Training patient safety in digital natives - Retention after CPR training with avatars in Virtual Worlds.

Johan Creutzfeldt[1], Leif Hedman[1,2], Karl Stengård[3], Christopher Medin[1], Li Felländer-Tsai[1]
[1]CLINTEC and Center for Advanced Medical Simulation, Karolinska Institutet, Sweden, [2]Department of Psychology Umeå University, [3]Huddinge Gymnasium, Sweden

Background and goal of the project:
Disseminating the skills of Cardio- Pulmonary Resuscitation (CPR) among potential lay person rescuers is considered to be of greatest importance in order to reduce cardiac mortality. Traditional Basic Life Support (BLS®) training is difficult to disseminate, requires trained instructors and shows poor retention among course attendees. Furthermore, non-technical skills are not trained, which may reduce the effectiveness in a real CPR event. Serious games have been suggested as effective tools to train people in both technical and non-technical tasks. They meet many of the important characteristics for effective education and training such as individualization, feedback, engagement and scaffolding. Serious games may also promote active group achievements, transfer and assessment.

We have developed and used Massive Multiplayer On-Line Simulations (MMOS) to train high school students in BLS. The goal of this project is to study the characteristics, outcomes and effectiveness of such training. So far we have noticed high degrees of enjoyment and good conditions for learning in terms of affective outcomes. In these pilot studies we also found performance to increase quickly. The purpose of the current study was to follow up previous training to investigate signs of retention 18 months later.

Research methods:
Twelve Swedish 10th grade high school students in Huddinge were recruited on a voluntary basis to train CPR adhering to the newest guidelines in an authentic school setting using MMOS, also called "Virtual Worlds" (Forterra Systems, Inc.'s On-Line, Interactive, Virtual Environment, OLIVE) game development platform). Each student played the role of a character ("avatar") in 4 similar scenarios. After a standardized CPR lecture, the students interacted with other avatars in the Virtual World by using the keyboard and mouse to control their avatar's actions/movements and headsets with voice over IP to communicate in real time with the other players. After the virtual world role play, trainees participated in an instructor-led debriefing. For each scenario, three students interacted in the Virtual World to practice the steps they would take to rescue the victim, suffering from a cardiac arrest. The duration of the training was about 180 minutes. The same training, with the only exception that the lecture was omitted, was repeated 6 months later. Another 18 months later 9 subjects in this group (experimental) (at that point attending12th grade) was assessed and compared to 7 matched fellow students (control) who did not attend the Virtual World training. All subjects had participated in the traditional BLS training program at their school 6 months prior to the intervention. For that training an older version of CPR guidelines was used (fig 1).

Knowledge was tested using a 10 item quiz. Performance was assessed in terms of speed and correctness of procedure and mental strain was self-assessed using the Borg CR10 scale in a simulated cardiac arrest scenario. The students now worked in groups of 3, 4 and 5 in this scenario where a full scale medical simulator was employed.

Results:
No difference in overall CPR knowledge was detected between the groups. However in the experimental group 4 out of 9 students correctly answered that pulse check before starting CPR had been omitted from the procedure compared to 0 out of 7 in the control group. Although there were no obvious signs of differences in performance at this point, all groups in the experimental group used the newer compression:ventilation ratio (which had been changed from 15:2 to 30:2) while the subjects in the control group did not. There was a significant difference in mean mental strain between the experimental group, 4.6, and the control group, 1.8.

Conclusion:
Eighteen months after repeated Virtual World CPR training the subjects remembered the changes of the CPR guidelines that had been actively practiced. This was in contrast to what had been lectured but not practiced and in contrast to the control group, where no difference was found. The mental strain was low in both groups, however there was a significant difference indicating that the groups might react to the scenario in different ways. Despite no measurable effect on performance 18 months after training, there were signs of retention of previous training (e.g. the 2 major changes in the BLS procedure). In conclusion, mannikin-based training might

have other effects after pretraining with MMOS. The results of this study warrants further refinement of the MMOS training program in order to maximize retention. Also more and larger studies on the effects of combined MMOS and other training should be conducted in order to clarify how it is best used and how it compares to conventional training.

