

The Effect of *Mabar* Applications on Improving Knowledge of Out Hospital Cardiac Arrest among High School Students

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Abstract

Introduction: Out-of-hospital cardiac arrest (OHCA) is one of the significant contributors to mortality worldwide. It is essential to encourage knowledge of cardiac arrest management for everyone. **Objective:** This study aimed to examine the effect of *Mabar* applications on improving understanding of cardiac arrest management among students. **Method:** The True Experimental study, pre-test, and post-test with non-equivalent control group design was applied in this study. **Results:** The result found that there is a significant improving knowledge between before and after training CPR from the simulation method ($p < 0.05$), MABAR application ($p < 0.05$). However, the comparison both of methods showed a significant difference in knowledge after receiving training $p = 0.01$ ($p < 0.05$). All of the influence of the technique increases ability before and after training CPR. However, the *Mabar* application effectively improved more clinical skills, saving time and energy. It has compatible with using independently without depending on the trainer. Using *Mabar* applications can increase attention and impulse for the trainer. **Recommendation:** The *Mabar* application as a CPR training method is highly recommended, especially for teenagers and students. For further research need to examine this application for a broad population.

Keywords: cardiac arrest, application, knowledge, high school students.



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INTRODUCTION

Out of hospital cardiac arrest (OHCA) is one of the leading contributors to death worldwide. In 2016, the incidence of OHCA was estimated at 700,000 to 800,000 people in the United States and Europe. It was also with a safety rate below 10% (1). According to the Association of Indonesian Cardiovascular Specialists (PERKI) in 2015, the estimated Indonesia incidence of cardiac arrest is around 10 out of 100,000 people under 35 years. Each year, the overall number of events is estimated at 300,000-350,000 events (2).

The majority of cases of OHCA occurred in public places, which was around 39.5%, followed by 27.5% at home and 18.2% in nursing homes (3). OHCA victims are at risk of dying 7-10% every minute. If only just waiting for help or bringing the victim directly to a health care center, it will take a long time. That way, we need immediate help from people around the victim (4). Giving cardiopulmonary resuscitation (CPR) immediately increased the safety level of Victims by 2-3 times (5).

This high incidence of OHCA has become a reason for increasing knowledge of management cardiac arrest for everyone. Based on research by Wassenberg et al. (6), comparing the numbers of help provided by CPR volunteers with the number of survivors of OHCA in Denmark from 2001 to 2010, the results showed there was an increase in the number of aids from 21.1% to 44.9. % of all OHCA incidents and number of the safe victims increased become 21.8% in 2010.

The 2015 European Resuscitation Council (ERC) strategy provides cardiopulmonary resuscitation (CPR) training for all laypeople. It could increase volunteer CPR by recognizing OHCA and providing high-quality CPR (7). The International Liaison Committee on Resuscitation (ILCOR) and the American Heart Association (AHA) also recommend that CPR training and the introduction of Automated External Defibrillators (AED). It should be carried to the entire

community and become a part of the school curriculum standards and graduation students (8).

CPR training for school students aged 15-16 years in Hong Kong is an effective way to develop the next generation of CPR volunteers (9). In Indonesia, based on statistical data from the Central Statistics Agency of the Republic of Indonesia, in 2017, the Indonesian population aged 15-19 years is the largest number of people, and more than 60% are currently undergoing education or schooling (10). We can imagine how many CPR volunteers will be created in our communities if all students are required to know and can perform CPR on victims with OHCA (9).

The CPR training process can be carried out on laypeople with traditional methods such as conducting seminars and simulations or using the technological developments method (11). Yunanto et al. 2015 Concludes that "traditional (simulation) and non-traditional (application) methods influence the level of knowledge and skills, but they use the applications programs more effective in increasing understanding of CPR (12)

The results of the preliminary study on September 30th, 2018, at Senior High School Number 8 Malang, 10 students were interviewed about the methods of training CPR, 5 of them want to try training with a smartphone application, 3 people with simulation, and two people with videos and images. This preliminary study found the students desire to get a variety of CPR training, but the android application method is the most desirable. This is why the author is to develop an android application that combines modules, video tutorials, and simulations for CPR training, which the researchers call *MABAR (Main Bareng Aplikasi Resusitasi Jantung Paru)*.

