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SPECIAL REPORT

INNOVATIVE METHODOLOGY TO TRAIN PRE-SCHOOLERS IN THE FIRST LINK IN THE CHAIN OF SURVIVAL: RCPARVULARI STUDY

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ABSTRACT

Introduction

It is postulated that with adequate training everybody can save a life. Training children and teachers in life support could have a major impact on public health.

Primary schoolers are keen to learn cardiopulmonary resuscitation and can transmit this knowledge to friends and family. The literature does not contain validated questionnaires on life support training in 3-6 year old schoolchildren.

Methods and Analysis

Randomized community intervention study conducted by primary care professionals. The target population are 4 to 6 year old children of local schools.

The aim of the study is to assess the knowledge, attitudes and skills of children aged 4 to 6 years of age before and after life support training, by an "ad hoc" questionnaire at the beginning and end of each training session and 6-12 months after the intervention.

Schools that agree to participate will be randomly allocated to the intervention or control groups. After completing the intervention, schools in the control group will be offered the same life support training than their intervention counterparts.

Ethics

The study protocol has been submitted to the Clinical Research Ethics Committee of the Institut Universitari d'Investigació en Atenció Primària Jordi Gol (IDIAPJGol). All participants (their parents or guardians) must sign an informed consent form to participate in the study.

Dissemination

The results of this study will be published in national and international scientific journals.

Keywords: Cardiopulmonary Resuscitation; Teaching Materials; Primary Education. Clinical Trial.

INTRODUCTION

Cardiorespiratory arrest (CRA) in the community is the third leading cause of death in high-income countries.[1] Since most CRAs are witnessed by non-health personnel, training the population in cardiopulmonary resuscitation (CPR) manoeuvres should improve survival.[2,3]

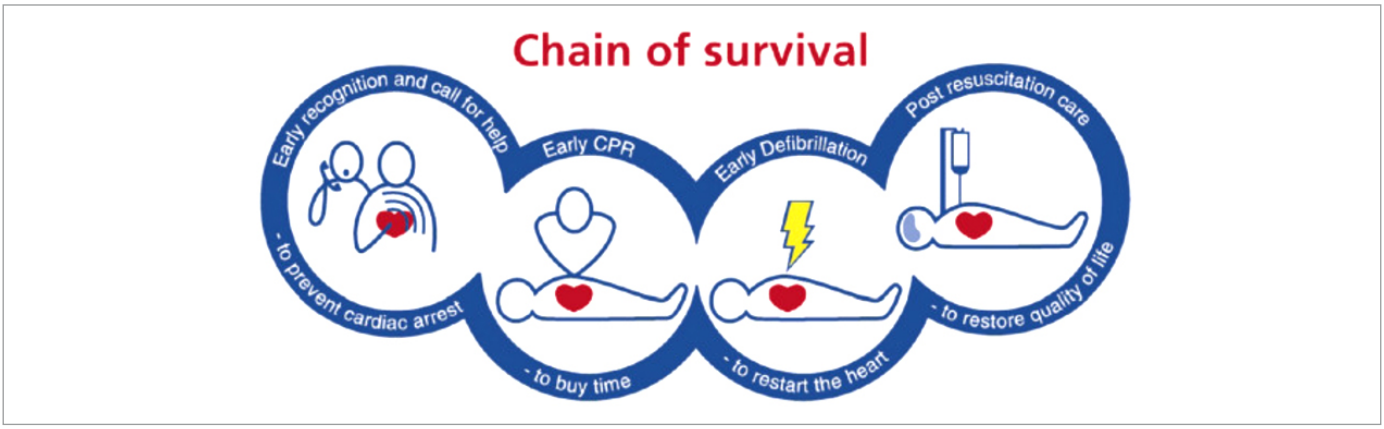
Some countries have suggested incorporating compulsory training on CPR in schools.[4,5] Over the past decade, several school CPR training programmes have been implemented in the European Union under the umbrella of the Kids Save Lives project (European Resuscitation Council).[6]

According to the European Resuscitation Council, 12 is the optimal age to start training in chest compressions.[7] Other studies have shown that from the age of 5, children are able to learn life support measures such as assessing consciousness and breathing, remembering the emergency number, opening the airway and putting the patient in the recovery position.[8]

CPR training in schools is based on the hypothesis that having adequate training, everybody can save a life.[9] Providing life support training to school-age children is part of the comprehensive strategy that aims to improve CRA survival rates and the quality of life of patients. Scandinavian countries, where CPR training has been included in the school curriculum for over a decade, have the highest CRA survival rates.[10]

It has been shown that primary school students are interested in learning CPR and moreover, they spread this knowledge among family and friends.[11,6,10] Importantly, studies have shown that only 2 hours of training per year are sufficient to acquire this knowledge.[10] Providing life support

Figure 1. Chain of survival. Source: European Resuscitation Council. www.erc.edu.



training to schoolchildren has the added social value of teaching schoolchildren the value of helping others.[6,10]

In Catalonia, one of the pioneering initiatives to introduce basic CPR training in schools is conducted in Tarragona and called "Spiral Training Programme", which aims to progressively introduce CPR training during primary and secondary education (from 5 to 18 years of age).[12,13,14]

Cerdà et al.[13] and Lopez-Messa et al.[15] have long insisted on the need to promote CPR training in the general population, starting in primary and secondary schoolchildren. The work of Cerdà et al.[13] and Miro et al.[12] evaluates the effects of training on primary school children.

