Original Article

Peer-assisted learning to train high-school students to perform basic life-support

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BACKGROUND: The inclusion of cardiopulmonary resuscitation (CPR) in formal education has been a useful approach to providing basic life support (BLS) services. However, because not all students have been able to learn directly from certified instructors, we studied the educational efficacy of the use of peer-assisted learning (PAL) to train high-school students to perform BLS services.

METHODS: This study consisted of 187 high-school students: 68 participants served as a control group and received a 1-hour BLS training from a school nurse, and 119 were included in a PAL group and received a 1-hour CPR training from a PAL leader. Participants' BLS training was preceded by the completion of questionnaires regarding their background. Three months after the training, the participants were asked to respond to questionnaires about their willingness to perform CPR on bystander CPR and their retention of knowledge of BLS.

RESULTS: We found no statistically significant difference between the control and PAL groups in their willingness to perform CPR on bystanders (control: 55.2%, PAL: 64.7%, $P=0.202$). The PAL group was not significantly different from the control group (control: 60.78 ± 39.77 , PAL: 61.76 ± 17.80 , $P=0.848$) in retention of knowledge about BLS services.

CONCLUSION: In educating high school students about BLS, there was no significant difference between PAL and traditional education in increasing the willingness to provide CPR to bystanders or the ability to retain knowledge about BLS.

KEY WORDS: Peer-assisted learning; Basic life support; Education

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INTRODUCTION

Almost 50%–65% of cardiac arrests occur at home.^[1] The early recognition of cardiac arrest and the performance of bystander cardiopulmonary resuscitation (CPR) are important to improve the survival of victims.^[2,3] Meissner et al^[4] reported bystander CPR increases the survival rate of victims with out-of-hospital cardiac arrest (OHCA) by two- to three-fold compared to those who did not receive such treatment. Therefore, it is important to provide basic life support (BLS) training to the general public. The American Heart Association (AHA) guidelines 2010 for CPR emphasized the need for bystander CPR and recommended BLS training for the general public.^[5] According to the

2012 data from the Korea Centers for Disease Control and Prevention, the prevalence of cardiac arrest in Korea was increasing, but the rate of bystander CPR remains low (about 8%) despite an increase compared with the previous rate.

CPR training for the general public could increase their ability to perform BLS services in response to a sudden cardiac arrest.^[6,7] However, it is difficult to provide BLS education to the general public due to limited resources. Therefore, one potentially useful approach to this situation may involve high-school students in training BLS. In Korea, training to perform BLS is not usually recognized as a required course in high-school curriculum. In general, BLS education in high school is provided

primarily by school nurses who teach CPR to students. Yet, the current curriculum makes it difficult for nurses to train all students due to lack of instructors and time.

Peer-assisted learning (PAL) has been used to educate the public about health-related topics such as smoking, alcohol, and the use of other substances.^[8,9] It is widely available, cost-effective, and culturally attuned, and could bring great benefit to communities with limited resources.^[10] Studies^[11-14] on the use of PAL in BLS education showed the educational efficacy of PAL was similar to that of traditional training. However, these studies were performed on adults and medical students. In this study, we used PAL to educate high school students about BLS. We hypothesized that PAL could train more students about BLS as effectively as school nurses. Therefore, we compared the efficacy in terms of trainees' willingness to perform bystander CPR and knowledge about BLS between PAL and school nurses.

METHOD

Study design

This prospective observational case-control study recruited students in the first and second grades of high school. CPR education in the control group was provided by a school nurse and the CPR education in the PAL group was provided by peers who had been trained in BLS services. Before education, both groups completed a survey about their interest in CPR, and 3 months after the CPR training, both groups completed questionnaires about their willingness to perform bystander CPR and their knowledge of BLS services. This study was approved by the Chung-Ang University Hospital Institutional Review Board (Seoul, South Korea). The students participated voluntarily in this study, and informed consents were received after the last survey for elimination of the effect of allocation.

