

Selected Topics: Prehospital Care



PEER-ASSISTED LEARNING IN CARDIOPULMONARY RESUSCITATION: THE JIGSAW MODEL

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Abstract—Background: Training a large cohort of the population could, over time, increase the rate of bystander cardiopulmonary resuscitation (CPR) and survival after out-of-hospital cardiac arrest. **Objectives:** This study investigates 1) the quality of peer-assisted learning (PAL) by means of the jigsaw method compared to direct teaching by an instructor for learning CPR, and 2) the extent to which acquired skills can be passed on from tutor to tutee without loss of learning. **Methods:** One hundred thirty-seven master students were randomized into a jigsaw and a control group. In the jigsaw group, subjects were randomly split into a chest compression group (CC) and a ventilation group (VEN). After each group had learned the respective skill by an expert instructor, all students were randomized into pairs and taught their partner the acquired skill. In the control group, both skills were taught by the expert instructor. CPR assessment was individually conducted 1 week prior to intervention (baseline) and 2 weeks after (post) on a manikin using a PC-Skill Reporting System. **Results:** At baseline, no significant differences were observed between the three groups. At post, all groups met the European Resuscitation Council (ERC) 2010 guidelines. No significant difference was observed between the jigsaw and control group. One significant difference was found between the VEN and CC group for chest compression depth ($p < 0.01$). **Conclusion:** This study demonstrated that the jigsaw model is as effective as expert instruction to achieve the ERC 2010 guidelines. Only one difference was found between the tutor and tutee group. © 2016 Elsevier Inc.

Keywords—basic life support; skills education; cardiopulmonary resuscitation; jigsaw

INTRODUCTION

Out-of-hospital cardiac arrest is a leading cause of death in the Western world. The provision of bystander cardiopulmonary resuscitation (CPR) significantly improves survival but is generally performed in less than one-third of cases (1–3). To increase the likelihood that a victim of out-of-hospital cardiac arrest promptly receives CPR, the International Liaison Committee on Resuscitation recommends increasing the number of people trained to perform CPR (4). It is assumed that bystanders trained in CPR are more likely to take action than those who are not trained (5). Although training is necessary to overcome the barrier to perform bystander CPR, the quality of bystander CPR performance is highly important for survival of the victim. Extensive research in basic life support (BLS) and CPR has shown that mouth-to-mouth ventilation and chest compression is complex and difficult for laypersons to execute (6,7). Research in teaching CPR skills has pointed out that self-instruction is an effective method to improve CPR competence (8–11). The challenge remains how best to

organize training to enhance laypersons' skills learning. One approach is to encourage reinforcement and revision of learning, provision of prompts and personal feedback, and the promotion of responsibility. These and other benefits have been subscribed to peer-assisted learning (PAL) (12). PAL (or peer learning) is an instructional model in which peers cooperate to maximize each other's learning (13). In this model, peers perform roles of both tutor and tutee to master the necessary knowledge and skill (14). A systematic review has reported positive outcomes on the effectiveness of peer teaching and learning in psychomotor and cognitive domains (15). PAL has been used extensively in medical education, and in CPR training in particular (16–23). For instance, at the University of Birmingham, a peer-led program on BLS and automated external defibrillation skills was introduced in 1995. In this program, senior students underwent a European Resuscitation Council (ERC)-endorsed instructor course to enable them to deliver supervised training to first-year students (24,25).

In this study, a jigsaw model was introduced to investigate the extent to which acquired skills can be passed on from tutor to tutee without loss of learning. Jigsaw is a form of PAL in which students are teamed up to work on academic material that has been broken down into relevant subskills (26). For example, learning how to perform chest compressions in dyads could be divided into learning the correct compression rate, and the correct compression depth. Individual students then learn their part of the skill (i.e., compression rate or compression depth) by means of an expert or some instructional tool (e.g., task cards, video). When both students have mastered their part of the content, they pair up again and teach the acquired skill to their partner. The jigsaw method has been investigated in the psychomotor domain and has demonstrated positive effects on students' self-esteem, the number of trials performed, and the number of correct trials performed (27,28). Also, jigsaw was found to improve learning for both low-skilled and high-skilled sixth-year school students (28). To date, no research examining jigsaw as a model to learn CPR in (young) adults exists. In addition, although most PAL studies in CPR were conducted with trained senior health care students as instructors, this study deploys same-age lay peers who have been trained in either chest compression or ventilation for only 30 min preceding the jigsaw intervention. In this article, we assessed the quality of the jigsaw model together with a traditional instructor-led model through comparison with the ERC 2010 guidelines for CPR. Secondly, within the jigsaw model, we studied the difference in skill performance between tutors and tutees, that is, students who were teaching their acquired skill and students who were taught the skill by their peer, respectively.

METHODS

Participants

Participants were master students in the preservice teacher education program of a Belgian university. The study was part of a curricular first-aid training course. Students filled in a questionnaire prior to the intervention to determine whether they had received previous BLS or CPR training. Informed consent was obtained from all participants.

Procedure

A flowchart of the procedure is shown in [Figure 1](#). One week prior to intervention, each participant completed a baseline CPR skill test. Prior to the intervention, participants were assigned to the jigsaw or control group by random assignment of a number (1 or 2) by means of the sealed envelope system carried out by an independent researcher who was not involved in the data analysis. Allocation concealment was obtained because the instructor was not involved in the randomization process. The jigsaw group received training in the morning and the control group in the afternoon. Both groups were trained by the same instructor. This instructor was male, 39 years of age, and had 5 years of experience as a certified BLS instructor with the Belgian Red Cross. BLS was taught according to the ERC 2010 guidelines (29). Additionally, the jigsaw group was randomly split into a chest compression (named CC) group and a ventilation (named VEN) group by means of the sealed envelope technique. All three classes were standardized and started with a brief introduction of about 2 min explaining the content (chest compression or ventilation). In the jigsaw group (CC and VEN), the format was additionally explained for about 2 min. An independent observer (certified BLS instructor) was present to note inconsistencies if present. No inconsistencies were reported.

The jigsaw groups were accommodated in two separate classrooms. Chest compression and ventilation were taught using the jigsaw method, consisting of a 30-min instructor-led phase followed by a 24-min peer-learning phase. In the instructor-led phase, the CC group was instructed in chest compression for 30 min, then the instructor switched classrooms and trained the VEN group in the ventilation skill for 30 min. While teaching one group, the other group was practicing bandaging techniques. Each group started with a 10-min step-by-step demonstration of the skill given by the instructor. To maximize engagement, students were told that they would be responsible for teaching the acquired technique to a peer from the other group. After instructor demonstration, students were asked to form dyads with one

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