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Comparison of Willingness to Perform Cardiopulmonary Resuscitation between Video Self-Instruction and Conventional Method

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Abstract

Objectives: The purpose of the study is to compare the effect of traditional face-to-face Cardio-Pulmonary Resuscitation (CPR) training to the video self-instruction method and to improve layperson training and cost savings. **Methods/Statistical analysis:** In a randomized controlled study following the control group design, a self-led video training group received 30 minutes of video instruction while a traditional training group received 30 minutes of conventional classroom instruction. Data were drawn from pre- and posttest structured group interviews and posttest CRP performance scores using Laerdal Skill Reporter™ manikins. Analysis of covariance was employed to verify the effect of video and traditional training on the willingness to perform CPR. **Findings**: The video training group (131.6) exhibited a statistically significant (p<.001) acceleration in compression speed over the traditional group (117.1), with the video group showing a statistically significant lower compression correctness rate (38.6) compared to the traditional group (59.7). Further statistically significant differences (p=.008; .002; .006) between the video training group and the traditional face-to-face group includes lower scores in CPR willingness (1.9:2.8), knowledge (3.1:3.7) and performance (3.0:3.4) in the video group compared to the traditional group. **Improvements/Applications**: Under identical conditions, training using video self-instruction has a smaller effect on the willingness to perform CPR compared to traditional classroom instruction.

Keywords: Cardiopulmonary Resuscitation (CPR), Layperson Training, Education, 30-Min Traditional Classroom Instruction, 30-Min Video Self-Training

1. Introduction

While Cardio-Pulmonary Resuscitation (CPR) training for laypersons is widely available, actually making people perform CPR in incidents of cardiac arrest is not easy. Timely CPR is a key element of survival for OHCA (out of hospital cardiac arrest) patients, and an effective means to induce bystanders to actively perform CPR needs should be found. Compression-only CPR[1], CPR training retention[2,3], pre-arrival CPR instruction from emergency medical dispatchers[4,5], CPR video self-instruction[6-8] and other factors affecting the willingness to perform CPR[9-12] have been identified, helping increase the rate of CPR performed by laypersons.

Repeated self-instruction using video clips on a mobile phone, a convenient way to provide training to large groups of people, has been found to have a sustained effect on CPR performance, confidence and willingness[13] but a

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comparison between video and traditional (classroom) training under the same training conditions has not been carried out. The application of the advantages of traditional training identified through such an examination to newer video-based training would further expand video CPR training for members of the general public as well as make CPR training more economical. This study aims to compare these two training methods to explore the effects of video training and traditional face-to-face training on the willingness to perform CPR.

2. Method

The subjects of this study were 3rd- and 4th-year students of health environmental studies at Eulji University who underwent CPR class on April 20, 2016; students received an explanation of the study and provided their consent. In a controlled randomized study following the pretest-posttest control group framework, subjects were randomly assigned to two groups (Video Self-Instruction (VSI) and Traditional Method (TM)) using stratified sampling taking into account the subject's demographical characteristics (age, gender, major, year of study). To ensure uniformity in the training content, a researcher produced a 30-minute video following the American Heart Association 2015 guidelines for adult CPR (1) for use in the self-instruction session, and the same researcher conducted a 30-minute traditional face-to-face session in another classroom using identical training content.

Data were drawn from pre- and posttest structured group interviews and posttest CRP performance scores using Laerdal SkillReporter™ manikins (Resusci Anne SkillReporter™; Laerdal Medical, Stavanger, Norway). Analysis of covariance (ANCOVA) was employed to verify the effect of video and traditional training on the willingness to perform CPR. A pretest survey was used to collect information on subject's demographics, whether previous CPR instruction had been received, a CPR willingness score (number of multiple responses selected from the seven willingness variables of: confidence in ability to perform correct compression, understanding of the damage caused by compression, confidence in the subject's own physical capacity, ability to overcome the patient's appearance of distress, low probability of infection, awareness of exemption from liability, prevention of brain damage progression) and a pretest self-rating scores of CPR knowledge on the Likert scale (1. not at all; 2. not really; 3. undecided; 4. somewhat; and 5. very much). For a posttest comparison of CPR performance levels, data on five cycles of mouth-to-mouth ventilation and chest compression CPR data were collected.

The probably of type-I errors was set at α=.05 (two-tailed test) using SPSS 18.0 for Windows (IBM Inc, New York, USA); for subject characteristics, frequency (%) was used to organize discontinuous variables and average and standard deviation for continuous variables. An independent t-test was performed to compare the CPR scores of video and traditional instruction, and analysis of covariance (ANCOVA) for comparing the effect of video and traditional training on the willingness to perform CPR. Extraneous variables were minimized by employing random assignment through stratified sampling, and pretest CPR willingness scores and self-evaluation scores were used as covariates to minimize the impact of measurement errors on posttest variables.

