals should have a basic standard of regular BLS training and assessment. Furthermore, Hand (2008, p. 191) emphasized that the mnemonic (D.R.A.B.C.D), which stands for danger, response, airway, breathing, circulation, and defibrillation, to be a simple yet very prominent mnemonic that provides an easy way to retain the BLS algorithm. It is suggested to be reliable and suitable mnemonic for both healthcare professionals and lay rescuers (Resuscitation Council, 2005). Espina and Varon (2011, p. 29) claimed that almost every one of us has seen or encountered at least one CPR being performed either on screen or in real life. Besides that, the majority of the population says that they remember and know how to perform CPR – yet only around 25% of OHCA receive initial CPR. Another issue with retention of standard BLS knowledge and skills is the complication of the technique for most bystanders. To address this issue, the resuscitation committee has simplified the CPR process to chest compressions only for bystanders who are unable or unwilling to perform standard CPR. According to Cassan et al. (2016, p. 42) as a result of chest compressions only CPR, performance scores were considerably higher with a faster reaction and better retention in the setting of OHCA. Additionally, to assist with the CPR technique the AHA has developed a smartphone application to review CPR procedures and details on responding to a medical emergency (Wang et al., 2015, p. 162).
Acquisition and retention of BLS skills were significantly superior with novel training methods compared with conventional BLS courses (Halm & Crespo, 2018, p. 516). Some studies in simulated surroundings show that CPR skills are hard to master for both laypeople and professionals, and skill retention declines considerably over time (Frank & Kluge, 2019, p. 215). Therefore, in order to provide high-quality CPR and increase bystander CPR rates, it is essential to implement various training policies such as frequent training and simulated clinical case scenarios for the retention of CPR skills and knowledge (Meaney et al., 2013). To improve retention of BLS knowledge and skills Hirose et al. (2014, p.1), found that the uses of a short video, mobile, and computer self-instruction programme, with minimal or no instructor training, together with hands-on practice can be an adequate substitute for instructor-led BLS courses. The 2010 Consensus on Science and Treatment Recommendations (CoSTR) statement suggested that training should be targeted to ensure that learners obtain and retain the knowledge and skills that will enable them to act correctly during real-life cardiac arrests (Nolan et al., 2010).

**BLS Training and Retention of Knowledge in the Use of Defibrillator**

The survival rate after a sudden cardiac arrest significantly increases when immediate bystander CPR and AED are performed (Capucci et al., 2002, p. 1065). According to (Powell et al., 2004) the majority of SCA cases are found to be in ventricular fibrillation, which can be successfully managed if intervened with early defibrillation. In medical settings such as cardiac rehabilitation centers where defibrillators are readily available, survival rates approach up to 80% compared to only 2% to 5% survival after 12 minutes of a delay from collapse in a community setting (Powell et al., 2004). In a study conducted by Abelsson et al. (2020, p. 4), the statement; I would use a defibrillator was rated 61 in the pre-training test and increased to 81 in the post-training on a 100-point Likert scale. According to these authors, the self-confidence to use an AED lead to more effective CPR and increased motivation among youth to be involved in a future emergency. A similar study conducted by De-Smedt et al. (2018, pp. 5-7), found that in the pre-training test, only 35 % of school children said they would use an AED. Whereas, after learning that they only needed to turn on the AED to start automated guidance, their confidence to apply an AED rose to 82%. As defibrillation is a vital component in the chain of survival, there is an actual need for better information and training of people regarding AED use and its safety procedures. Moreover, sudden cardiac arrest, with an early
shockable rhythm (ventricular fibrillation or pulseless ventricular tachycardia) has better outcomes with early CPR and defibrillation (Hawkes et al., 2017, as cited in Newell et al., 2018, p. 1).

In 2015, the Resuscitation Council UK decided to include the use of AED in the BLS guideline (Perkins et al., 2015 as cited in Barker, 2019). In accordance with the latest ILCOR guidelines, the European Resuscitation Council has reviewed its position to follow the AHA’s recommendations to install AEDs in areas where there is a reasonable probability of one cardiac arrest occurring every 5 years. An integrated programme of public access defibrillator (PAD) has been mobilized by educating people working near a PAD. This involves informing them about the precise location of PADs, how to use them, as well as training them in BLS procedures. These activities are made more successful by involving members of the healthcare community working near a PAD (Mao & Ong 2016, pp. 30-32).

**BLS Training and Confidence**

Most of the bystanders will often hesitate to perform BLS in real-life scenarios due to a lack of self-confidence. In order to successfully provide CPR, it is crucial to maintain sufficient self-confidence and keep knowledge and skills updated for emergency care following BLS training (Kose et al., p. 2253). This statement is supported by Aqel and Ahmad’s (2014, p. 395) review in which nursing students optimistically valued simulation-based training as effective as learning real-life scenarios and improving their confidence and capacity to perform CPR. Healthcare professionals with more work experience and frequent BLS training are more confident in providing BLS to a victim (Terzi et al., 2017, p. 74). Likewise, bystanders frequently trained in BLS are more confident in approaching a victim with suspected cardiac arrest and rendering help (Calicchia et al., 2016). In contrast, Lee et al.’s (2016) study found improvement in participants’ confidence and willingness to perform CPR and to use an AED regardless of the training duration. Similarly, Wynne et al. (as cited in Castle et al., 2007, p. 664) demonstrated that the level of confidence of individual nurses to execute BLS did not correlate with their competence, regardless of how long the individual had been working as a qualified nurse.
A short two-hour BLS training course conducted in a high school by Abelsson et al. (2020, p. 3) found that the participants’ self-confidence almost doubled from 51 in the pre-test to 90 in the post-test on a 100 mark visual analogue scale. Having reported this, they concluded that repeated BLS training helps to manage emergencies with more confidence and with more positive attitudes. In contrast, a study conducted by Bjaen and Axelsson (as cited in Hopstock, 2008, p. 4) reported that even without prior CPR training some of the participants had the basic knowledge of resuscitation which could be from different sources of information without actually being trained on the practical skills. Nevertheless, according to Quiney et al. (as cited in Castle et al., 2007, p. 665), a combination of structured training which is supported by clinical exposure, maybe the best learning strategy; however, there is no means of ensuring regular emergency encounters for most laypersons or even for healthcare professionals.

Lack of confidence in some of the healthcare workers showed that the need for BLS trained healthcare professionals to motivate other staff to initiate BLS procedures. Another study conducted by Ohtake et al. (2013, p. 224), focused on the association between BLS training and confidence levels finding that students’ satisfaction levels were highly positive; they firmly believed that the simulation training skills and in-depth course contents were valuable learning tools. A study conducted by Castle et al. (2007, p. 666) showed that there was a disproportionate finding between confidence and competence. They explained that some healthcare assistants were overconfident in their ability yet were unable to demonstrate the needed skills on assessment. Their study concluded that there needs to be a change in existing training which is largely based on facts and figures, to focus more on clinical scenarios-based emergencies, prompting participants to think more comprehensively. According to Kuramoto et al. (in 2008, as cited in Birkun & Kosava., 2018) in order to increase bystander CPR rates in public, BLS knowledge, BLS training status, confidence, willingness, barriers to engage in training, and to perform CPR must be addressed.

