

# Peer Trainers Compared with Basic Life Support Trainers in Delivering Effective Cardiopulmonary Resuscitation Training to Secondary School Students

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## ABSTRAK

Pendidikan kemahiran resusitasi kardiopulmonari (CPR) kepada orang awam sangat penting dalam merendahkan kadar kematian serangan jantung. American Heart Association mencadangkan kemahiran tersebut harus dimasukkan ke dalam kurikulum sekolah. Pelatih rakan sebaya adalah kaedah yang berkos rendah dan berkesan dalam mencapai objektif ini. Objektif kajian terkawal 3 bulan ini adalah untuk membandingkan keberkesanan pengajaran kompresi CPR antara rakan sebaya dan jurulatih Basic Life Support (BLS) kepada pelajar sekolah menengah. Peningkatan pengetahuan dan kemahiran psikomotor pemampatan CPR adalah hasil utama yang dinilai. Dua belas pelatih rakan sebaya berusia 16 tahun dan dua belas pelatih BLS telah direkrut dalam kajian ini. Kompresi CPR diajarkan kepada 36 pelajar sekolah menengah secara rawak oleh pelatih rakan sebaya (Kumpulan P) atau pelatih BLS (Kumpulan B). Pra-ujian, pasca ujian serta ujian pengekal 3 bulan mengenai pengetahuan dan kemahiran psikomotor telah dijalankan. Tidak terdapat perbezaan yang signifikan secara statistik dalam skor min pengetahuan dan psikomotor pada pra-ujian, pasca ujian serta ujian pengekal 3 bulan antara Kumpulan P dan Kumpulan B. Terdapat peningkatan skor pengetahuan yang signifikan antara pra-ujian dan pasca ujian dalam Kumpulan P (perbezaan min  $5.8 \pm 2.7$ ,  $p < 0.001$ ) dan dalam Kumpulan B (perbezaan min  $4.7 \pm 2.7$ ,  $p < 0.001$ ). Skor

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*psikomotor meningkat secara signifikan antara pra-ujian dan pasca ujian dalam Kumpulan P (perbezaan min  $7.11 \pm 1.49$ ,  $p < 0.001$ ) dan Kumpulan B (perbezaan min  $7.22 \pm 1.5$ ,  $p < 0.001$ ). Pengajar rakan sebaya adalah berkebolehan setara dengan pelatih BLS dalam mengajar CPR kepada pelajar sekolah menengah kerana kedua-dua kumpulan menunjukkan peningkatan yang signifikan pada pasca ujian.*

*Kata kunci: komuniti, latihan, pendidikan perubatan, resusitasi kardiopulmonari, sokongan asas kehidupan*

## ABSTRACT

Teaching cardiopulmonary resuscitation (CPR) skills to the public is essential in improving cardiac arrest survival. American Heart Association suggested to incorporate it into the school curriculum. Peer trainers is a low cost and effective method in achieving this. The objective of this 3 months prospective controlled study was to compare the effectiveness of teaching compression only CPR between peers and certified basic life support (BLS) trainers to secondary school students. Improvement in knowledge and psychomotor skills of CPR compression were the primary outcome evaluated. Twelve peer trainers aged 16-years-old and twelve certified BLS trainers were recruited into the study. Compression only CPR was taught to 36 randomized secondary school students by either peer trainers (Group P) or BLS trainers (Group B). A pre-test, immediate post-test and 3 months retention test on knowledge and psychomotor skill were conducted. There was no statistically a significant difference in the mean scores of knowledge and psychomotor at pre-test, post-test and 3 months retention between Group P and Group B. There was significant increase of knowledge score between pre-test and post-test in Group P (mean difference  $5.8 \pm 2.7$ ,  $p < 0.001$ ) and in Group B (mean difference  $4.7 \pm 2.7$ ,  $p < 0.001$ ). Psychomotor score was significantly increased between pre-test and post-test in Group P (mean difference  $7.11 \pm 1.49$ ,  $p < 0.001$ ) and Group B (mean difference  $7.22 \pm 1.5$ ,  $p < 0.001$ ). Peer trainers is non-inferior to BLS trainers in teaching CPR to secondary school students as both groups showed significant improvement at post-test.

