



THE EFFECTIVENESS OF CHEST COMPRESSION EXERCISE USING THE "CPR TRAINER" APPLICATION BASED ON ANDROID ON THE SPEED OF DOING CHEST COMPRESSIONS STUDY ON A MANEKIN

Setianingsih^{ID}, Lestari Eko Darwati, Naimatur Rizkiyah, Ahmad Asyrofi

STIKes Kendal, Kendal, Jawa Tengah, Indonesia

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CONTACT

Setianingsih
ningsihsetia9988@gmail.com
STIKes Kendal, Kendal, Jawa
Tengah, Indonesia

ABSTRACT

Introduction: The problem of cardiac arrest is currently the number one cause of death in the world so that fast treatment is needed, namely cardiopulmonary resuscitation (CPR). Nursing students are prospective health workers who must have basic skills in performing CPR, but most have not been able to perform chest compressions at the right speed. Achieving these abilities requires an appropriate learning media, one of which is by using the "CPR Trainer" application. This study aims to determine chest compression exercises using the "CPR Trainer" application on the speed of doing chest compressions in 8th semester nursing students at STIKES Kendal.

Method: This research used a quasi-experimental with pretest posttest with one grub design. Sampling using purposive sampling technique on 22 8th semester students at STIKES Kendal using mannequins, counters, stopwatches, androids and observation sheets as research tools.

Results: Data analysis using the Wilcoxon test showed that there was no relationship between chest compression exercises using the "CPR Trainer" application on the speed of performing chest compressions with a value of $= 0.638$ ($p > 0.005$).

Conclusion: This can be influenced by the exercise factor because the more a person is exposed to the "CPR Trainer" application, the easier it is for someone to remember the rhythm of the compression speed on the simulator doll.

Keywords: *application CPR trainer ; CPR; chest compression speed*

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INTRODUCTION

The problem of cardiac arrest is still the number one cause of death in the world and causes around 17.9 million people to die each year due to heart and blood vessel disease (WHO, 2019). Cases of cardiac arrest are divided into two, namely events outside the hospital or known as Out Of Hospital Cardiac Arrest (OHCA) and events inside the hospital or known as In Hospital Cardiac Arrest (IHCA). Data shows that 70% of cases of cardiac arrest occur at home, and about 50% of events are not witnessed by other people

(Nofiyanto, 2019). The incidence of OHCA in the United States is 500 thousand people with an average safety or so-called survival rate of 15%.

Cases of cardiac arrest in Indonesia are not yet known for certain data regarding the prevalence of daily occurrences both outside and inside the hospital. According to the 2018 Basic Health Research (Riskesdas), the prevalence of heart disease in Indonesia averages 1.5%, with the highest rate in North Kalimantan at 2.2% and the lowest in East Nusa Tenggara at 0.7%, while in Lampung Province the

figure is 0.7%. the smallest of the national figure of 1.2% (Kemenkes RI, 2019). The exact data on cardiac arrest cases in Central Java is still unknown, but the number of cases of someone diagnosed with heart disease is 91,161 cases (Rikesdas, 2018). Cases of cardiac arrest in Kendal Regency in 2014 cases of cardiac arrest caused by Angina Pectoris were 0.77%, 0.79% were caused by AMI and 10,

American Heart Association(AHA) suggests an evidence-based strategy that can be used in cardiovascular emergencies, namely ensuring the quality of Cardiopulmonary Resuscitation (CPR) performed. CPR is a heart massage action that aims to maintain the supply of oxygen (O₂) to the brain when the heart stops beating. There are 5 standards for providing quality CPR (High Quality CPR), namely: first, perform chest compressions at a rate of 100-120 x/minute. Second, the minimum depth is 2 inches or 5 cm and not more than 6 cm. Third, it allows full recoil after each compression. Fourth, minimize pauses and fifth, ventilate 2 rescue breaths after 30 compressions, each rescue breath given for more than 1 second, each time the chest is lifted (AHA, 2020). The quality of CPR performed by health workers was found to be almost 50% too long and too shallow compression less than 5 cm and more than 35% frequency less than 80 times/minute (Fikriana, 2016). This study is in line with research conducted by Marti (2018) which states that as many as 44.16% of students have a chest compression speed in accordance with the 2015 AHA provisions, namely 100-120x/minute, while 55.14% of students have a chest compression speed that is not appropriate. with the provisions of the 2015 AHA (55.14% with a speed of >120 x/minute) and 5 students with a speed of <100 x/minute. The average compression speed of students is 135 x/minute.

Factors that can hinder the achievement of high quality CPR during compressions, namely fatigue and the degradation of rescuer skills can be the cause of failure to perform quality chest compressions during CPR. Maintaining quality compressions in accordance with standard CPR implementation is difficult and tiring for rescuers, so the compression speed of a rescuer will change after the first minute the rescuer performs resuscitation and starts to feel tired (Edwin, 2013).

