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Simulation and education

# Influence of pre-course assessment using an emotionally activating stimulus with feedback: A pilot study in teaching Basic Life Support☆,☆☆

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ABSTRACT

*Background:* Cardiopulmonary resuscitation (CPR) mastery continues to challenge medical professionals. The purpose of this study was to determine if an emotional stimulus in combination with peer or expert feedback during pre-course assessment effects future performance in a single rescuer simulated cardiac arrest.

*Methods:* First-year medical students ($n = 218$) without previous medical knowledge were randomly assigned to one of the study groups and asked to take part in a pre-course assessment: Group 1: after applying an emotionally activating stimulus an expert (instructor) gave feedback on CPR performance (Ex). Group 2: after applying the same stimulus feedback was provided by a peer from the same group (Pe); Group 3: standard without feedback (S). Following pre-course assessment, all subjects received a standardized BLS-course, were tested after 1 week and 6 months later using single-rescuer-scenario, and were surveyed using standardized questionnaires (6-point-likert-scales: 1 = completely agree, 6 = completely disagree).

*Results:* Participants exposed to stimulus demonstrated superior performance concerning compression depth after 6 months independent of feedback-method (Ex: 65.85% [$p = 0.0003$]; Pe: 57.50% [$p = 0.0076$] vs. 21.43%). The expert- more than the peer-group was emotionally more activated in initial testing, Ex: $3.26 \pm 1.35$ [$p \leq 0.0001$]; Pe: $3.73 \pm 1.53$ [$p = 0.0319$]; S: $4.25 \pm 1.37$) and more inspired to think about CPR (Ex: $2.03 \pm 1.37$ [$p = 0.0119$]; Pe: $2.07 \pm 1.14$ [$p = 0.0204$]; S: $2.60 \pm 1.55$). After 6 months this activation effect was still detectable in the expert-group ($p = 0.0114$).

*Conclusions:* The emotional stimulus approach to BLS-training seems to impact the ability to provide adequate compression depth up to 6 months after training. Furthermore, pre-course assessment helped to keep the participants involved beyond initial training.



## 1. Introduction

The mastery of cardiopulmonary resuscitation (CPR) continues to challenge medical professionals. Within CPR, external chest compressions (ECC) are the key element providing forward blood flow and therefore maintaining heart and brain viability, and thus are of paramount importance to improve outcome after in- or out-of-hospital cardiac arrest.

Insufficient evidence exists for the best way to teach Basic Life Support (BLS) to laypeople and health care providers. The 2010 Guideline recommendations include self-directed learning, the use of CPR prompt or feedback devices, and frequent assessment and refresher courses.[1,2]

The quality of ECC performed by laypersons as well by professional healthcare providers has been called into question and no strategies to motivate course participants beyond the course were described so far.[3,4]

We tried to improve the participants' intrinsic motivation to learn the technique of Basic Life Support and to raise their willingness to engage in all aspects of basic resuscitation skills. To

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achieve this, we used an emotional stimulus pre-course combined with feedback. The rationale was based on knowledge about first year medical students, which showed that about 90% had previous training in resuscitation ("BLS for driving license" ~70%, "First Aid"-course ~20%, previous medical qualification ~15%).[5,6]

The aim of this study was to evaluate whether the integration of a pre-course assessment using an emotional stimulus combined with feedback lead to an improved retention of skills and if an influence on the engagement with the issues of BLS could be observed. As peer education is being used more frequently in teaching and assessing BLS-skills the differences between expert- and peer-feedback were observed additionally.[7–9]

## 2. Methodology

### 2.1. Participants

All first-year medical students ($n = 248$) from the Medical School of RWTH Aachen University, Germany were invited to take part in the study and were considered laypersons because they had no specific medical education after leaving secondary school or no previous medical training, professional CPR knowledge or CPR skills. Those students who passed any medical emergency training, comparable to emergency medical technician, paramedic, nurse etc. were excluded because they were ranked as healthcare providers. The final study group included 218 students. All students were informed that their performance would be evaluated and used for scientific purposes. Therefore, informed consent from each person was taken prior to first evaluation (enrolment details and study design in Fig. 1). However, they were blinded and not informed about the different approaches and their allocation as well as the individual evaluator was blinded to the respective approach.