Keywords: basic life support, cardiopulmonary resuscitation, training, community, medical education

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## INTRODUCTION

A victim's survival chance in an out of hospital cardiac arrest is substantially higher when attending bystander has knowledge and skills on basic

life support (BLS) (Koster et al. 2010). However, survival in an out-of-hospital cardiac arrest (OHCA) is still low because only one-third of bystanders are able to initiate CPR (Holmberg et al. 2000).

Education on CPR skills among laypersons is among steps that need to be taken to improve OHCA outcome. In 2003, The International Liaison Committee on Resuscitation (ILCOR) recommended CPR training in schools. American Heart Association suggested in 2010 that CPR skills will be a requirement for students to graduate from high school (Chamberlain & Hazinski 2003). Previous CPR training is a strong predictor on whether a bystander would provide CPR to a victim (Swor et al. 2006). Gräsner et al. in 2011 found that countries with compulsory resuscitation training in schools had significantly higher layperson OHCA resuscitation rates.

Adolescents are able to perform chest compression as effective as adults (Jones et al. 2007). Conventionally, healthcare professionals, medical students and first aid rescuers are the BLS trainers. Little is known whether school students as peers will be able to effectively teach CPR skills in schools. By training students to become peer trainers, the schools will not be burdened by the cost of bringing external trainers to teach their students. In addition, peer-teaching experience will be able to empower students with positive character building (Fujiwara et al. 2011), (Mowbray et al. 1987). Peer trainers were reported to increase students' confidence to learn, enjoyment of teamwork and the ability to connect with young learners. The trainees were also reported to be more comfortable in asking questions (Carruth et al. 2010).

The objective of this study was to

compare the effectiveness of delivering adult compression only CPR module between peers and certified BLS trainers to secondary school students.

## MATERIALS AND METHODS

This was a prospective randomized controlled trial comparing the effectiveness of delivering knowledge and psychomotor skill of compression only CPR between peer trainers and BLS trainers among secondary school students. The study was conducted in a private secondary school in Selangor over 8 months period between April 2016 until November 2016. Ethical approval was obtained from the institutional Research Ethics Committee (code no FF-2016-232).

### Development of the Module

An 8-minute video-assisted teaching module (LIVES Engage module) was developed by a panel of experts who were certified AHA trainers. It was designed based on AHA recommendation of compression only CPR. The animation video consists of basic science knowledge on CPR and psychomotor demonstration. The psychomotor training of participants will be aided by the video using the technique of practice while watching (PWW).

### Trainers Preparation

Twelve voluntary peer trainers aged 16 years old and twelve certified BLS trainers were recruited for the study. One day training of the trainers on

module delivery was conducted prior to the study by certified American Heart Association (AHA) instructors. Standardization and calibration of all trainers were also conducted.

## Research Design

Fifty secondary school students aged 16 years old were enrolled in the study. Students who were not consented by parents or guardians, with physical disabilities and those who do not complete the study were excluded. Students were randomized using stratified randomization into group P and group B. Each student was given a code number randomly that will be used throughout the study. Group P was trained by the peer trainers and group B was trained by the BLS trainers.

A pre-test on knowledge questionnaire was distributed to both groups prior to training. It consisted of 10 knowledge questions with a total score of 20. These questions were developed by the panel of experts and face validation was conducted. A pre-test of CPR psychomotor skills was assessed by an independent assessor using a standardised checklist. The psychomotor checklist was designed by an expert panel based on AHA recommendation of compression only CPR. The steps assessed were scene assessment, check for response, call for help, breathing assessment, adequate chest compression (hand placement, technique, rate of compression and chest recoil), and complete 2 minutes chest compression. These assessors were blinded to the participants grouping.

The students in each group were further divided into smaller groups with the instructor to student ratio of 1:3 during the training using the teaching module (LIVES Engage module). Psychomotor skills training was conducted using the PWW technique with the aid of the video and a mannikin. The student to mannikin ratio was 4:1.

A post-test knowledge questionnaire and CPR psychomotor skills test were conducted immediately after the training and at 3 months post-training. Data collected were then analysed using the Statistical Package for Social Science (SPSS) version 21. Demographic data was shown in descriptive form and comparison data of knowledge and psychomotor skills were analysed using independent t-test.