The development of information and communication technology is currently very rapid, one of which is Smartphones which have become everyday friends both among children and adults. Smartphones have offered various applications that can be used for health, one of which is the "CPR Trainer" application that can be operated anywhere

and anytime. The "CPR Trainer" application is a simple application that can measure and analyze the speed and frequency of compressions applied to the simulator doll through the pressure sensor on the touch screen on the cellphone.

Nursing students are a part of health workers who must have basic skills in performing CPR through learning carried out in the laboratory and participating in CPR training. Before the nurse profession student enters the clinical practice vehicle, an evaluation of CPR practice in the laboratory is carried out, the results show that 33 (61%) students have not been able to perform chest compressions at the appropriate speed and as many as 21 (39%) students are able to perform chest compressions at the appropriate speed. in accordance. Most of the students have not been able to apply chest compressions at the appropriate speed, thus requiring an intervention to improve the quality of CPR practice in order to be able to perform chest compressions at the appropriate speed. Hospital policy requires students who are going to clinical practice to be able to perform CPR properly and correctly according to standard operating procedures, because students will participate in performing CPR if at any time there are patients who experience cardiac arrest. Laboratory practice learning is very important for students to study properly and correctly, so that when clinical practice students are ready and able to perform CPR. This must also be supported by adequate equipment so that students can study in the laboratory optimally, one of which is a flash light device that is connected to a CPR manikin as a medium for observing compression accuracy.

METHOD

This study uses a Quasi Experiment research design with one group pretest-posttest design. The sampling technique of this study used purposive sampling with a sample of 22 8th semester students at STIKES Kendal with the criteria of chest compression speed at pretest less than 100 x/minute or more than 120 x/minute and female. Data collection tools using Counter, Stopwatch and Observation sheet. The data from this study were analyzed using the Wilcoxon test.

RESULTS

The results of this study are presented in the form of tables 1, 2, 3 and 4 and are explained as

Table 1 Size of respondent concentration based on the age of 8th semester students at Institute of Health Science Kendal (n=22)

Variable	median	Minimum	Maximum
Age	22	21	23

Table 1 shows the median age value of 8th semester students, which is 22

Table 2 Frequency distribution based on body mass index (BMI) of 8th semester students at Institute of Health Science Kendal (n=22)

Variable	F	%
Body Mass Index (BMI)		
- Less BMI (<18.5)	8	36.4
- Normal BMI (18.5-22.9)	11	50.0
- Obesity (25-29.9)	3	13.6
Totals:	22	100

Table 2 shows the majority of normal body mass index (BMI) (18.5-22.9) totaling 11 respondents with a percentage value (50%).

Table 3 Chest Compression Rate for 8th semester students before and after being given chest compression exercises using the "CPR Trainer" application

Variable	mean	median	Standard Deviation	Min-Max	95% CI
Pretest Chest Compression Rate	-	125,250	-	55.5-149.5	-
Posttest Chest Compression Speed	113,091	-	12,2704	-	107,651-118,531

Table 3 shows that the chest compression speed of 8th semester students before being given chest compression exercises using the "CPR Trainer" application has a median value of 125.250 x/minute,

while the chest compression speed after being given chest compression exercises using the "CPR Trainer" application is an average of 113 x/minute. with a standard deviation of 12.2704

Table 4 Wilcoxon Analysis Test Results

	Median(Min-Max)	P value
Pre-test chest compression rate (n=22)	125,250 (55.5-149.5)	0.638
Post-test chest compression rate (n=22)	113,500 (90.5-133.5)	

Table 4 shows the results of the research analysis using the Wilcoxon test, the results obtained (p= 0.638), because the value of p>0.005, statistically there was no difference in the speed of chest compressions before being given chest compression exercises using the "CPR Trainer" application and after being given chest compression exercises using the "CPR Trainer application.

DISCUSSION

Age

The results showed that the minimum age of students was 21 years and the maximum age of

students was 23 years with a median value of 22 years because these students were regular students who were studying in semester 8, so that age was the average age of students.

The results of this study are in line with the results of research by Fikriana and Al-Afik (2016), who explained that the factors associated with achieving high quality CPR were age, gender, weight and height. A person's age affects the high quality CPR obtained. The younger the age, the average ventilation volume obtained will also be more optimal, namely 500-800. This will directly increase the achievement of the

effective volume in each cycle of CPR action. According to researchers, a person's age can affect the speed of compression because the younger a person's age can produce a more optimal compression speed.

Body Mass Index (BMI)

The results showed that the body mass index (BMI) in the 8th semester students majority BMI in the normal category (18.5-22.9) amounted to 11 respondents (50%), BMI in the less category (<18.5) amounted to 8 respondents (36.4%), and BMI in the obesity category (25-29.9) amounted to 3 respondents (13.6%).