To check the item validity of research instruments, principal component analysis was set as the extraction model, varimax for orthogonal rotation and Eigen value as greater than 1 to perform an exploratory factor analysis of the interval scale items of CRP knowledge, performance and willingness; acceptable validity of .571 pretest ($p<.001$) and .660 posttest ($p<.001$) were determined (greater than .5 indicating acceptability). To verify item reliability, Cronbach's α was used to check the internal consistency of the interval scale items of knowledge, performance and willingness, with the results showing a moderate .579 pretest and a high .821 posttest (1.0-.8 indicating high correlation, .79-.6 moderately high correlation, .59-.4 moderate correlation, .39-.2 low correlation, and .19-0 no relationship correlation).

3. Results

Randomized assignment using stratified sampling kept the two subject groups relatively similar, although the video group had two fewer 3rd-year students and five more 4th-year students. The video group also had two additional subjects with prior CPR instruction, and two fewer students who did not receive previous instruction as shown in Table 1.

Table 1. Characteristics of the participants

	VSI(n=36)	TM(n=37)	Overall(N=73)
Age (SD)	21.6(1.8)	21.4(1.4)	21.5(1.5)
Gender			
Female (%)	25(69.4)	26(70.3)	51(69.9)
Male (%)	11(30.6)	11(29.7)	22(30.1)
Grade			
Junior (%)	27(75.0)	29(78.4)	56(76.7)
Senior (%)	9(25.0)	4(21.6)	17(23.3)
Previous CPR training			
Yes (%)	18(50.0)	16(45.9)	35(47.9)
No (%)	18(50.0)	20(54.1)	38(52.1)

SD: standard deviation, CPR: cardiopulmonary resuscitation, VSI: video self-instruction, TM: traditional method

The video group showed a statistically significant (p<.001) faster rate of chest compression (131.6) compared to the traditional group (117.1), exceeding the 100-120 compressions as prescribed by CPR guidelines; the video group also had statistically significant (p=0.21) lower compression accuracy (38.6) compared to the traditional group (59.7). The video group had a higher number of total chest compressions (161.8) over the traditional group (152.7), exceeding 150 compressions (five cycles), and more incomplete recoils (8.6) compared to the traditional group (1.4). The video instruction group had lower average ventilation volume (306.7:373.5) and number of total ventilations (3.6:4.8) compared to the traditional group, but exhibited a higher rate of correct ventilations (23.9:14.5) as shown in Table 2.

Examining the results of the multiple responses to the CPR willingness variables reveals that while both groups had similar responses (73:75) before the test, the video group's response count fell to 68 and the traditional group's rose to 95 as shown in Table 3. However, there were fewer responses on the understanding of damage caused by compression, ability to overcome the patient's appearance of distress and prevention of brain damage progression, while the traditional group had lower responses on the ability to overcome the patient's appearance of distress and prevention of brain damage progression.

Table 2. Comparison of cardiopulmonary resuscitation scores between video self-instruction and traditional

Manikin assessed skill	M(SD)		t	p
	VSI	TM		
Average compression depth (mm)	49.5(7.6)	50.8(38.5)	-0.750	.456
Average compression rate (#/min)	131.6(15.9)	117.1(9.3)	4.766	<.001
Total compression (#)	161.8(28.5)	152.7(11.8)	1.778	.082
Correct compression (%)	38.6(38.3)	59.7(38.5)	-2.355	=.021
Incomplete recoil (#)	8.6(21.8)	1.4(4.7)	1.938	.060
Average ventilation volume (ml)	306.7(311.6)	373.5(321.1)	-0.902	.370
Total ventilation (#)	3.6(4.3)	4.8(4.3)	-1.197	.235
Correct ventilation (%)	23.9(84.8)	14.5(23.9)	0.648	.519

M: mean, SD: standard deviation, VSI: video self-instruction, TM: traditional method, #: number, min: minute

Table 3. Willingness variable to perform cardiopulmonary resuscitation between video self-instruction and traditional method

Willingness variableVSI		Answer	
		VSI	TM
Confidence in ability to perform correct compression	pre	17	19
	post	19	24
Understanding of the damage caused by compression	pre	8	6
	post	7	16
Confidence in the subject's own physical capacity	pre	5	4
	post	5	7
Ability to overcome the patient's appearance of distress	pre	15	16
	post	12	14
Low probability of infection	pre	3	1
	post	4	6
Awareness of exemption from liability	pre	2	4
	post	3	7
Prevention of brain damage progression	pre	23	25
	post	18	21
Overall	pre	73	75
	post	68	95