**BLS Training and Confidence in Maintaining Airway**

Vorster and Beningfield (2019, p. 3) found that out of 74 participants, 18 (24%) reported that they were confident in implementing all 3 essential components (compressions, airway, and breathing) of BLS. However, 31 (42%) of the participants felt least confident with airway management. According to The Australian and New Zealand Committee on Resuscitation (ANZCOR, 2016a) guidelines, there are clear instructions regarding maintaining the airway in
unresponsive victims without neck injury. To encourage the rescuer’s confidence in maintaining airways, there are simple maneuvers to follow like “win with the chin” and 'sniffing morning air’. Brindley et al. (2010, pp. 498-499) conducted a study in which 43% of the participants were more confident with ‘win with the chin’ recall, while 15% opted for the widely used ‘sniff’ instruction. Their study concluded that overall, ‘win with the chin’ was a superior teaching technology for beginners and could replace the more widely used ‘sniffing position’ technique.

**BLS Training and Confidence in Giving Rescue Breathing**

According to the Australian and New Zealand Committee on Resuscitation (ANZCOR, 2016b), a person who is unresponsive and is gasping or not breathing requires resuscitation. Numerous studies have found that in an adult cardiac arrest patient without an advanced airway, providing mouth-to-mouth for 1-second rescue breathing improves outcomes (Koster et al., 2010, p. 53). According to Perkins et al. (in 2015, as cited in Newell et al., 2018, p. 5), the recommended guideline for ventilation during CPR is 2 positive pressure breaths after every 30 chest compressions. Each breath should be of an inspiratory count of 1 s and generate a visible chest wall rise. In a study conducted by Castle et al. (2007) amongst healthcare personnel, about 90% of doctors were confident in giving a correct rate of chest compressions to breaths, while the confidence level of nurses and healthcare assistants was 60%. A study conducted among a Belgium high school teachers and principals found that their confidence to implement chest only compressions was as high as 85%, whereas confidence to perform chest compressions and mouth to mouth breathing was only 42% (De-Smedt et al., 2019, p. 4).

**BLS Training and Confidence in Chest Compression**

The rate of chest compressions during each continuous cycle of chest compressions is known as the compression rate (Kleinman et al., 2015, pp. 414-435). Optimal chest compressions are essential in maintaining blood flow to the vital organs and have been highlighted in the 2015 resuscitation guidelines (Georgiou et al., 2014; & Soar et al., 2015; as cited in Renshaw 2018, p. 5). It is reasonable for healthcare professionals to provide chest compressions and ventilation for all patients in cardiac arrest, from either a noncardiac or cardiac cause. In average adult victims of cardiac arrest, it is practical to provide a chest compressions rate of 100 to 120/minute and depth of at least 2 inches or 5 cm (Kleinman et al., 2015, pp. 414-435).
Effective initial cardiac compressions during BLS are of paramount significance in forthcoming advanced hospital care, and therefore successful BLS remains the foundation of advanced cardiac life support (Castle et al., 2007). The AHA (2005) guidelines advise a chest compressions to breaths ratio of 30:2, to maximize coronary and cerebral perfusion and to minimize the frequency of interruptions during cardiac arrest (Hess & White, 2010, p. 591). Ewy et al. (2008, p. 44) confirm that while ventilations are possibly necessary for unwitnessed cardiac arrests, victims with witnessed arrests do not necessarily need assisted ventilation initially because their arterial oxygen content is adequate for several minutes. Moreover, they state that in subjects who gasp, the arterial oxygen amount remains sufficient for almost 15 minutes with chest compressions only CPR. Conforming to the AHA (2015) recommendation, the continuous chest compression protocol is reserved for those bystanders who are unwilling or unable to perform mouth to mouth breathings in OHCA, which is presumed to be of cardiac origin. According to Ewy et al. (2008, p.44) the perfusion of the heart and brain are so marginal that any interruption in chest compressions during resuscitation effort except for defibrillation is deleterious.

**BLS Training and Willingness to Help**

Although BLS training is vital to improve bystander CPR rates, not all bystander show the same extent of willingness to initiate CPR in OHCA. Therefore, in order to retain an acceptable level of bystander CPR willingness, it is essential to recognize the most efficient strategy, in terms of method, frequencies, and the interval between training sessions (Son et al., 2017, p. 85). Sipsma et al’s (as cited in Son et al., 2017, p. 81) study found that willingness to perform BLS was higher when individuals had received BLS training within the last five years or more than three times. This finding reveals the link between a willingness to implement BLS and the timing and frequency of BLS training. Moreover, Lubin et al. (in 2004, as cited in McDonough et al., 2012) concluded that high school students were willing to complete BLS training if it fitted into their school timetable or was offered at no cost. Cho et al. (as cited in Son et al., 2017, p. 85) also showed an increase in willingness to initiate bystanders CPR following BLS training at seven Korean university hospitals.

The study conducted by De-Smedt et al. (2018, p. 5) to evaluate confidence among principals and teachers in a Belgium high school also evaluated their willingness to apply CPR. They found that teachers were more reluctant to initiate CPR when witnessing a cardiac arrest due to either lack of knowledge (74%) or fear of causing harm (65%). Birkun and Kosova’s (2018,
study found that willingness to perform bystander BLS on a stranger in real-life scenarios was 79% (304 of 384), whereas on a family member it was 91% (348 of 384). Similarly, Son et al.’s (2017, p. 83), study showed that the percentage of willingness to initiate BLS on friends or family members was 55.3% compared with 32.2% for strangers. Hamasu et al. (as cited in Son et al., 2017, p. 85) found that bystanders’ CPR willingness amongst college students after BLS training increased from 58% to 92.7% for family and from 12.8% to 76.8%, for outsiders. Numerous studies have established that bystanders are unwilling to give mouth to mouth breathing due to fear of contracting diseases, having concerns regarding the effectiveness of CPR, concerns about causing harm, or fear of exposure to legal issues (AHA, 2014; Coons & Guy, 2009; & Lester et al., 2000; as cited in Renshaw et al., 2018, p. 2). Larsen et al. (2004, pp. 4-6) surveyed 400 New Zealanders about their attitudes and knowledge towards CPR and found encouraging results with 74% having prior CPR training, 73% willing to learn more, and 63% suggesting that they would perform mouth-to-mouth breathing on a stranger. According to them, the international response shows that the willingness to perform ‘mouth-to-mouth breathing’ ranges from 3% in Japan, to 15% and 43% in the USA and Australia, respectively. However, apart from the eagerness of New Zealanders to perform CPR, the authors acknowledge that there is room for more knowledge and skills. According to Winkelman et al. (2009, p.10) to motivate more bystanders to initiate BLS, measures need to be taken to simplify the processes (e.g., less importance on mouth-to-mouth breathing). This might improve willingness to perform CPR, particularly among respondents who reported a fear of causing harm or a fear of contracting an infectious disease. The WHO confirms that the chance of contracting a transmissible disease is negligible while giving mouth-to-mouth ventilation and should not be a reason to withhold CPR (Su-May, 2006, p. 9). According to the AHA (2008) guidelines, laypersons who are unwilling to provide rescue breaths should be encouraged to perform compression-only CPR (American Heart Association, 2020). Additionally, compression-only CPR has been recommended for dispatcher-assisted instructions for untrained bystanders (Sayre et al., 2008). As a result, the BLS algorithm has been simplified for lay rescuers who are reluctant to perform mouth to mouth breathings, and they are encouraged to implement Hands-Only CPR (Karuthan et al., 2019, p.1).
SECTION 3
METHODS