## RESULTS

Thirty-six participants completed the 3 months study. Both groups were equally distributed with equal gender proportion. Majority of them have no prior CPR training except for one participant. No significant difference was found between the two groups on baseline knowledge and psychomotor skill (Table 1).

There was no statistically significant difference between the two groups in knowledge and psychomotor scores at pre-test, post-test and 3 months retention. There was significant increase of knowledge and psychomotor score between pre-test and post-test in both groups (Table 2). The mean difference of knowledge score was higher in group

Table 1: Group comparison of baseline knowledge and psychomotor skill

	Group P (peer trained, n=18) Mean score ± SD	Group B (BLS provider trained, n=18) Mean score ± SD	p value
Pre-test (psychomotor)	2.0 ± 1.1	2.3 ± 1.6	0.40
Pre-test (knowledge)	9.5 ± 2.4	10.1 ± 2.2	0.45

\*student t-test (p<0.05 is significant)

P compared to group B. Whereas, the mean difference of psychomotor score for group B was higher than group P. However, both groups showed a slight reduction in the knowledge and psychomotor scores at 3 months retention test

Good retention was observed in the majority of students in 6 steps of the psychomotor skills (Table 3). There is reduction in the percentage of students from both groups performing adequate assessment of breathing and rate of compression at 3 months retention test. Less students in group P were able to perform adequate compression at 3

months retention test.

### DISCUSSION

It is critical to train as many as possible in BLS to provide immediate bystander CPR. One method of increasing bystander CPR rates to improve survival of out of hospital cardiac arrest (OHCA) is by training school students. ILCOR in 2003 has recommended the incorporation of CPR training in the school syllabus. However, most of the countries have not yet implemented this in their school curriculum. In Norway, bystander CPR rates increased from

Table 2: Comparison of knowledge and psychomotor skill scores among participants during Pre, immediate post-training session and retention at 3 months

		Group P (n=18) Mean score ± SD	Group B (n=18) Mean score ± SD	*p value
Knowledge	Pre-test	9.5 ± 2.4	10.1 ± 2.2	0.45
	Post-test	15.3 ± 1.8	14.8 ± 1.3	0.36
	Retention test at 3 months	14.9 ± 1.7	13.8 ± 1.5	0.06
	Mean difference Pre-test and post-test	5.8 ± 2.7 p<0.001*	4.7 ± 2.7 p<0.001*	0.23
	Mean difference Post-test and retention test	0.4 ± 2.2 p=0.47	1 ± 2.0 p=0.049*	0.39
Psychomotor	Pre-test	2.00 ± 1.05	2.3 ± 1.56	0.40
	Post test	9.11 ± 0.90	9.61 ± 0.99	0.12
	Retention test at 3 months	8.89 ± 0.96	9.22 ± 0.73	0.25
	Mean difference Pre-test and Post-test	7.11 ± 1.49 p<0.001*	7.22 ± 1.5 p<0.001*	0.84
	Mean difference Post-test and Retention test	0.2 ± 1.1 p=0.41	0.4 ± 1.0 p=0.11	0.57

\*student t-test (p<0.05 is significant)

Table 3: Participants performance on steps on psychomotor skill of CPR at pre, immediate post-training session and retention at 3 months

Psychomotor steps for CPR	Pre-test			Post-test			Retention-test		
	P (%)	B (%)	*p value	P (%)	B (%)	*p value	P (%)	B (%)	*p value
1. Scene safety	5.56	27.78	<0.001	100	94.4	0.013	100	100	1.0
2. Check response	55.55	61.11	0.47	88.89	100	<0.001	88.89	100	<0.001
3 Call for help	16.67	27.78	0.06	94.4	100	0.013	94.4	100	0.013
4. Scan for breathing	44.44	33.33	0.11	94.4	100	0.013	77.78	66.67	0.08
5. Correct hand position	22.22	22.22	1.0	83.33	88.89	0.22	88.89	88.89	1.0
6. Adequate compression	16.67	11.11	0.21	83.33	88.89	0.22	66.67	88.89	<0.001
7. Adequate rate	5.56	11.11	0.21	88.89	94.4	0.25	83.33	83.33	1.0
8. Allow chest to recoil	5.56	5.56	1.0	94.4	88.89	0.25	94.4	100	0.013
9. Complete cycle 2 minutes	11.11	5.56	0.21	94.4	88.89	0.25	100	100	1.0

\*student t-test (p<0.05 is significant)

60% (2001-2005) to 73% (2006-2008) by training 54000 school children after implementing this recommendation (Lorem et al. 2008). Many different levels of trainers have been used to disseminate the knowledge of CPR to students such as health professionals, emergency medical services, teachers and medical students. Choi et al. (2015) showed there was no difference in CPR skills knowledge and willingness to perform CPR among high school students when trained either by nurses or their peers.