CPR: cardiopulmonary resuscitation, VSI: video self-instruction, TM: traditional method

Table 4. ANCOVA of willingness to perform cardiopulmonary resuscitation between video self-instruction and traditional method

Self-assessed scoreVSI		M(SD)		F	P
		VSI	TM		
CPR willingness point (variable 0-7)	pre	2.0(1.4)	2.0(1.4)		
	post	1.9(1.7)	2.8(2.4)	7.483	=.008
Knowledge (Likert scale 1-5)	pre	2.6(0.8)	2.7(0.8)		
	post	3.1(0.9)	3.7(0.6)	10.049	=.002
Performance (Likert scale 1-5)	pre	2.4(0.9)	2.2(0.9)		
	post	3.0(1.0)	3.4(0.7)	7.924	=.006
Attitude	pre	3.6(0.9)	3.1(0.9)		
(Likert scale 1-5)	post	3.5(1.1)	3.6(0.8)	3.730	.057

M: mean, SD: standard deviation, CPR: cardiopulmonary resuscitation, VSI: video self-instruction, TM: traditional method

Overall comparison of the two groups indicates that the video group had statistically significant lower scores (p=.008; .002; .006) for CPR willingness (1.9:2.8), knowledge (3.1:3.7) and performance (3.0:3.4). However, no statistically significant difference was found in attitude as shown in Table 4.

4. Discussion

Lower scores on performance from video self-instruction of CPR compared to classroom training can be interpreted to mean that face-to-face training is more effective when training time is kept equal. Among the eight items on skill, compression speed and correctness show statistically significant differences which indicate that these two areas should be buttressed in video training. Incomplete compression recoil did not show a significant difference, but there was indeed a large gap between the video and traditional groups along with a large standard deviation for the video group. This indicates that video training provides an insufficient learning of proper recoil after compression, and the relevant part of video training should be augmented. Lower rates of incomplete recoil shown by subjects in a study examining the effects of Basic Life Support (BLS) training via distance e-learning appear to be the result of prior instruction and repetition[14]. Training efficacy could be improved through the use of video training to supplement hands-on traditional training, or for repetition and practice following the training session.

In a study of non-healthcare providers between the ages of 40 and 70 who did not receive CPR training in the preceding five years, 30 minutes of video self-training produced statistically superior overall performance compared to a 3-4 hour instructor-led classroom Heartsaver course, and similar results for chest compression[15]. These results appear to stem from difference in the training curriculum between the two subject groups or extraneous variables caused by errors in random assignment between the groups. However, these results do seems to testify to the effectiveness of self-motivated focused learning, and show that around 30 minutes is the ideal timeframe for providing CPR training and sustaining trainee interest under normal circumstances.

While research has shown that chest compression CPR video training using one-, five- and eight-minute videos are effective in increasing the rate of CPR attempts, this was merely a comparison with a control group that did not receive any instruction; taking into account performance abilities, training longer than the prescribed eight minutes will be required[8]. On the other hand, an eight-minute video e-learning session produced similar performance results when compared to an hour-long traditional training. This, however, appears to have been caused by differences in trainee composition as well as video content and only provides additional circumstantial evidence that different videos depending on various learning conditions may increase training effectiveness[16].

Examining the posttest responses to CPR willingness factors, the video group had fewer responses while the traditional group had more responses, confirming

the effectiveness of traditional classroom training for increasing willingness to perform CPR. The personal interaction between the instructor and trainees seems to have affected willingness, and a way to enhance such interaction in the video content should be explored. The video group had statistically significant lower scores for CPR willingness, knowledge and performance compared to the traditional group, which shows the disadvantage of providing unidirectional training delivered by a video clip without any questions and answers or repetitive stressing of important learning points during training. A study that used a mobile phone (iPhone) for feedback to show the effectiveness of CPR chest compression training provides some interesting insight[17].

5. Conclusion

Under the same training conditions, video self-instruction was found to have a smaller impact on the willingness to perform CPR compared to traditional face-to-face training. Video training also had a negative effect on CPR knowledge and performance capability. However, augmenting training videos with additional content for boosting willingness and using the material as an audio-visual supplement prior to hands-on practice could overcome this limitation. Furthermore, self-led video training could be a convenient, cost-effective and time-saving tool for maintaining the level of CPR performance, confidence and willingness in sufficiently motivated students[18].

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