Cho et al^[6] reported that the respondent's willingness to perform standard cardiopulmonary resuscitation (CPR) increased to 56.7% after basic life-support (BLS) training. The sample size was calculated based on the respondent's willingness to perform CPR as the primary outcome variable. We hypothesized that the respondent's willingness to perform CPR would be equal between the control group and the peer-assisted learning (PAL) group at 57% after BLS training, and the equivalence limit was set at 25%. We set the one-sided significance level at 0.05 and the power of the test at 80%. The allocation ratio between the control group and the PAL group was set at 1:2. By using a web program (sample size calculator: two parallel-sample proportions [one-sided equivalence hypothesis]) the number of participants was determined

to be 51 in the control group and 101 in the PAL group.^[15]

Setting

In this study, all 187 participants were high-school students: 68 were assigned to the control group, and the other 119 to the PAL group. Traditional BLS education was provided to the control group by a school nurse, and peers provided BLS education to the PAL group. One teacher provided 1 hour of instruction on CPR to the 68 students in the control group using mannequins for practice. Five volunteers in the PAL group attended a 3-hour training on BLS led by a specialist in this field. And in both groups, education of BLS was given. In the PAL group, the 5 PAL leaders trained their classmates for 1 hour using a mannequin for practice. In the control group, one school nurse educated students for BLS skills. For practice, three and five mannequins were used each class (Table 1).

Questionnaires (Table 2) were completed before and after training. The pre-training questionnaire addressed interest in and background knowledge about CPR: "Do you know what CPR is?", "Via which route did you get to know about CPR?", "Do you think it is necessary to educate CPR to high school students?", "Do you know how to perform CPR?", "Do you know how to use an automated external de-fibrillator (AED)?", and "If there is an opportunity, are you willing to learn CPR?". Three months after the CPR training, participants completed a survey evaluating their retention of information about BLS services and their willingness to perform such services. The students' knowledge about CPR was assessed with six questions with a total score of 100: "What is the first thing you have to do when performing CPR?", "What is the most important thing to do during CPR?", "What is the correct rate of chest compressions?", "What are the proper position and depth for chest compressions?", and "What is the correct ratio of chest compressions to rescue breathing?".

Statistical analyses

The baseline descriptive characteristics of participants include means and standard deviations (SDs) for continuous

Table 1. The characteristics of the control and PAL groups

Variables	Control group	PAL group
Grade level in high school	1 st	1 st and 2 nd
Instructor	School nurse	Student
Instructor:trainee ratio	1:34	1:6
Duration of education	1 hour	1 hour
Number of trainee	68	119
Mannequin:trainee ratio	1:5	1:5

PAL: peer-assisted learning.

variables and numbers and percentages for categorical variables. The educational efficacy of the control and PAL groups was compared with the Chi-square test or Fisher's exact test. The P values ≤ 0.05 were considered statistically significant. All statistical analyses were performed with SPSS (ver. 20.0 for Windows; Chicago, IL, US).

RESULTS

A total of 187 questionnaires were completed by first- and second-year high-school students. All participants were female, because this study was performed in a girls' high school. The age of the participants ranged from 15 to 16 years because they were first or second grade high-school students (Table 1).

Interest in and background knowledge of CPR

A total of 184 (98.4%) students had some exposure

to CPR: 30.5% had been exposed via television, and 59.9% had been exposed at school. High-school students believed that CPR training should be included in their school curriculum, but most (75.9%) did not know how to perform CPR. Moreover, most students wanted to learn CPR if relevant education was provided.

Willingness to perform CPR and knowledge of BLS services

The CPR and PAL groups were not significantly different in their willingness to perform bystander CPR (55.2% and 64.7%, $P=0.202$) or in their retention of knowledge of how to perform BLS services (control group: 60.78 ± 39.77 , PAL group: 61.76 ± 17.80 , $P=0.084$; Figure 1). Comparisons between answers to individual questions by members of both groups revealed that the PAL group was more likely to retain the knowledge of CPR addressed by Q1, Q2, and Q3 (Table 3).