The Authors can examine the effect of using *Mabar* applications on improving knowledge regarding out-of-hospital cardiac arrest for senior high school student Number 8 Malang and find out the

effectiveness of the methods in CPR training.

OBJECTIVE

This study aimed to examine the effect of using cardiopulmonary resuscitation applications (MABAR) on improving knowledge of outside the hospital cardiac arrest (OHCA) in students of Senior High School Number 8 Malang.

METHODS

The Design of the study

This research was a quantitative study true experimental quasi-experimental study, with pre-test and post-test with non-equivalent control group design. The intervention group received MABAR applications, while the control group received only the simulation method.

Sample & Sampling technique

The population in this study were High School students at Malang. A total of 60 samples were selected using systematic random sampling. Thirty students were allocated to the treatment group, and the other 30 students were the control group. The selection of samples was based on the inclusion criteria, including 1) Age 15-18 years old, 2) being able to use a smartphone, 3) has an android smartphone at least OS KitKat, RAM min 1 gigabyte, accessible storage space at least 50 megabytes and 4) willing to run the MABAR application on their smartphone.

Ethical considerations

The ethical approval by the committee of ethics from the Health Research Ethics Commission, Faculty of Medicine, Universitas Brawijaya No. 311/EC/KEPK-S1-PSIK/11/2018. All participants were asked to write down the informed consent form and sign it voluntarily after receiving information about the study and their right to participate or not in the study. The researcher convinced their privacy and confidential information with highly secured.

The instrument for data collection

The questionnaire to aim knowledge regarding out-of-hospital cardiac arrest used in this study was a modified questionnaire from Yunanto et al. (2017) (12). the author modified the questionnaire and tested it with validity and Cronbach's Alpha. The result is the validity of r count for each item $> r$ table (0.361) and Cronbach's Alpha reliability (0.747) $> r$ table (0.361). The questionnaire with ten closed questions, ranging from 0 to 10, correct answers are scored 1, and incorrect answers are scored 0.

MABAR Application

MABAR application is an Android-based educational and simulation application. The minimum requirement to run this application is the Android operating system version KitKat, RAM min 1 gigabyte, accessible storage space at least 50 megabytes. Features MABAR include; 1) Virtual Module with Theory, 2) sound and pictures OHCA management, 3) Vidio tutorial OHCA management, 4) Simulation case of OHCA.

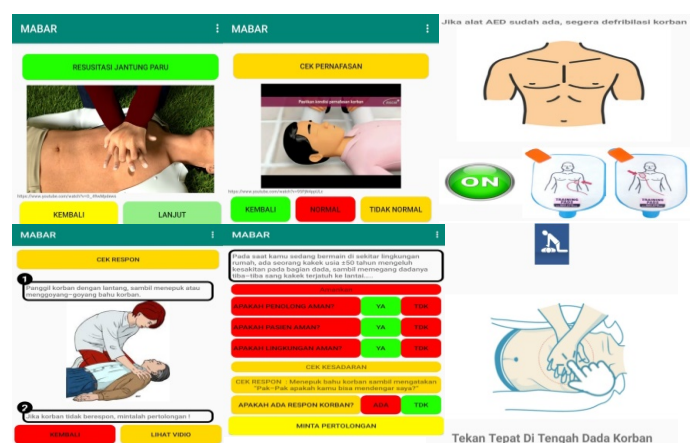


Figure 1. MABAR Application

Data collection

The data were collected in January 2019 using a structured questionnaire. All participants were given information about the purposes and stages of this study and asked to fill informed consent form. The technical intervention was performed once

for 45 minutes in each group. The intervention group was asked to use MABAR Application, and the control group was given simulation OHCA management. Both groups conducted pre-test and post-test.

Data analysis

The data were analyzed using the software. The characteristics of respondents in the treatment and control groups were analyzed using frequency and percentage. The Kolmogorov-Smirnov test was applied to verify the normality distribution among variables. The Paired t-Test was used to examine before and after using the MABAR application and Simulation method. The Independent t-test was used to compare the mean difference between the intervention and control groups. The significance level was considered at $p < 0.05$.