Introduction
This study explored the effectiveness of BLS training on the retention of BLS knowledge, confidence, and willingness to step forward and help among Faculty of Health, Humanities and Computing students. Along with an explanation of the study design, details of the research tools, sample sizes, and ethical considerations are discussed in this chapter.

Research Methodology
This study employs a quantitative research methodology and uses pre and post-training questionnaires to collect relevant data from the participants. A pre and post-test method is appropriate for this research project as this study is interested in evaluating the effectiveness of a training course in terms of the retention of knowledge, and individual confidence, and willingness to step forward and help. Since the association between BLS training and retention of knowledge and the effect of attitudes remain inconclusive, this methodology appears to be suitable for exploring these questions.

Ethics
This research project was carried out with approval from the Human Research Ethics Committee, Southern Institute of Technology, New Zealand. Every section of the research project was reviewed and approved by the Human Research Ethics Committee team.

There were several potential ethical issues, which the researcher took into consideration for this project. The participants’ identities were kept strictly confidential, thus meeting the conditions of the code of ethics. The questionnaires do not request any personal information from the participants which could reveal their identity. The questionnaires do not include any sensitive questions which could provoke or reveal the privacy of the participants. The responses collected from the questionnaires were only viewable by the researcher and the supervisor. Once the data collection and analysis phase are completed, the data collected will be stored securely in a locked account, which can only be viewed by the researcher. Finally, all the
information gathered in the course of this research project would be used only for the objective of the research and will be kept confidential.

**Methodology**

**Customised Basic Life Support Questionnaire (BLSQ)**

The research tool used in this research project was a customised questionnaire developed by the researcher. The questionnaires (Appendix A) were developed based on American Heart Association (AHA, 2015) and Australia New Zealand Committee on Resuscitation (ANZCOR, 2016) guidelines and were customised to fit the study purpose. The questionnaires were organised into five sections. The first section included questions related to the socio-demographic characteristics of participants. The second section sought to probe the retention of BLS knowledge of the participants using multiple-choice questions. The third section asked about participants’ confidence levels in applying BLS techniques using Visual Analogue Scales (VAS). The fourth section of questions asked about the participants’ willingness to step forward and help using VAS. The final section of questions asked the participants’ opinions on the effectiveness of the training.

After setting up the research questions, the researcher developed the pre and post-BLS training questionnaires. Drafts of the questionnaires were sent to the project supervisor for review. Questions were subsequently refined and modified to include BLS case scenarios. Questionnaires were then piloted with two individuals with nursing backgrounds, confirming the suitability of the questionnaires.

As the pre training and post training questionnaires were completed immediately before and immediately after BLS training, care was taken to ensure that participants completed the questionnaires to the best of their abilities. Questions in the pre and post-training questionnaires were presented in different orders, and the VAS was used to minimise the recall and increase the reliability and validity of responses.

**Sampling Strategy**

A sample of convenience was recruited for this study. With the permission of the class tutor and BLS team leader, voluntary participants in BLS training were provided with information
on the study and invited to participate. To ensure that the participants voluntarily participated in the study, a brief explanation of the research project was provided. A separate declaration of the consent form was included, and the informed consent of the participants in writing was taken in advance. Only those participants who were capable of giving consent were considered. Those below 18 years of age were excluded from this study. Participation was limited to the first 30 students who returned their consent forms.

**Data Collection**

The pre and post-training questionnaires (pen and paper) were completed by the participants in the training center approximately 15 minutes before and 15 minutes after the training. BLS training was provided by a certified trainer during a two and a half-hour training session.

**Data Analysis Method**

The independent variables were the training method involving standard BLS training together with various cardiopulmonary arrest scenarios. The dependent variables were: measures of retention of BLS knowledge, measures of confidence, and measures of willingness to help.

All completed questionnaires were collected, with no invalid forms excluded. The data collected from the research project was organised and pre and post training measures were analysed to explore the effect of BLS training on retention of knowledge, confidence, and willingness to help. Data were transferred to Excel Spread Sheets for basic statistical analyses. Mean, Median, Standard Deviation was calculated and T-tests were utilised to explore pre – post training differences.
SECTION 4

FINDINGS

This research project sought to explore the effect of the BLS training on the immediate retention of BLS knowledge, confidence, and willingness to step forward and help to perform BLS including CPR by the healthcare professionals studying in the Faculty of Health, Humanities, and Computing.

Thirty participants (n= 23 female, n= 7 male) currently studying in the Faculty of Health, Humanities, and Computing volunteered for this study. All of them were above 18 years of age, with most (n=19) being between 25-39 years of age. All participants were either health professionals or working in allied health fields (Table 1).

Table 1

Professional Background of the Participants

<table>
<thead>
<tr>
<th>Professional Background</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physiotherapists</td>
<td>11</td>
<td>37</td>
</tr>
<tr>
<td>Nurses</td>
<td>8</td>
<td>27</td>
</tr>
<tr>
<td>Psychologists</td>
<td>5</td>
<td>17</td>
</tr>
<tr>
<td>Lab technicians</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Other health professions</td>
<td>4</td>
<td>12</td>
</tr>
</tbody>
</table>

A high percentage (n=21) of the respondents had previous BLS training, with the remaining 9 participants having never completed BLS training despite working in the healthcare sectors (figure 1).
4.1 Retention of Knowledge

Several multiple-choice questions were used to assess the retention of knowledge asked during pre and post training. Several stages of BLS were presented in the questionnaires in the sequential order of approaching an unconscious person, administering CPR, and the use of an AED.

Firstly, a multiple-choice question was designed to find what participants considered to be the initial step when approaching an unconscious person (Figure 2). Pre-training only 3% of participants correctly identified ensuring their own safety. After training, 53% of participants correctly identified this first step.
When asked about checking responsiveness (adult victim) 73% correctly identified ‘by tapping shoulder and shouting ‘Are you Ok?’’. This increased to 93% after the training.