Table 2. Questionnaire before BLS training (n, %)

Variables	Control group	PAL group	P value
Do you know what CPR is?			
Yes	67 (98.5)	117 (98.4)	0.965
No	1 (1.5)	2 (1.6)	
Via which route did you get to know about CPR?			
Television	22 (32.4)	35 (29.4)	0.585
Internet	1 (1.5)	2 (1.7)	
School education	42 (61.8)	70 (58.8)	
Campaign	2 (2.9)	10 (8.4)	
No experience	1 (1.5)	2 (1.7)	
Do you think it is necessary to educate CPR to high school students?			
Yes	66 (98.5)	119 (100)	0.181
No	1 (1.5)	0 (0)	
Do you know how to perform CPR?			
Yes	15 (22.4)	30 (25.2)	0.666
No	53 (77.6)	89 (74.8)	
Do you know about AED?			
Yes	20 (29.4)	35 (29.4)	1.000
Do you know how to use an AED?			
Yes	7 (10.3)	16 (13.4)	
No	13 (19.1)	19 (16.0)	
No	48 (70.6)	84 (70.6)	
If there is an opportunity, are you willing to learn CPR?			
Yes	59 (86.8)	116 (97.5)	0.004
No	9 (13.2)	3 (2.5)	

DISCUSSION

Although everyone should be trained in BLS for immediate performance of bystander CPR, this is actually difficult to achieve. Moreover, in the education of BLS, giving knowledge about BLS is not enough; also important is that laypersons are willing to perform bystander CPR. CPR training itself is a way to enable laypersons to perform bystander CPR.^[6,16] Therefore, it is important to

Figure 1. The overall score after evaluating retention of knowledge of BLS. There was no statistical difference between the two groups (control group 78 ± 39.77 , PAL group 61.76 ± 17.807 , $P=0.848$).

Table 3. The willingness to perform bystander CPR and knowledge of BLS 3 months after the education (n, %)

Variables	Control group	PAL group	P value
Willingness to perform CPR			
Yes	37 (55.2)	77 (64.7)	0.202
No	30 (44.8)	42 (35.3)	
Knowledge of CPR (the rate of correct answer)			
What is the first thing you have to do when performing CPR?	46 (67.6)	100 (84.0)	0.009
What is the most important thing to do during CPR?	29 (42.6)	30 (25.2)	0.014
What is the correct rate of chest compressions?	40 (58.8)	63 (52.9)	0.437
What is the proper hand position for chest compressions?	35 (51.5)	82 (68.9)	0.018
What is the proper depth for chest compressions?	47 (69.1)	90 (75.6)	0.333
What is the correct ratio of chest compressions to rescue breathing?	51 (75.0)	76 (63.9)	0.117

broaden the general public's access to CPR training. In Korea, the prevalence of cardiac arrest is increasing in each year and the availability of CPR training courses has also increased. However, Kang et al^[17] reported that only 4.3% of the population in a metropolitan city in Korea was given CPR education. Studies^[18,19] have examined effective approaches to extending CPR training to the general public and one of them involves educating all students about CPR. The present study found that most participants (184; 98.4%) had indirect knowledge about BLS, but only 45 (24.2%) participants knew the BLS process in detail. We found that the primary source of information about CPR was school; however, this did not include training on how to perform CPR on a mannequin but consisted of lectures. Table 2 shows that most students did not know how to perform BLS correctly. Only 55 (29.4%) students were familiar with such devices, and only 23 (12.3%) of them knew how to use the devices. However, they thought the education of BLS was necessary for them and they wanted to be trained, if possible.