RESULTS

Characteristic of respondents

Table 1 shows the characteristics of the respondents. Most of the respondents were 15 years old (48.3%), with 56 females (93.3%). No participants have any CPR training (0%); however, some of them have ever looked at the cardiac arrest and CPR action before (6.67%). About 36.67% of respondents are willing to perform CPR.

Table 1. Respondents Characteristic

Charact eristic	Categ ories	Total		Exp		Con	
		n	%	n	%	n	%
Age	15	2	48.	1	46.	1	50
	Years	9	33	4	67	5	
	16	1	31.	1	43.	6	20
	Years	9	67	3	33		
	17	1	18.	2	6.6	9	30
	Years	1	33		7		
Gender	18	1	1.6	1	3.3	0	0
	Years		7		3		
	Males	4	6.6	3	10.	1	3.3
Training			7		00		3
	Femal	5	93.	2	90.	2	96.
	es	6	33	7	00	9	67
History	Ever	0	0	0	0	0	0
	Never	6	10	3	10	3	10
		0	0	0	0	0	0

Saw Cardiac Arrest	Ever	4	6.6	3	10	1	3.3
			7				3
	Never	5	93.	2	90	2	96.
		6		7		9	67
Willing To Perform CPR	Yes	2	36.	1	33.	1	40
		2	67	0	33	2	
	No	6	63.	2	66.	1	60
		0	33	0	67	8	
The desire to learn CPR	Yes	6	10	3	10	3	10
		0	0	0	0	0	0
	No	0	0	0	0	0	0

The mean difference of knowledge before and after training

Table 2. The mean difference of knowledge before and after training

Group	Pre- test	Post-test	t	p*
	M ± SD	M ± SD		
Control group	5.93 ± 0.98	7.50 ± 1.22	-	-
Experim ent group	6.50 ± 1.04	9.43 ± 0.67	15.83	0.00

0.000

*Paired t-test

Table 2 shows the mean knowledge difference before and after receiving the training. The findings explained both groups' average knowledge before and after the intervention (p-value was 0.000). After CPR training, the highest average of knowledge was 9.43 in the MABAR application method.

Comparison of the Effects Simulation and MABAR Applications

Table 3. Comparison The Effect of Knowledge with the Simulation and MABAR Application Method

GROUPS	n	Average Value of Knowledge After Training (±SD)	p*
SIMULATION	30	7.50 ± 1.22	0.001
MABAR APPLICATION	30	9.43 ± 0.67	

*Independent t-test

Table 3 shows a significant difference in knowledge between both groups with a p-value < 0.000 ($p = 0.001$). The higher average knowledge value in the MABAR application group is 9.43.

DISCUSSION

Characteristics of Students of SMA Negeri 8 Malang City

The most age group respondents are 15 years old, recommendations from the World Health Organization (WHO), CPR training recommended starting at 12 years old, or earlier (13). Still, unfortunately, no one respondent ever got CPR training before. How can we create CPR volunteers in the community if there is no program CPR training for the layperson, mainly students? Based on Wilks et al. (2015) research, CPR training for school students aged 15-16 years in Hong Kong is an effective way to develop the next generation of CPR volunteers (9). The International Liaison Committee on Resuscitation (ILCOR) and the American Heart Association (AHA) also recommend that CPR training and Automated External Defibrillators (AED) should be included as part of the standard school curriculum and graduation requirements students (8).

1 of 12 respondents saw cardiac arrest or CPR performed with OHCA victims. This result match with research from Benjamin et al. (2018), which states the majority of the incidence OHCA in public places, and the home environment. Only 36.67% of respondents in this research were willing to perform CPR. The respondent was not willing to do CPR was because never gotten CPR training before and did not know how to do CPR. The level of knowledge affects the willingness to perform CPR on students in Malang (14). The Central Statistics Agency (BPS) of the Republic of Indonesia, in 2017, recorded the number of Indonesian population aged 15-19 years is the largest society. More than 60% of them are currently undergoing education or school. We can imagine if all students are required to know and can perform CPR due to the OHCA victims, how many bystanders CPR

was created in our community by students (10).