If the victim was unresponsive, all respondents suggested that they would either call an ambulance or seek help from others (figure 3).
To identify whether the victim was breathing normally, most answered that they would either ‘Look, Listen and Feel for Airflow Through the Victim’s Nose or Mouth’ (67% pre and 83% post training) or ‘look for abdominal movement’ (23% Pre, 10% Post).

To assess the retention of knowledge, participants were asked the next appropriate step if the person was not breathing normally (figure 4). Pre training, only 38% correctly identified ‘beginning chest compressions.’ This improved to 73% after BLS training.

Figure 4

*Next Appropriate Step if the Person is not Breathing Normally (in%)*

Participants struggled with the ideal rate of chest compressions (*100 to 120/min, Figure 5*), with only 24% nominating this rate prior to training, and 77% following training.
When asked to nominate the proper hand position for one-rescuer chest compression most knew this for infants (77% pre training, 100% post training), with fewer knowing this for children (55% pre training, 87% post training) and adults (53% pre training, 90% post training, figure 6).

Figure 5
Recommended Chest Compression (in %)

Figure 6
Proper Hand Position for One-Rescuer Chest Compressions (in %)
The compression to breathing rate in a CPR cycle for infants, children and adults were only evaluated post training, with 76%, 80% and 100% identifying the correct ratios.

The last question assessed participants knowledge on use of an automated external defibrillator. A 10 cm Visual Analogue Scale (VAS, 0 poor to 10 high) was used with responses showing an average pre training familiarity of 5.22 (Median 4.5, SD 3.45). This increased to 7.95 (Median 9.5, SD 2.84) following training. The significance of this difference was confirmed with a t-test, $t(29) = 2.045$ and $p<0.05$.

The immediate impact of BLS training on responses is evident in (Figure 7). These line graphs show positive changes on the correct response in every stage representing improvement in retention of knowledge.
Figure 7

Changes on Correct Response Pre and Post Training in Several Stages of BLS (response in %)
4.2 Confidence to Step Forward and to Carry out Basic Life Support

To assess the confidence of participants to step forward to carry out basic life support, a 10 cm VAS was used when responding to the presentation of mock emergency. In response to a choking scenario, the average pre training confidence of participants was 6.02 (Median 7, SD 3.11) which increased to 8.51 (Median 9, SD 1.84) after training, a significant improvement (t (29) = 2.045 and p<0.05).

Similarly, participants' confidence in initiating major steps of BLS training programme, i.e. Airway (A), Breathings (B), Circulation (C) was also assessed using VAS. The findings (table 2) show improvement in all these steps after the training. The average score, which was between 5.5 to 7 increased to above 9. This significant increase in confidence is further verified statistically t (29) = 2.045 p<0.05 in all three stages. Thus, showing increased confidence among participants post-training.

Table 2

<table>
<thead>
<tr>
<th>Confidence Level in Initiating BLS Pre and Post Training</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Test</td>
</tr>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>Maintain Airway</td>
</tr>
<tr>
<td>Check Breathings</td>
</tr>
<tr>
<td>Chest Compression</td>
</tr>
</tbody>
</table>

4.3 Willingness to Step Forward and To Carry Out Basic Life Support

The willingness of participants to step forward and carry out basic life support was assessed by presenting hypothetical emergency scenarios in both pre and post-training questionnaires and using a VAS of 0 to 10 scale. In response to assisting an unconscious person in a public space scenario, the average pre training willingness was 7.60 (Median 8.25, SD 2.47) which increased to 9.07 post training (Median 9.50 and SD 1.44), a significant improvement t (29) = 2.045 and p <0.05.
A similar scenario was presented in post-training to initiate BLS to a friend, one who suddenly collapses and is not responding and breathing in the middle of a rugby game. The willingness to initiate BLS in case of a friend was 9.15 out of 10 (Median 9.5, SD 1.35) slightly more than the general public (case one as mentioned above; Mean – 9.07).

### 4.4 Participants’ Response to Training Effectiveness

Participant was also asked to mark comments on the effectiveness of the training. A VAS of 0 to 10 was used. The average score was 9.2 (Median – 9.5, SD 1.41). Only 7% of respondents reported the effectiveness of training to be less than 7 out of 10.

When asked about major factors for the effectiveness of the training (table 3), 77% identified trainer experience and deliberation. Similarly, face-to-face interactions with the trainer were noted by 50 percent. Both willingness and self-motivation, and previous knowledge and experience was 47% percent.

<table>
<thead>
<tr>
<th>Major Factors for the Effectiveness of Training Attained</th>
<th>Frequency</th>
<th>% of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Willingness and Self-Motivation</td>
<td>14</td>
<td>47</td>
</tr>
<tr>
<td>Previous Knowledge and Experience</td>
<td>14</td>
<td>47</td>
</tr>
<tr>
<td>Trainer Experience and Deliberation</td>
<td>23</td>
<td>77</td>
</tr>
<tr>
<td>Group Activities and Team Work</td>
<td>11</td>
<td>37</td>
</tr>
<tr>
<td>Face-to-Face Interaction with the Trainer</td>
<td>15</td>
<td>50</td>
</tr>
</tbody>
</table>

Using a VAS (scale 0 to 10), participants were asked whether the skills gained from this training were sufficient enough to practice BLS. The average score was 8.3 (Median 9.25, SD 2.14). Eighty-two percent of the participants responded with scores greater than 7.

Lastly, participants were asked the key factors in the retention of knowledge and skills attained from the BLS training. As shown in Table 4, 60% thought that encounters with simulated real-life situations as a major factor in the retention of knowledge and skills, while around 53% thought that refresher training was a key factor.
### Table 4

*Factors Playing Key Role in the Retention of Knowledge and skills Attained from BLS Training*

<table>
<thead>
<tr>
<th>Factors</th>
<th>Frequency</th>
<th>% of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refresher Training</td>
<td>16</td>
<td>53.3</td>
</tr>
<tr>
<td>Self-Study</td>
<td>6</td>
<td>20.0</td>
</tr>
<tr>
<td>Discussion with Colleagues</td>
<td>10</td>
<td>33.3</td>
</tr>
<tr>
<td>Exposure to Real Life Scenario</td>
<td>18</td>
<td>60.0</td>
</tr>
<tr>
<td>Total Frequency</td>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>
SECTION 5
DISCUSSION

This research project focused on the effectiveness of BLS training of healthcare professionals studying in the Faculty of Health, Humanities, and Computing on the immediate retention of BLS knowledge, confidence, and willingness to step forward and help to perform CPR.

Despite significant advances in the treatment of cardiac arrest and an increase in the numbers trained in CPR, CPR is often not initiated by bystanders. This may be due to poor retention of BLS knowledge (Abolfotouh et al., 2017; & Hamilton, 2005), a lack of confidence to act (Avisar et al., 2013), and a fear of possible legal consequences, causing harm to people or contracting infectious diseases (Huang et al., 2018, p. 575). Understanding the effectiveness of BLS training and its immediate impact on the retention of knowledge, confidence to initiate BLS, and willingness to step forward in initiating BLS were the objectives of the current research project.