### 2.2. Study design

In this prospective interventional study subjects were randomized to one of the following study groups and tested on a manikin in a mock cardiac arrest scenario:

- *Group Ex*: an emotional stimulus was applied before CPR and an instructor (the "expert") provided standardised feedback after performance.
- *Group Pe*: an emotional stimulus was applied before CPR and a feedback was provided by a peer from the same group.
- *Group S*: was treated as the standard and received no feedback during initial CPR-testing.

#### 2.2.1. Emotional stimulus

The emotional stimulus was given to Group Ex and Pe by asking them to imagine being in a situation where they needed to resuscitate someone emotionally close to them. This was done by the following standardised approach:

> "Who is the person you are emotionally closest to? (E.g. girl- or boy-friend, mother, father, brother, sister)
> Okay, imagine, this person now collapses without any obvious reason straight in front of you.
> This manikin represents this person! What would you do right know?
> Please take the measures which are necessary in your opinion!"

#### 2.2.2. Feedback

The feedback given by Ex and Pe after the pre-course test was about "average depth of compressions [mm]" and "time needed from start of the scenario to start chest compression [s]" using a predefined form, where parameters were filled in by a study assistant. To give an idea how good or bad the results were, three categories were created for compression depth with "optimal" [40–50 mm] and "too deep", "too shallow" as well as for the time to start CPR [seconds to compressions]: good [<20 s], average [20–30 s] and improvable [>30 s]. Apart from this data, no further feedback on the participants' testing performance was given.

#### 2.2.3. BLS training

After the initial pre-course assessment subjects of all three study groups received a standardised tutorial in BLS in the same manner according to recent guidelines.[10] To assure consistent instructions for all participants, the standardized and common teaching methodology "4-stage-approach" (Demo by instructor > Explanation > Instructor guided by learner > Demo by learner followed by time to practice) was used in all groups.[11] Every participant had the same time to train (course duration 4 h) and the same support during training with no systematic differences.

### 2.3. Measurements, data acquisitions

Participants were tested prior to the BLS tutorial, again after 1 week and 6 months following the BLS training without any additional feedback or emotional stimuli. Each participant was individually tested following a standardised testing protocol and not able to see other participants' performances. The procedure was always carried out as single-rescuer-CPR (ECC in combination with mouth-to-mouth-ventilation) and terminated after at least 180 s duration. Participants completed a standardised pre-course and post-performance questionnaire concerning emotional influence and personal values about CPR after each testing.

Practical test setup consisted of a manikin (Skillreporter Resusci® Anne, Laerdal, Stavanger, Norway) placed in supine position on the floor dressed with a zippered jacket. The manikin was connected to the Laerdal PC-SkillReporting Software (Version 1.3.0, Laerdal, Stavanger, Norway) for data acquisition of applied compressions. A certified ERC Advanced Life Support instructor supervised the performance of each participant and data recording.

### 2.4. Data analysis

#### 2.4.1. Performance data

The practical endpoints were adapted to current guidelines[10] – an average compression depth within 40 and 50 mm and rate of ECC within 90 and 110 $min^{-1}$. In addition, the total number of compressions with correct depth and adequate release was observed.

Furthermore incomplete releases of pressure between compressions as well as too shallow and too deep compressions were recorded during ECC performance. In each case a portion of more than 20% of compressions with one of these failings was assumed to be unacceptable.

#### 2.4.2. Further data

In addition, "time to start CPR" (identical to the first compression) was documented for each scenario. The qualitative endpoints were the emotional influence and personal values with respect to the subject of CPR and measured using standardized questionnaires observed by a 6-point-Likert-scale (1 = completely agree to 6 = completely disagree, detailed questions displayed in Fig. 3).

#### 2.4.3. Statistical analysis

Continuous variables were summarized by means and corresponding standard deviations. Categorical data were presented by percentages. Depending on the scale of the endpoint two-way repeated measures analysis of variance (repeated measures ANOVA) or two-way repeated logistic regression was carried out to investigate the effect of group (group factor, 3 levels: Ex, Pe, S),