Differences Knowledge Before and After CPR Training with Simulation Methods

Based on this study was found the simulation method group had a significant difference value of knowledge between before and after receiving CPR training p-value < 0.05 (0.000) with a value of the average of knowledge after training was 7.50 (SD $\pm$ 1.22). The range before and after training was 1.57. This happens because of the direct transfer of understanding between the trainer and the trainees. According to Harderland et al. (2017) which states "using simulation training can provide education and direct respond, to increasing knowledge of management OHCA and CPR actions" (15).

Another study by Agel and Ahmad (2014) claim that CPR training with the simulation method could increase knowledge about CPR actions in trainers (16). This statement is reinforced by the research of Thomas et al. (2016) that using the simulation method will make it easier for participants to understand the management of HJLRS given by a trainer (17).

Differences Knowledge Before and After CPR Training with Simulation Methods

Based on this research was found the MABAR Application method group had a significant difference value of knowledge between before and after receiving CPR training p-value < 0.05 (0.000) with a value of the average of knowledge after training was 9.43 (SD $\pm$ 0.67). The range before and after training was 2.93. The results in this conducted by Yunanto et al. 2017) state an increase in the value of knowledge in respondents who use training methods using smartphone applications (12).

The increased average of knowledge due to CPR training with the MABAR application method can be explained by the technological component approach to the activation of the frontal and parietal cortex, which will trigger cognitive stimulation and strengthen

memory (18). The components involved in the application as one of the innovative media in supporting the learning process are audio, image, and video motion that will provide an imaginary audio effect on humans. This audio will affect the improvement of the long-term memory ability of the brain and make it easier for individuals to remember the content that has been learned (19).

Chemobilsky and Grantio (2012) explain that "learning methods had components of images, sounds, and motion animation have the advantage of being more attention-grabbing, very easy to remember, increasing motivation and retention from the material" (20). Using game-based smartphone applications improves cognitive abilities. Learning methods using application methods can be done independently as long as retaining support devices are available and accessible (21).

The MABAR application in this study developed with the team has the same characteristics as previous research. However, in this research, the MABAR application was combined with several types of previous application content into one interesting mobile application content consisting of virtual modules (module, images, videos) and real-life simulations.

The components of the MABAR application make respondents interested in implementing the learning process and repeating the material independently so that ways based on this study described the effect of CPR training with the MABAR application method, increasing the average value knowledge of respondents significantly. Before and after training.

The Comparison of the Effects of CPR Training Using Simulation Methods and MABAR Applications

Based on this study, the comparison level of knowledge from the simulation method & MABAR application group was significantly different $p\text{-value} < 0.05$ (0.000), with the range average after the Mabar application method bigger 1.93 more than the simulation method. Using

the MABAR application has advantages from technology-based learning, making it easier for someone to achieve a clinical skill because using the mobile application. It would increase the attention of trainees cause an audio imagery effect and increased activation of the frontal and parietal cortex, which stimulates cognitive aspects and strengthens memory (22).

Thomas et al. (2015) stated that training with traditional methods (simulation) is not enough to support respondents' knowledge retention and remember the trainee's material. Traditional training methods have several weaknesses, including; makes participants less active than the application method. The simulation method does not give the respondent the freedom to repeat material independently (17), but all methods influence knowledge before and after CPR training. The most effective CPR training method is the MABAR application. Using MABAR application has the advantage of technology-based learning, making it easy to achieve a clinical skill, saving time, energy, can be used independently without depending on the trainer.

CONCLUSION

1. There is an effect of CPR training with the simulation method and MABAR application method for OHCA and CPR knowledge management in students of Senior High School Number 8 Malang.
2. There are differences between knowledge of OHCA management and CPR using the CPR training method with simulation and MABAR application, and the MABAR application method is more effective than the simulation method.

STRENGTH AND LIMITATION

1. The MABAR application can be a CPR training application that the general public can access as a suitable learning medium about the management of HJLRS.
2. CPR training activities can be recommended in the annual activities

of high school students to increase the number of CPR volunteers in the community.

3. Suggestions for future researchers to aim retention of knowledge management of OHCA using the MABAR application method.

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