There were four main findings from the current study. First of all, the majority of the participants in the pre-training test were unable to correctly answer most of the questions related to basic knowledge of BLS. Thus, the percentage of participants who could knowledgeably implement the BLS technique in real-life scenarios was likely to be much lower. Secondly, most participants significantly improved their confidence levels of handling life-threatening conditions following training. Thirdly, after training, individual willingness to perform CPR on a friend was slightly higher than for a stranger. Lastly, the majority of participants identified trainer experience as a key factor contributing to the effectiveness of the training. Hands-on practice and refresher training were identified as critical factors in the retention of knowledge and skills.

Although all participants in this study were healthcare professionals, most of them lacked knowledge about the basic components of BLS before the training. The majority of the participants gave priority to ensuring the safety of the property instead of ensuring their own safety. Goniewicz et al. (2012, p. 761) found that participants tended to ignore their safety while practicing first aid. In their study, only 20 percent improvement was seen among the students regarding ensuring their own’s safety after training. McGarvey et al. (2014, p. 444)
argue that participants must understand the sequential approach or DRSABCD algorithm where first and foremost step ‘D’ stands for ‘to look out for any possible danger to a potential rescuer before commencing CPR’. In the current study after the training more than half of the participants gave priority to their own safety in the first step. Increased knowledge aids in improved safety in attempting to intervene in emergencies.

In another step of the BLS process, most of the participants in the current study were confused about whether to shout for help or to call an ambulance if an unconscious person was not responding. In contrast, Cassan et al.’s (2016, pp. 33-35) study showed that initial knowledge of BLS among the 516 individuals who participated in all stages was relatively low, except for the concepts of ‘call for help’ which was high (69.8%). In agreement with McGarvey et al. (2014, p. 444), several studies have shown that the DRSABCD algorithm where S stands for sending for help or shout is a typical response and more comfortable to follow. In the present study, for the next step of the BLS participants were not aware of the importance of chest compression. According to Rajab et al. (2011, p. 4), if a person is unresponsive and not breathing normally, then the rescuer should presume that this person is in cardiac arrest and immediately begin chest compressions. According to Qara et al. (2019, p. 3), the leading reason that may stop someone from beginning chest compressions was reported as a fear of making a mistake. In the present study, after the training, the majority of participants answered ‘begin chest compression’ if a person was not breathing normally. It is, however, essential to understanding that proficient decision-making is a consequence of knowledge, skills, and experience (Benner as cited in Halm, & Crespo, 2018, p. 516).

The retention of knowledge appeared to differ based on the nature of the information. Participants tend to remember basics as well as the unique nature of the information, as opposed to technical specifications. For instance, the majority of the participants in the current study knew how to check the responsiveness of an unconscious person - quite general knowledge. The study by Garg et al. (2017) showed that in real-life scenarios, there are cases where the procedure of checking a person's response by tapping and shouting is mostly followed by those trained in BLS and first aid. Furthermore, in the current study, the majority of the participants answered correctly for the proper hand position for infant chest compressions. This can be attributed to the unique finger position for infants during chest compression (as opposed to the use of one hand for a child and two hands for an adult), which is easy to remember (Kim et al., 2016, p. 1001). Similarly, in Brindley et al.’s (2010) study, most of the BLS responders seemed
to know the head tilt–chin lift maneuvers to secure the airway of a victim with no evidence of neck trauma. This general technique can be related to the morning ‘air sniffing’ position (Brindley et al., 2010, p. 496), the reason why BLS responders in the majority of cases may correctly recall this information.

In contrast, more technical numbers such as chest compressions rate and compressions to breaths rate tend to be poorly recalled by participants. In the current study, the majority of the participants suggested a much lower rate of chest compressions than recommended. This finding is supported by Castle et al.’s (2007) observation that both registered nurses and healthcare assistants tended to perform chest compressions poorly, often too slowly. After the training, the correct answer for the chest compressions rate increased by more than three-fold. This improvement can be interpreted as due to the immediate impact of the present CPR training. Also, the report of Rawlins et al. (2009, p.1) supports the present finding, which showed that post-training chest compressions conducted in time to the rhythm of the song Nellie the Elephant significantly improved the outcome. Having considered this, it is quite encouraging to see the overall changes in the immediate retention of knowledge noted in the present study. For instance, participants were reasonably unfamiliar with the use of AED before training, which improved markedly in the post-test. In the same vein, Smith et al. (2017, p. 269) found that few people knew what an AED was, how to operate it, and who can use it. It is thus recommended simplifying teaching procedures so that the retention of knowledge increases. It can either be by simplifying the way of remembering, for instance as mentioned by Rawlins et al. (2009, p.1) that chest compression rate can be optimized if taught using the beat of the Bee Gees’ song “Staying Alive”, or through the use of technology to ease BLS processes. Onan et al. (2018) found that the mobile-assisted programme for identifying the exact compression point for CPR was highly effective among BLS responders.

The immediate increase in the retention of knowledge in the current study significantly contributed to an immediate improvement in the confidence and willingness to initiate BLS among participants. In the present study, knowledge acquisition improved following training. In the post training, participants were equally more confident and more willing to initiate BLS as required. The confidence level of the participants in assisting a person with choking increased following training. The present study finding is supported by Benner (as cited in Halm, & Crespo, 2018, p. 516), who also noted that proficient decision-making is a
consequence of knowledge, skills, and experience. Similarly, Kumar et al. (2013, p.146) found that inadequate knowledge and infrequent training were the major reasons behind low confidence in executing BLS among Pakistani medical students and for some Europeans. According to Abolfotouh et al. (2017, p. 8), repeated training programmes lead to an improvement in BLS performance and the use of AED.

Similarly, an increased willingness to act can be attributed to an increase in the retention of knowledge. In the present study, the willingness of participants to initiate BLS for an unconscious person in a public space increased significantly following training, however the willingness to help a friend was even greater. Similarly, a study by Onyeaso, and a study by Taniguchi et al. (in 2010, as cited in Onyeaso, 2016, p.166) found that Nigerian and Japanese participants, respectively, were more willing to administer CPR to a relative than to the general public. Huang et al. (2018, p. 575) likewise found that respondents were more willing to perform CPR on immediate family members, close relatives, and friends. However, they were reluctant to perform mouth to mouth CPR on a stranger. There was an improvement in willingness to perform compression-only CPR when they learned that they would not need to perform mouth to mouth CPR for a stranger. Böttiger and Aken (2015) found that students cited panic, and fear of failure (poor knowledge) as the key reasons for their unwillingness to perform CPR.

