

**Título:** BASIC LIFE SUPPORT TRAINING IN SCHOOL CENTRES

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**Resumen:** INTRODUCTION

Cardiac arrest (CA) is the sudden, unexpected and potentially reversible interruption of spontaneous circulation and breathing. Out of hospital CA (OHCA) is the third cause of death in industrialized countries and more than 70% are witnessed. Although bystander assistance could improve survival and outcomes, bystander resuscitation rate is far below 20% in most countries.

At the time of collapse, shockable rhythms are present in 50-70% of CA in adults. In such cases the restoration to a perfusing cardiac activity may be achieved by means of electrical defibrillation, resulting in four-fold higher survival rates when the shock is applied within the first 3-5 minutes.

The automated external defibrillator (AED) is a simple and secure device able to analyse cardiac rhythm, to recognize an arrhythmia and to deliver a shock in order to restore a viable cardiac rhythm if required. There are recommendations from the international scientific community that endorsed the training of non-medical staff in the use of AED as well as the implementation of these devices in public places where crowds of people occur,

such as airports or sports centres

The simplicity and reliability make the defibrillator a device that can be used by anyone, regardless of age, education degree or handicaps and disabilities.

Children are considered an interesting target group to train in BLS. Their training should provide the guarantee to secure a large number of future rescuers for the community. As well, schools have been pointed out as a perfect environment to start BLS training. In fact, school training has the highest impact for improving the bystander CPR rate. Even though it is not clear which professionals are more suitable for teaching schoolchildren, the inclusion of schoolteachers as a key element of BLS training has been endorsed by international initiatives like Kids Save Lives (KSL) and national ones as ANXOS.

#### HYPOTHESIS:

¿The AED is a known device for primary and secondary students aged between 6-16 years old.

¿Schoolchildren are able to use the AED correctly following their intuition, without any prior training or indications.

¿A brief formative video is enough for schoolchildren learn how to use an AED and for one-month skill retention.

¿Young persons with Down syndrome are able to learn how to use an AED after a very brief theoretical and hands-on training supported by a brief formative video.

¿University Educational Science students BLS knowledge is deficient currently.

¿Future school teachers have willingness to include BLS topics in their scholar lessons.

¿A brief BLS training session supported by real-time feedback is useful for university Educational Science students improve their CPR skills and knowledge.

#### OBJECTIVES:

The main objectives of this research are:

1.To analyse the ability of primary and secondary schoolchildren to use an AED correctly in less than 3 minutes intuitively, after viewing a short instructional video and one-month after instruction.

2.To assess the usefulness of very brief BLS training programs to improve CPR-AED knowledge and skills of university educational science students.

The secondary objectives of the present research are:

1.To investigate if the AED is a known device for primary and secondary schoolchildren aged between 6-16 years old.

2.To assess primary and secondary schoolchildren AED use following only their intuition, without any prior

training.

3.To ascertain if the variable age is related with better AED use in schoolchildren and to compare defibrillation knowledge and skills according to educational stage.

4.To determine if a simple formative video is enough for schoolchildren learn to use an AED in less than 3 minutes and retain this skill after one month.

5.To investigate if Down syndrome young people are able to learn how to use and AED after a brief theoretical and hands-on training.

6.To assess future Physical Activity teachers current BLS knowledge and skills.

7.To determine the learning effect of a brief BLS training session supported by real-time quality feedback in university students.

## RESULTS:

This thesis follows an article compendium modality. Therefore, the results are presented as research articles.

1. Automated external defibrillation skills by naïve schoolchildren.

The objective of this study was to assess the current ability of schoolchildren to use an AED without any prior training or feedback during the performance.

A multicentre descriptive study was carried out, 1295 children from 6 to 16 years of age without previous BLS or AED training took part in this study. Subjects performed a simulation with an AED and a manikin with no training or feedback and were evaluated by means of a checklist.

A total of 258/1295 (19.9%) participants managed to simulate an effective and safe discharge in less than 3 minutes time.

Gamma coefficient showed a mild but significant correlation between correct defibrillation and age group ( $G = 0.172$ ) ( $p < 0.001$ ).

From 9 years old on, almost one out of four managed to achieve the defibrillation objective.

Time Global average was  $83.3 + 24.6$  s. Time to defibrillation decreased with increasing age [6 years old ( $108.3 + 40.4$ ) vs. 16 years old ( $64.7 + 18.6$ )] [ $p < 0.001$ ].

2. Learning how to use the semiautomatic defibrillator by means of audiovisual methods in schoolchildren. (Aprendizaje del uso del desfibrilador semiautomático mediante métodos audiovisuales en escolares).

The aim was to assess the ability of schoolchildren to use an AED to provide an effective shock and their retention of the skill 1 month alter training exercise supported by audio-visual materials.

Quasi-experimental controlled study in 205 initially untrained schoolchildren aged 6 to 16 years old was conducted. AEDs were used to apply shocks to manikin. The students took a baseline test (T0) of skill and were then randomized to an experimental or control group in the first phase (T1). The experimental group watched a training video and both groups were then retested. The children were tested in simulation again 1 month later (T2).

The whole sample (196) was able to use the AED correctly in less than 2 minutes time.

AED knowledge was better in secondary students ( $p < 0.001$ ). No significant differences were obtained between groups in the basal test

After training, the number of those experimental group participants who accomplished defibrillation objective was

double than control group in primary stage [Control: 14(29.8%) vs. Experimental: 30 (62.5%),  $p < 0.001$ ].