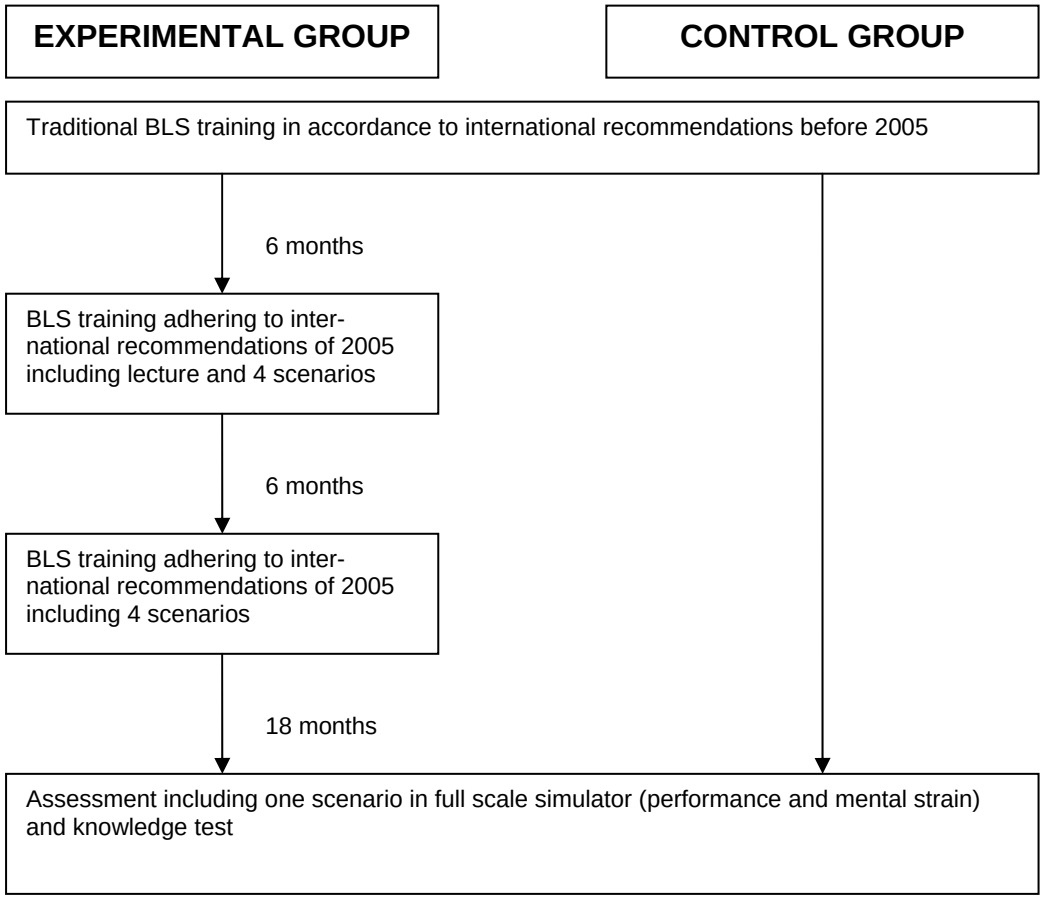

Figure 1. Design of the pilot study. The number of MMOS trained subjects was 12, but before the final assessment there was a drop-out of 3, leaving the experimental group n=9. The control group consisted of the rest of the class, n=7.

Contact information:
Johan Creutzfeldt
Center for Advanded Medical Simulation and Training, K32
Karolinska University Hospital, Huddinge
141 86 Stockholm
Phone: +46 (0)8 58586334
Fax: + 46 (0)8 7795424
johan.creutzfeldt@karolinska.se