Furthermore, the ability to act competently in a cardiac arrest scenario depends on the retention of BLS skills, knowledge, and attitudes (Bukiran et al., 2014, p.150). We cannot neglect the fact that all training experiences are not equally effective. A post training survey showed that immediately after the training, almost 50% of trainees were still reluctant to perform CPR in a person with cardiac arrest (Chew & Yazid, 2008, p. 304). A limited acquisition of knowledge can be attributed to inadequate training, trainee capacity, and willingness to learn (Beskind et al., 2016). Several studies (Eisenburger & Safar, 1999; Brennan et al., 1996; & Mahony et al., 2008; as cited in Anderson et al., 2012, p. 317) have found that there is concern about the currency of trained healthcare personnel. Several studies have shown that the repeated training leads to improved and continue retention of knowledge (Onan et al., 2018; & Kose et al., 2019) resulting in increased confidence (Cho et al., 2010; & Montgomery et al., 2012) and willingness (Son et al., 2017) to perform BLS. This is where we should focus resources to provide frequent refresher training and to ensure up-to-date and quality information.
In the present study, the effectiveness of the training was associated with trainer experience and students’ face-to-face interactions with the trainer. While hands-on practice and refresher training were identified as the key factors in the retention of knowledge and skills. Several studies have identified similar reasons for BLS training effectiveness: small class sizes (Kose et al., 2019), feedback mechanisms or face-to-face interactions (Cave et al., 2011). According to Schröder et al. (2017, p. 9), especially for a topic like BLS, demonstration, understanding, frequent training of practical skills, and experience, are essential for achieving consistent learning effects. McGarvey et al. (2014, p. 448) conducted a Round-the-table teaching method on resuscitation, under supervision, to a small group of interdisciplinary participants. They found that it was effective in allowing individuals to be responsible for each specific stage and take the lead. It is thus important to conduct periodic and timely refresher training to ensure continuous improvement in the retention of knowledge (Cave et al., 2011).

However, it is important to acknowledge that an immediate post-training evaluation does not signify long-term retention. Several studies (Cheng et al., 2018; Kleinman et al., 2018; & Saad et al., 2019 as cited in Oermann et al., 2020, p. 2) have documented a significant decline in CPR knowledge and skills within weeks to months of training. These researchers also found that a short CPR training course of 1 or 2 days may confirm participants' possession of knowledge and skills for a short while, but those knowledge and skills tend to deteriorate within a short period without refresher training or continued practice. We also have to consider that frequent changes in BLS methodologies and practices can create confusion in understanding and practices of BLS. Garvey (in 1998, as cited in Hamilton, 2005, p. 293) claims that confusion and poor retention of knowledge and skills among rescuers are associated with the frequent modifications to the guidelines by the Resuscitation Council (UK). Fooks (in 1998, as cited in Hamilton, 2005, p. 293) also highlighted the confusion confronted by the people who had previously studied different guidelines. According to Liu et al. (2019, p. 222), as of now, the American Heart Association (AHA) and European Cardiopulmonary Resuscitation Council (ERC) revise their guidelines on BLS every five years. Basically, that frequent changes to the guidelines and the gradual erosion of knowledge and skills provide a justification for regular refresher training.
Cardiac arrest is a global health problem, and immediate CPR helps save lives. Studies have revealed an association between inadequate BLS training and low bystander-initiated CPR, which can lead to a poor survival rate in OHCA. Undertaking BLS training has proven to contribute to improving bystanders' BLS knowledge, skills, confidence, and willingness to help. The purpose of this research was to evaluate the immediate impact of BLS training on the retention of CPR knowledge and attitudes for the Faculty of Health, Humanities, and Computing students. The BLS training method used a combination of standard BLS education and participation in a simulated cardiopulmonary arrest scenario.

Findings

The main findings from this study were that there were changes in both BLS knowledge and attitudes with training. It was worth noting that the knowledge and confidence levels were considerably higher prior to training in participants who had undertaken prior BLS training in the last two years. After training, differences in knowledge and behaviors were reduced. The study also showed that there was some association between recency of BLS training and acquisition of knowledge. Participants tended to recall authentic applications, for example, shoulder tapping and the unique nature of information more readily than technical information. This study also found that the recency of BLS training increased both the immediate confidence level and willingness to instigate CPR; however, the improvement in confidence levels was found to be higher than the willingness to act.

Limitations

This project had several limitations. The capacity of the training hall and limited time frame for this research limited the number of participants to thirty. The limitation of the sample size and the disproportionate presentation of the professional backgrounds in the sample group means that this study does not represent the general population and may influence the generalisability of the findings. The custom-designed BLSQ used in this research was abbreviated to improve usability but, as a result, may impact the validity of the findings. The study results were evaluated immediately after the training. It is not known if the knowledge
and behaviors after the training would be similar in the longer term. Finally, the instructor knew about the study, which could have unintentionally influenced the way the course was taught.

**Future Research Directions**

The following suggestions are made based on the findings and conclusions from this study. The immediate increase in acquisition of BLS knowledge, confidence, and willingness in this population was sufficient to indicate a need for future research in this area. Educators can incorporate simulated clinical scenarios into their curriculum to improve retention of knowledge, confidence, and willingness. Apart from training healthcare professionals, BLS training can also be provided for the general public. Considering that OHCA usually occurs away from medical facilities, and the survival rate depends on early bystanders-initiated CPR, more training of the population is desirable. Incorporating this type of simulated clinical scenario training can improve bystander’s CPR skills in the case of OHCA. Finally, it is recommended that frequent retraining and reviews determine the retention of knowledge, confidence, and willingness to help and ways to improve these. In conclusion, BLS training is associated with an immediate improvement in knowledge, confidence, and willingness to step forward and help.
REFERENCE


Anderson, G. S., Gaetz, M. (2008). CPR and first aid skill retention, focus on tomorrow, CiteSeerX. Retrieved from citeseerx.ist.psu.edu › viewdoc


Australia New Zealand Council of Resuscitation (ANZCOR). (2016a). Guideline 4 – Airway -Australian Resuscitation ... Retrieved from resus.org.au › download › section_4 › anzcor-guideline-4-airway-jan


Quraishi, M. K., Hanif, U. K., & Parmar, R. (2018, April 28). Improvement in confidence levels for the management of paediatric cardiac arrests in medical students following a training course. *Anaesthesiology and pain medicine, 8*(2), e14867. https://doi.org/10.5812/aapm.14867


Riggs, M., Franklin, R., & Saylanya, L. (2019). Associations between cardiopulmonary resuscitation (CPR) knowledge, self-efficacy, training history and willingness to


Appendices

Appendices 1: Research Questionnaire

Research Questionnaires (customised basic life support questionnaire (BLSQ))

Effectiveness of Basic Life Support Training for Faculty of Health, Humanities and Computing Students.

Pre-Training Questionnaire

Thank you for agreeing to participate. Please tick the most correct answer you deem appropriate or write as required. If you are not comfortable with a question you need not to answer that question.