Since 2009, CPR education has been included as the essential educational curriculum of primary schools but not in secondary schools in Korea.^[20] However, almost all CPR training in Korea is provided by a few specialists, such as American Heart Association BLS instructors, Emergency medical services (EMS) members, healthcare providers, etc. Although CPR education has been included in the primary school curriculum, most of this training is provided by nurses of the school. Because a school usually has only one school nurse in Korea, it is difficult to provide thorough CPR training that includes relevant information and performance skills to all students. In many cases, the number of instructors, time, space, and money are limited.

PAL has been defined as a process by which people from similar social groups who are not professional teachers, help one another, and learn by teaching.^[21] PAL can be an alternative to traditional pedagogical instruction by a specialist that enables more individuals to be trained in BLS. As it is widely available, cost-effective, and culturally attuned, it could be of great benefit to communities. PAL has significant positive effects on educational achievement by offering relationships that provide encouragement and companionship.^[8-10] Thus, PAL is suitable for many people, such as public school students, who are familiar with one another. There were several studies to utilize PAL in BLS education. PAL may enable adults to reach a skill level in CPR similar to the level reached by those trained by healthcare providers.^[11] PAL potentially reduces the cost of CPR training, eliminates

the need for a trained instructor, and reduces the length of training.^[12] However, participants of these studies were healthcare providers or medical students.

In Korea, high school education is compulsory. If high school students are trained in BLS, most of the population would eventually be aware of BLS. It could be an effective method of disseminating BLS to the general public in Korea. However, it is difficult for one school nurse to train BLS to all students due to the lack of instructors, time, and funds. Therefore, we tried to apply PAL to the CPR education of high-school students. In this study, we didn't evaluate the quality of performance, because it is more important for students to remember the sequence of BLS and start bystander CPR to a victim in actual SCA. Therefore, we investigated the retention of BLS knowledge and the willingness to perform bystander CPR 3 months after education. There was no significant difference between the two groups in the willingness to perform bystander CPR and retention of knowledge. We found no significant difference between the groups in their overall scores for retaining information after 3 months (Figure 1). The distribution of scores of the PAL group was narrower than that of the control group. Additionally, the PAL group achieved a higher correct rate for some questions than the control group (Table 3). Therefore, the educational efficacy of PAL was similar to that of traditional education in terms of the retention of information about BLS services.

We also questioned students of the PAL group about the advantages of PAL, and received the following feedback: "the course was interesting and easy because of its less awkward circumstances", "we were given opportunities to ask whatever questions that we had", "we might find a school teacher uncomfortable, but peers were more friendly and engaged in usual conversations," and "the course was not boring." In a previous study, pedagogical advantages such as improved performance and increased student retention have been associated with PAL.^[21] Traditional teaching by specialists adopts a vertical structure, and the relationship between the top and the bottom of the hierarchy may render learning and sharing difficult. However, PAL leaders and their students share similar thought processes and cultures. In this study, the PAL leaders were classmates and thus were similar to the other participants in terms of age, position, culture, and background. The PAL leaders guided the PAL course for their classmates, and all students learned collaboratively. Therefore, PAL may be an effective method for training students to perform CPR in high schools.

LIMITATIONS

This study included a small sample of high-school students, and the assessment of retention did not include evaluations of the performance skills of BLS, because it is more important for non-medical personnel to perform bystander CPR than to provide high quality CPR. Therefore, this study only evaluated the willingness to perform CPR and retention of knowledge about CPR. In this study, PAL leaders were also students from the same high school which the participants attended. They were trained on BLS skills and background knowledge by instructors specializing in BLS and advanced cardiac life support from the American Heart Association. We didn't qualify them officially by certification of BLS, but are regarded specialists as they practiced sufficiently and well understood BLS skills.

In conclusion, BLS training for high school students through traditional BLS education by school nurses and through PAL showed similar results in terms of the test participants' willingness to perform bystander CPR and retention of knowledge of BLS.

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Contributors: Choi HS proposed and wrote the study. All authors contributed to the design and interpretation of the study, and approved the final manuscript.

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