3D CPR Game Can Improve CPR Skill Retention

Jia Li[a], Yimin Xu[a], Yahong Xu[a], Peng Yue[a], Liu Sun[a], Ming Guo[a], Shuqin Xiao[a], Shu Ding[a], Yanyan Cui[a], Shulan Li[a], Qiuying Yang[b], Polun Chang[c], Ying Wu[a,*]

[a] *School of Nursing, Capital Medical University, Beijing, China*
[b] *School of Biomedical Engineering, Capital Medical University, Beijing, China*
[c] *Institute of biomedical informatics, National Yang-Ming University, Taiwan*

Abstract

Adequate cardiopulmonary resuscitation (CPR) skill is essential in improving survival rate of sudden cardiac arrest (SCA). However, the skill deteriorates rapidly following CPR training. We developed a computer game by using 3-Dimensional virtual technology (3-D CPR game) for laypersons in the purpose to improve skill retention. As the testing phase, a randomized control trial, in which we recruited 97 freshman medical students who had no prior CPR training experience, was used to test its effect on 3-month CPR Skill retention. The usability of the game was also tested using a 33 item questionnaire rated with 5-point Likert scale. Three months after the initial CPR training, the retention rate of CPR skill in the game group was significantly higher compared with the control (p<0.05) and the average score on 4 dimensions of usability were 3.99-4.05. Overall, using 3-D CPR game in improving CPR skill retention is feasible and effective.

Keywords:

CPR; 3-D computer game; skill retention; Cardiac arrest

Introduction

SCAs are usually occurred in out-of-hospital settings (OHCA). Bystander CPR is an effective way of improving the outcome of OHCA. However, the survival rate depends on the quality of bystander's CPR skill which could deteriorate quickly even at 2 weeks after training [1]. Although our previous study showed that remote supervised reinforcement of CPR skills by telephone could improve CPR skill retention, adherence was poor. Because game can provide a learning-by-playing environment and motivate trainees, we designed a 3-D CPR game for laypersons to refresh CPR skills and improve skill retention. This pilot study was to test the effect and the usability of the game by recruiting freshman medical students who had no prior CPR training experience, therefore provide evidence for further usage of CPR game in improving skill retention among a larger population of laypersons.

Materials and Methods

3-Dimensional virtual technology and real-world scenario were used to develop a CPR computer game. After repeated modification and trial use, freshman medical students who had no prior CPR training experience were recruited and randomly assigned into game or control group using sealed envelopes if they pass the test after AHA basic life support *Heartsaver* course. Subjects in the game group were instructed to play the game to approach a victim and provide resuscitation according to the CPR skill they learned, while control group were told to refresh their skills frequently. Three months (±2 weeks) fol-

lowing the CPR training, all the subjects who had passed the initial examination were invited to return for re-examination on Resusci Anne manikins which can printout data on volume of ventilation, rate and depth of compression, and compression site. The usability of the game was also evaluated on a 5-point Likert scale questionnaire, which was developed according to Technology Acceptance Model of Davis, F. D. (1989). The content validity for the total scale was 0.95 and the Cronbach's alpha was 0.98.

Results

The interfaces of the final CPR game are shown in Figure.1. There are two avatars (one SCA victim and one rescuer). The player can control the rescuer avatar by computer mouse and keyboard to act as a rescuer to perform CPR as learned during the CPR training course.

During the testing phase, 97 subjects were recruited and finished the study. The 3-month retention rates of overall performance, compression depth, airway opening, and ventilation volume were higher in the game group compared to the control (p<0.05). The average score on 4 dimensions of usability scale for this game were 3.99-4.05.

Figure.1 - Resuscitation game interfaces

Conclusion

Using 3-D CPR game in improving CPR skill retention is feasible and effective among freshman medical students who had no prior CPR training experience, and the effect for laypersons needs to be further investigated in a wider range of population.

References

[1] Roppolo LP, Saunders T, Pepe PE, Ldris AH. Layperson training for cardiopulmonary resuscitation: when less is better. Current Opinion In Critical Care. 2007;13(3):256-60.

Address for correspondence

∗ Corresponding author. Ying Wu.
  E-mail address: helenywu@vip.163.com