1. What is your age?
   - [ ] 18-24 years of age
   - [ ] 25-39 years of age
   - [ ] ≥40 years of age
   - [ ] Prefer not to answer.

2. What is your gender?
   - [ ] Female
   - [ ] Male
   - [ ] Other ______________________
   - [ ] Prefer not to answer.

3. What is your professional background? ________________________________
4. When did you last complete any tailored professional training in Basic Life Support (BLS)?
   - □ Less than 1 year ago
   - □ 1-2 years ago
   - □ More than 2 years ago
   - □ I've never completed one

5. You are walking in Queens Park and observe that a person collapses on the path. He appeared to be unresponsive and not breathing and there is no one around in close proximity. How willing are you to initiate basic life support? 1 (Not at all willing) to 10 (Extremely willing). Please mark a vertical line through the horizontal line [-----|-----] below to indicate your response.

   1                                                                                               10
   Not at all willing                      Extremely willing

6. You are enjoying a meal out in a restaurant when a lady a few tables away suddenly grabs her throat and cannot make any sound. You ask, “Are you choking”? she nods ‘Yes’. How confident are you to assist with back blows to relieve her choking? Please mark a vertical line through the horizontal line [-----|-----] below to indicate your response.

   1                                                                                               10
   Not at all Confident                             Extremely Confident

7. You are at Oreti Beach with your family, you saw a person performing chest compressions and breaths to a Cardiac arrest victim in a wrong way, how willing are you to step forward and perform CPR in a right manner? Please mark a vertical line through the horizontal line [-----|-----] below to indicate your response.

   1                                                                                               10
   Not at all Willing                                                                                   Extremely Willing
8. How confident are you in initiating the following Basic Life Support Processes? Please mark a vertical line through the horizontal line [-----|-----] below to indicate your response.

<table>
<thead>
<tr>
<th>Process</th>
<th>1</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintain Airway</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check Breathings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chest Compressions</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9. What is your first step when approaching an unconscious person? Tick one (best) answer.

☐ Ensure your safety
☐ Ensure patient safety
☐ Ensure property safety
☐ Check responsiveness
☐ Don't know


☐ By shouting near the victim’s ear
☐ By pinching and asking
☐ By tapping shoulder and shouting “Are you OK”?  
☐ By shaking gently and calling with name
☐ Don't know

11. What is the next step if the person is not responding? Tick one (best) answer.

☐ Call an ambulance
☐ Call /shout for help
☐ Call the police
☐ Call the victim’s family members
☐ Don't know
12. How do you check if the person is breathing normally? Tick one (best) answer.

□ Look in the mouth for a possible obstruction
□ Feel for a carotid pulse
□ Look, listen and feel for airflow through the victim's nose or mouth
□ Look for abdominal movement
□ Don't know

13. If a person is not breathing normally, the next appropriate step is to: Tick one (best) answer.

□ Ask for help
□ Begin chest compressions
□ Administer two breaths
□ No intervention required
□ Don't know

14. The proper hand position for one-rescuer chest compressions for: Tick one best answer.

<table>
<thead>
<tr>
<th>Infant (&lt; 1 year)</th>
<th>Two Fingertips just below imaginary line across the nipples</th>
<th>Heel of one hand in the centre of the chest with other hand on top</th>
<th>Heel of one hand in the centre of the chest</th>
<th>Don’t Know</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Child (1 year to 8 years)</th>
<th>Two Fingertips just below imaginary line across the nipples</th>
<th>Heel of one hand in the centre of the chest with other hand on top</th>
<th>Heel of one hand in the centre of the chest</th>
<th>Don’t Know</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Adult (above 8 years)</th>
<th>Two Fingertips just below imaginary line across the nipples</th>
<th>Heel of one hand in the centre of the chest with other hand on top</th>
<th>Heel of one hand in the centre of the chest</th>
<th>Don’t Know</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

15. The recommended chest compression rate range is: Tick one best answer.

□ 100 to 120/min
□ 80 to 100/min
□ 120 to 140/min
□ 60 to 80/min
□ Don't know
16. The Automated External Defibrillator (AED) will advise a shock if needed, for all victims of cardiac arrest. Please mark a vertical line [-----|-----] through the horizontal line below to indicate your response.

1 10

Strongly Disagree Strongly Agree

------Thank You------

Effectiveness of Basic Life Support Training for Faculty of Health, Humanities and Computing Students

Post-Training Questionnaire

Thank you for agreeing to participate. Please tick ☑ the most correct answer you deem appropriate or write as required. If you are not comfortable with a question you need not to answer that question.

1. You find a person unconscious on the footpath. He appeared to be unresponsive and not breathing and there is no one around in close proximity. How willing are you to initiate basic life support? Please mark a vertical line through the horizontal line [-----|-----] below to indicate your response.

1 10

Not at all willing Extremely willing

2. You are enjoying a rugby game with your friends. You witness one of your friends suddenly collapses and is not responding and not breathing. How prepared are you to implement basic life support to your friend? Please mark a vertical line through the horizontal line [-----|-----] below to indicate your response.

1 10

Not at all prepared Extremely prepared
3. While you are dining with a friend, they suddenly clinch their throat and cannot make any sound. You ask, “Are you choking”? They nod “yes”. How confident are you to initiate basic life support? Please mark a vertical line through the horizontal line [-----] below to indicate your response.

1 10
Not at all confident  Extremely confident

4. The use of Automated External Defibrillator (AED) is advised, for all victims of cardiac arrest: Please mark a vertical line through the horizontal line [-----] below to indicate your response.

1 10
Not at all agree  Extremely agree

5. How confident are you in initiating the following Basic Life Support Processes? Please mark a vertical line through the horizontal line [-----] below to indicate your response.

Maintain Airway 1 10
Not at all Confident  Very Confident

Check Breathing 1 10
Not at all Confident  Very Confident

Chest Compression 1 10
Not at all Confident  Very Confident

6. What is your first step when approaching an unconscious person? Tick one (best) answer.

☐ Ensure your safety
☐ Ensure patient safety
☐ Ensure property safety
☐ Check responsiveness
☐ Don't know

☐ By shouting near the victim’s ear
☐ By pinching and asking
☐ By tapping shoulder and shouting “Are you OK”?
☐ By shaking gently and calling with name
☐ Don't know

8. What is the next step if the person is not responding? Tick [ ] one (best) answer.

☐ Call an ambulance
☐ Call /shout for help
☐ Call the police
☐ Call the victim’s family members
☐ Don't know

9. How do you check if the person is breathing normally? Tick [ ] one (best) answer.

☐ Look in the mouth for a possible obstruction
☐ Feel for a carotid pulse
☐ Look, listen and feel for airflow through the victim's nose or mouth
☐ Look for abdominal movement
☐ Don't know

10. If a person is not breathing normally, the next appropriate step is to: Tick [ ] one (best) answer.

☐ Ask for help
☐ Begin chest compressions
☐ Administer two breaths
☐ No intervention required
☐ Don't know

11. The recommended chest compression rate range is: Tick [ ] one best answer.

☐ 100 to 120/min
☐ 80 to 100/min
☐ 120 to 140/min
☐ 60 to 80/min
☐ Don't know
12. The proper hand position for one-rescuer chest compressions for: Tick one best answer.