This is in line with the research of Afif, Wihastuti, & Setyorini (2015), explaining that there is a significant relationship between BMI and the achievement of depth in CPR action. Depth is usually defined as the depth of CPR action can be influenced by the power generated from both arms and a person's fitness factor. The recommended BMI is BMI with normal limits so that it can provide adequate pressure and depth in accordance with predetermined standards, namely > 5 cm. With an ideal physiological status, it will affect a person's fitness and fatigue. A person with an ideal BMI tends to be able to maintain better endurance because the functions of various organs, especially the function of the heart and respiration, have better strength. So the fitter a person will produce the maximum depth because they are able to maintain chest compressions well besides that CPR action performed for 2 minutes or 5 cycles requires a lot of energy so that the fitness factor will also have an effect. Whereas in someone who has a higher BMI or obesity, it can affect fitness or fatigue in performing chest compressions. Obesity will have low strength in cardiorespiratory function which will have an impact on one's fatigue and fitness. Whereas in someone who has a higher BMI or obesity, it can affect fitness or fatigue in performing chest compressions. Obesity will have low strength in cardiorespiratory function which will have an impact on one's fatigue and fitness. Whereas in someone who has a higher BMI or obesity, it can affect fitness or fatigue in performing chest compressions. Obesity will have low strength in cardiorespiratory function which will have an impact on one's fatigue and fitness. This study is also in line with research conducted by Chalkias (2013), explaining the compressive force when performing chest compressions by someone who is obese will achieve lower results this is due to lower cardiorespiratory function compared to ideal body size. This study is also in line with research by Ardiansyah., Nurachmah., & Adam (2019), which explains that there is a relationship between the

quality of CPR compression and the rescuer's BMI ($p=0.018$; <0.005). BMI in normal category has higher compression quality than BMI in more category ((OR=3.571; CI=1.346-9.475).

Wirasakti & Wulansari (2020) explained that the most influencing factor in performing chest control at a specified depth is body mass index (BMI). Three respondents who were underweight after being given the intervention did not increase the depth of compression. However, normal BMI, overweight and obesity in performing chest compressions with the specified depth. The results of this study are also in line with the research of Sayee & McCluskey (2012) which explains that a BMI of more than 24 can perform quality chest compressions compared to a BMI of less than 24. A BMI of more than 24 has better muscle mass so that the compression is strong and does not tire easily. According to researchers, a person's body mass index (BMI) can affect the achievement of high quality CPR.

The effectiveness of chest compression exercises using the "CPR Trainer" application on the speed of doing chest compressions

Based on the results of the study, it was found that the speed of chest compressions for 8th semester students before being given an intervention in the form of chest compression exercises using the "CPR Trainer" application was a minimum value of 55.5 x/minute and a maximum of 149.5 x/minute with a median value of 125.250 and an average value of speed. 114 x/minute. While the value of chest compression speed after being given an intervention in the form of chest compression exercises using the "CPR Trainer" application, the minimum value is 90.5 x/minute and the maximum is 133.5 x/minute with a median value of 113,500 and an average speed value of 113 x/minute.

The results of the analysis of this study using the Wilcoxon test obtained p value = 0.6381 where p value > 0.005 so that it can be concluded that there is no difference in the value of measuring the speed of pre- and post-test chest compressions. The results of this study H_0 failed to be rejected, which means that there is no significant effect between the use of the "CPR Trainer" application and the speed of chest compressions. This study is in line with the research of Darmawan & Oktavianus (2013) showing the results that there is no significant difference between the pretest and posttest in the control group and the experimental group (Rule of Five) with Mann-Whitney statistical results p value of frequency = 0.597 ($p > 0.005$), which means that there is no effect

of chest compressions based on the rule of five on the rate of chest compressions.

This study is also in line with the research of Sutono, Ratnawati, & Suharsono (2015) which explains that there is no increase in the value of chest compressions before and after receiving CPR training with instructor guidance feedback, audio-visual guidance feedback and with instructor-audio-visual combinations for students. S1 nursing profession in Yogyakarta. There is no difference in the value of chest compressions in the three learning methods which means that both methods can be used as a method of learning RPP skills, especially in undergraduate nursing education in Yogyakarta.

This study is also in line with the research of Metrikayanto, Saifurrohman & Suharsono (2018) which shows that the results of the Mann-Whitney analysis of the posttest (simulation group) and posttest (simulation and Self-directed Video) scores have a significance value (p value) = 0.739 ($p > 0.05$), which means that there is no difference between the pretest and posttest scores of CPR training through self-directed video using I-Carrer cardiac resuscitation mannequins for high school students who are members of PMR. This study is also in line with the research of Imardiani & Iswari (2021) explaining that between the two methods, both the "Stayin Alive" music and the control group using the "Rule of Five" method, the results showed no difference with each value for the frequency of $p = 0.381$. ($p > 0.005$).

According to the researchers, although the results of the bivariate test showed no difference, when viewed from the pre and post test speed values, the average speed decreased towards normal to support high quality CPR. This can be influenced by the exercise factor because the more a person is exposed to the "CPR Trainer" application, the easier it is for someone to be able to remember the speed cadence that is on the simulator doll contained in the application.

CONCLUSION

The results of this study found that there was no effect of chest compression exercises using the "CPR Trainer" application on the speed of chest compressions ($p = 0.638$). It is necessary to conduct research on the effectiveness of interventions other than chest compression exercises using the "CPR Trainer" application on the speed of chest compressions.

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