Regarding quality objective, experimental group reached better results in primary stage [Control: 1 (7.1%) vs. Experimental: 13 (43.3%),  $p = 0.018$ ] also in secondary stage [Control: 3 (13.6%) vs. Experimental 12 (46.2%),  $p = 0.017$ ].

In T2, all secondary students improved the defibrillation objective but control group achieved worse results for quality objective

Concerning time analysis, this variable was shorter in secondary group and was decreasing in each study step.

3. Schoolteachers as candidates to be basic life support trainers: A simulation trial.

The aim was to assess future schoolteacher's BLS knowledge and willingness to include this content in school lessons and also to determine the learning effect of a brief BLS hands-on training session, supported by real-time feedback.

A convenience sample of 98 University students of Educational Sciences and Sports were recruited. The training program consisted of a brief theoretical and hands-on interactive session with 2/10 instructor/participants ratio. Knowledge and willingness were assessed by means of a survey. Chest compressions and ventilation quality were registered in 47 cases during 1-minute CPR tests.

CPR quality standards knowledge was poor firstly but, after training, knowledge improved in all concepts as well as the willingness to use an AED in an eventual emergency situation and the consideration of university BLS training as very important.

During one-minute test, more than 80% of chest compressions (CC) were performed at an adequate rate and all were delivered with correct hand position. Full chest recoil was better in women (Women: 72.2 + 32.8% vs. Men: 45.4 + 32.9%,  $p = 0.009$ ) and men group performed deeper CC (Men: 56.1 + 4.03 mm vs. Women: 52.17 + 5.51 mm,  $p = 0.007$ ).

4. Brief training in automated external defibrillation use for persons with Down syndrome.

The objective was to assess AED skills in young people with Down syndrome after a very brief and simple training program.

We invited member and staff of the Down Compostela Foundation to participate in a brief training program consisted on: 5 minutes easy lecture, short funny video watching and 20 minutes hands-on training. After training, every participant was tested individually in a simulated scenario, performance was evaluated by means of a check list.

All OT people and 17/22 (63%) DS participants accomplished the defibrillation objective [ $p = 0,014$ ]. Quality objective was obtained by 11 (91,6%) OT people and 8 (47%) DS participants ( $p = 0,013$ ). Time to defibrillation was 50,3 + 8 seconds in the OT group and 74,5 + 15 seconds in the DS group ( $p < 0,001$ ).

## DISCUSSION

Schoolchildren have been pointed out as an essential target group for BLS training. However, this sample have not been studied in a widespread way and it is not clear at what age schoolchildren are capable of learning different aspects of first-aid like AEDs use and how is their background knowledge on the subject or which professional is more suitable to lead this training.

The present research was the first to present the topic of schoolchildren AED knowledge. Our results shown that 3 of every 4 schoolchildren stated to know what an AED is, despite any of them had been trained in AED previously.

The study ¿Automated external defibrillation skills by naive schoolchildren¿ the first to assess the intuitive AED use in a large sample (1295 untrained schoolchildren) with a wide age range (from 6 to 16 years of age), showed that from the age of 9, one of every 4 schoolchildren are capable of applying the AED intuitively, and at the age of 16 half of the capable students are able to complete the procedure with quality.

Prior studies, conducted in other countries with smaller samples, obtained similar results which endorsed that from 9 years old schoolchildren are able to use an AED intuitively and the need of training programs in order to improve knowledge and skills.

Regarding time, this was less than 3 minutes in all cases and, from the age of 8 years old all participants completed the practical test in less than 2 minutes. Immediately after view a formative video, time to defibrillation decreased up to 70 seconds and one month after instruction was less than 55 seconds. Concerning Down Syndrome participants, after a brief and simple training 63% of them accomplished a defibrillation goal in a mean time of 75 seconds. Thus, time to defibrillation decrease after training and also with repeated use.

Instead of that schools have been pointed out as perfect environment to start BLS training it is no clear which professional is more suitable to lead this training. The need of healthcare professional could mean a barrier for BLS school training. Prior studies have shown that BLS training provided by schoolteachers is as effective or even more than training provided professional instructors. Current research shows how a very brief and simple training program have positive effect for knowledge and willingness to provided this content in university student of educational science and sports.

In countries where CPR is a mandatory part of school curriculum, bystander CPR is performed in more than 40% of OHCA and has been associated with double to triple survival rates.

Early BLS training is endorsed by international initiatives like KSL, which propose 2 hours per year of CPR training from the age of 12. Starting at a young age, children will not forget how to save a life and survival rate of people with OHCA could improve by the factor of two fourfold. This endorsed the idea that training schoolchildren is a good investment for the future

## CONCLUSIONS

1.The AED is a device known by a significant percentage of the school population and the school stage is significantly related to AED knowledge, which is better in secondary students.

2.Currently around 20% of theoretically naive schoolchildren are able to apply an AED in less than 3 minutes by means of their general knowledge and device¿s acoustic and visual instructions. However, children¿s background knowledge and AED instructions alone are not enough to perform the procedure satisfactory.

3.Defibrillation skills improve with age. Secondary students perform better AED use and they apply the shock in a shorter time than primary schoolchildren.

4.The visualization of a simple and brief formative video is useful for schoolchildren improve AED use and

contributes to short-term retention of learnt skills.

5. After a simple and brief training, most of Down syndrome young people are able to use an AED device in less than two minutes, although they don't achieve the same level of performance of other citizens.

6. Brief hands-on training supported by real-time quality feedback helps to improve knowledge and self-confidence in BLS and CPR skills of future schoolteachers. BLS training should be implemented in the University curricula for schoolteacher to promote the engagement of these professionals in effective BLS training of schoolchildren as supported by initiatives such as Kids Save Lives