Most CPR training in Malaysia is provided by well-established organizations such as American Heart Association, St Johns ambulance and services as well as non-governmental and non-profit organization. However, this organization's training are not standardized (Chew et al. 2008). CPR

training to the community poses a challenge in Malaysia due to the limited number of instructors, time, space and money. Peer-trainers are defined as people from similar social groups who are not professionally trained. Using peers as trainers to disseminate CPR training in the community may be cost-effective and beneficial as they are more readily available.

In this study, we studied the effectiveness of peer trainers (group P) in delivering compression only CPR training to secondary school students and compared their performance with BLS trainers (group B). Our findings showed that the majority of students at baseline have poor knowledge and psychomotor skill on CPR (Table 2). However, students trained in both groups showed marked improvement in their knowledge and psychomotor

score at immediate post-test. The technique and delivery method of trainers were standardized using video aided tool. Majority of students in both groups were able to perform all steps of the psychomotor skill at the immediate post-test. This demonstrates that peer trainers can deliver this module to their peers using standardized teaching aid. Allikmets et al. (2016) have shown that peer-led training is mostly preferred by students and as effective as the traditional method. Positioning students as teachers enhances leadership, responsibility and managerial skills (Krych et al. 2005). Students can openly discuss problems, more engaging and less intimidated when taught by peers (Hindmarch et al. 2015). Peer training has been proven to have significant positive effects on educational achievement by offering encouraging relationships (Ten Cate & Durning 2007).

However, as shown in Table 2 and 3 in comparison to group B students the psychomotor scores were less in group P both at post-test and 3 months retention. This demonstrated that although there is a potential benefit of peers as trainers in CPR, a certified BLS trained trainers still outshined in the CPR training. BLS trained trainers had more experience in conducting courses and trained participants as well as performing CPR previously as compared to peer trainers. Therefore, more extensive training of peer trainers with multiple training and supervision prior to conducting a school CPR training course independently may improve their teaching skills.

The Malaysian school system is

structured as such that students can choose to join any club or society as part of their co-curricular activity, for example as uniformed societies like Boy Scouts, Red Crescent society, St John Ambulance society and Girl Guides. These societies have incorporated CPR training at different training levels and students volunteers can be trained as peer trainers. However, the relevant authorities such as Ministry of Education should emphasize the importance of incorporating the CPR training into the school's curriculum. Without a legislative mandate and organized system of training, the training progress will be impeded. Peer training is a cost effective and sustainable way to propagate knowledge and skills of CPR among the Malaysian population.

The most important limitation of this study is the small and non-variable demographic sample size. This study was done in only a single private day school and limited to students in a school which may not represent the whole Malaysian population of students. The sample size was too small to demonstrate the noninferiority of the peer-led training.

Retention ideally should be further tested at 6 months and 1 year post initial training. This is important to detect the point of deterioration of knowledge and skills which will need refresher courses. However, our study only followed the retention up to 3 months as the students would have graduated from school by the end of 6 months.

Future studies can be performed to compare the effectiveness of CPR training module delivered by peer



trainers on a larger scale. A sample size which is bigger than this study will give a bigger impact and provide more evidence regarding the need for peer trainers. Exploring the willingness to perform CPR among the peer-trained students may be worth the look as it may reflect their response when posed with this situation later in real-life.

## CONCLUSION

This study may be one of the earliest in Malaysia to explore the possibility of using peer trainers among secondary school students. The results were encouraging and support the evidence that school students can be trained as peer trainers in CPR training and are potential candidates to disseminate CPR knowledge and skills to their family and community. This might have a significant impact on public health in a long run.

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Received: 31 Jul 2019  
Accepted: 12 Apr 2020