<table>
<thead>
<tr>
<th></th>
<th>Two Fingertips just below imaginary line across the nipples lines</th>
<th>Heel of one hand in the centre of the chest with other hand on top</th>
<th>Heel of one hand in the centre of the chest</th>
<th>Don’t Know</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Infant (&lt; 1 year)</strong></td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td><strong>Child (1 year to 8 years)</strong></td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td><strong>Adult (above 8 years)</strong></td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
</tbody>
</table>

13. How many chest compressions and breaths in a CPR cycle to be given when one rescuer is involved for: Tick one (best) answer for each row.

<table>
<thead>
<tr>
<th></th>
<th>5 compressions and 2 breathings</th>
<th>15 compressions and 2 breathings</th>
<th>30 compressions and 2 breathings</th>
<th>Don’t Know</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Infant (&lt; 1 year)</strong></td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td><strong>Child (1 year to 8 years)</strong></td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td><strong>Adult (above 8 years)</strong></td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
</tbody>
</table>

14. How do you rate the effectiveness of the training programme in the scale of: Please mark a vertical line through the horizontal line [-----] below to indicate your response?

1                                                10

Not Effective at all                               Very Effective
15. In your opinion, what are the major factors that made today’s training effective? *(Please tick ☑ all those that are applicable)*

☐ Willingness and self-motivation
☐ Previous knowledge and experience
☐ Trainer experience and deliberation
☐ Group activities and team work
☐ Face-to-face interaction with the trainer
☐ Others:______________________

16. Do you think the skills gained from the training is sufficient enough to practice BLS in a person who is in a Cardiopulmonary arrest? Please mark a vertical line through the horizontal line [-----|-----] below to indicate your response.

1                                                                                               10
Not at all sufficient                                   Extremely sufficient

17. In your opinion, what factors play the key roles in the retention of skills attained from BLS training? *(Please tick ☑ all those that are relevant)*

☐ Refresher training
☐ Self-study through multiple means including electronic devices
☐ Discussion with colleagues
☐ Exposure to real life scenario at work/public place
☐ Others:________________________________________________

------Thank You------
21 October 2019

Hennie Pienaar  
Southern Institute of Technology

Dear Hennie

HUMAN RESEARCH ETHICS APPLICATION  
Effectiveness of Basic Life Support (BLS) Training amongst students in the Faculty of Health, Humanities and Computing

Thank you for your response to the Ethic Committee’s request and I am pleased to confirm that the amendments to your application are satisfactory.

Congratulations, you may now proceed with your research project.

Kind regards

Yours sincerely,

Sally Bodkin-Allen  
Human Research Ethics Committee Chair
Appendices 3: Information Sheet

Information Sheet

Effectiveness of Basic Life Support Training for Faculty of Health, Humanities and Computing Students.
Information Sheet for Participants

Kia Ora, my name is Sudip Raj Pandey, my background is a general practitioner and I am currently a student at the Southern Institute of Technology (SIT) completing the Masters of Applied Health Sciences (Wellness and Rehabilitation).

Thank you for showing an interest in this project. Please read this information sheet carefully before deciding whether or not to participate. If you decide to participate, I thank you. You do not need to answer any questions you do not want to answer. By completing the consent form, you are giving your consent for your participation and your data to be included in my research project. If you decide not to take part, there will be no disadvantage to you of any kind and I thank you for considering my request.

This project aims to evaluate the effectiveness of the Basic Life Support (BLS) training programme for students. For my project, I am seeking students who are currently enrolled in Faculty of Health, Humanities and Computing to help me evaluate the effectiveness of the BLS training programme for students and I hope you will consider participating. You will be participating in a group BLS training programme. Participants will be handed out a pre-training questionnaire consisting of 16 short multiple-choice questions to be filled out before training commences. This may take approximately 15 minutes. Once the pre-training questionnaire is completed, a certified First Aid trainer will provide training in BLS techniques. After completion of the BLS training programme post-training questionnaire will be handed out to be completed in around 15 minutes. The study involves two and a half hours of BLS training programme including completing pre and post-training questionnaires at the First Aid Training Centre. The pre-training questionnaire will be used to compare with the post-training questionnaire to see if any changes occurred following the training programme. The answers will remain confidential and anonymous. Survey data will be stored on a password-protected computer. Only the research supervisor and the student researcher will have access to the raw data. After the research has been completed the raw data will be handed over to the programme manager and will be stored for 5 years, in accordance with SIT research policy after which it will be destroyed. The results will be published in a written research report that is an assessed part of my programme of study. The findings may be published in a relevant journal.
What if you have any questions about the project?

If you have any questions about the project, either now or in the future, please feel free to contact either Researcher or Supervisor:

Researcher: Sudip Raj Pandey  
Southern Institute of Technology  
Email: 2019000506@student.sit.ac.nz

Supervisor: Dr Phil Handcock  
Email: philjhandcock@gmail.com

This research has been approved by the Human Research Ethics Committee at SIT.

If you have concerns about the ethical conduct of this research or the researchers, the following procedure should occur.

Write to the following:

The Secretary of the Human Research Ethics Committee  
Southern Institute of Technology  
133 Tay St  
INVERCARGILL 9840 NZ  
Tel: 03 211 2699

All information is confidential and will be handled as soon as possible.
Appendices 4 : Consent Form

Southern Institute of Technology

Declaration of consent to be a participant in the Effectiveness of Basic Life Support (BLS) Training amongst students in the Faculty of Health, Humanities and Computing.

I have had the scope and nature of the research fully explained to me. Any questions about the research have been satisfactorily answered, and I understand that I may request further information at any stage. I accept and note that:

1. My participation in this research is entirely voluntary. I may withdraw from participation in the research at any time up until the point at which the data is anonymised and amalgamated into the report, without any disadvantage to yourself of any kind without explanation, disadvantage or disincentive.

2. The questionnaires filled during the training programme is being utilised solely for the purpose of the specific research project and will not be disclosed to any other person or agency without my express consent.

3. The questionnaires will be recorded for later transcription.

4. This information may be incorporated into the research report but actual names or other characteristics that may lead to identification of individuals or organisations will not be disclosed.

5. I may at any time request to view any completed drafts or sections of the research report to which I have contributed.

6. A copy of the completed research report will be made available to me, on request at the conclusion of the research.
DECLARATION

I have read and understood the information set out on this form, and give my informed consent to be participant in accordance with the stated terms and conditions.

Name of Participant: ..................................................

Name of Researcher: Sudip Raj Pandey

Signature .................................................................

Signature .................................................................

Date .................................................................

Date .................................................................