To date, no studies have been published on Life Support or CPR training in preschool children and we have not found validated questionnaires to assess CPR knowledge of preschool students.

In conclusion, we want to evaluate the effectiveness of teaching life support to preschool children within the aforementioned "spiral training". We also propose a tool to assess CPR knowledge in preschool children.

MATERIAL AND METHODS

Hypothesis

- Most pre-schoolers can identify an emergency and respond appropriately (estimate> 50%).
- Adequate training improves knowledge, attitude (decreasing anxiety) and practical skills in the target population. These acquired skills will persist over time.

Objectives

Main Objective

- Evaluate whether the target population learns and maintains CPR-related knowledge 6 to12 months after training.

Secondary Objectives

- Develop and validate a questionnaire to assess CPR knowledge in preschool children. Evaluate with the same questionnaire if students have consolidated their CPR knowledge over time.
- Analyse if training improves knowledge and changes children's attitude to CRA. Analyse mid-term retention of the information learned.

Design

Randomized community intervention study based on a self-administered and semi-structured *ad hoc* questionnaire. The design of the trial meets the CONSORT Statement.

Randomization: Cluster randomization will be used (clusters are schools with students who meet the inclusion criteria). A table of random numbers will assign each cluster to the intervention or control group.

The study design is as follows:

Community intervention study assessing the knowledge and practical skills of participants. Schools that agree to participate will be randomized using the random numbers table.

Intervention group:

The RCParvulari methodology will be used in preschool children (4 - 6 year old). This methodology is based on lessons and practical interventions regarding the first link in the chain of survival (Figure 1). The methodology starts with a lesson followed by practical training that comprises watching a video with a custom-made song and role-playing in emergency situations. Students will respond to the questionnaire at the beginning and end of each training session and 6-12 months after the intervention.

Control group:

The control group will receive a lesson that includes intervention in the first link in the chain of survival. For this, we will use a slide presentation including theoretical concepts, algorithms and images. Control group participants will also answer the questionnaire before and after the intervention, and after 6-12 months.

After study completion, the control groups will be offered the training according to the RCParvulari methodology.

Sample

Preschool students (4 to 6 years of age) from schools in the Baix Llobregat Nord area (Catalonia, Spain). All schools in the area will be invited to participate.

The Baix Llobregat Nord area has 49 schools: El Bruc (n = 1), Collbató (n = 2), Esparreguera (n = 7), Martorell (n = 7), Gelida (n = 2), Masquefa (n = 3), Sant Esteve Sesrovires (n = 3), Olesa de Montserrat (n = 7), Abrera (n = 3), Pallejà (n = 4), Sant Andreu de la Barca (n = 8), Sant Llorenç d´Hortons (n = 2)].

Table 1 shows the number of students of the ages studied in each town in the year prior to the study.

Sample size

In order to detect a difference over or under 10% in the proportion of correct responses expected in the control group (0.5, with a minimum relative risk of 1.2) and accepting alpha and beta risks of 0.05 and 0.2, respectively, 453 participants in the control and 453 in the intervention groups would be required. Lost-to-follow up have been estimated at 10% using a Poisson approximation.

GRANMO® sample size calculator (Version 7.12, April 2012) was used for calculations.

The randomization will increase the sample size, ensuring a design effect of 2. A total of 906 subjects will be included in each group (total of participants =1816).

Table 1. Distribution by age in participating towns according to the 2016 Institut d'Estadística de Catalunya – IDESCAT census (https://www.idescat.cat/pub/?id=pmh&lang=es)

Town	4 y.	5 y.	6 y.	total
Bruc	28	28	34	90
Collbato	43	58	72	173
Esparraguera	241	224	267	732
Martorell	367	380	366	1113
Gelida	90	96	88	274
Masquefa	102	104	106	312
S. E. Sesrovires	78	89	95	262
Olesa Monts.	323	339	312	974
Abrera	166	182	154	502
Palleja	135	135	137	407
S. Andreu de la B.	337	400	390	1127
S. Llorenc d'hortons	38	42	29	109
total	1948	2077	2050	6075

Study variables

- Dependent variables: Correct/incorrect understanding of CPR, recognition of emergency number (112) and relationship with mouth-nose-eye mnemonics.
- Independent variables: Age, gender, class group, school and test date.

Measuring instruments

Because no validated questionnaire to study CPR knowledge in preschool students was found in the reviewed literature, we will design an *ad hoc* questionnaire prior start of the community intervention study.

This questionnaire will consist of 3 sections and 11 variables (see Supplementary Material 1). It verifies the recognition of 112 as the emergency number and awareness of the mnemonic rule mouth-nose-eyes.

Since the target population are 4 – 6 year old children, the variables are represented through drawings.

To formulate the questionnaire, we consulted the following websites: edu365.cat[16]; laeduteca.blogspot.com.es[17] and educapeques.com[18]. Special emphasis was placed on the relationship between drawings and reading/writing, ensuring that each image was associated with one word. The questionnaires were compared with age-appropriate models of the Speech Therapy Service at the Hospital General de l'Hospitalet.

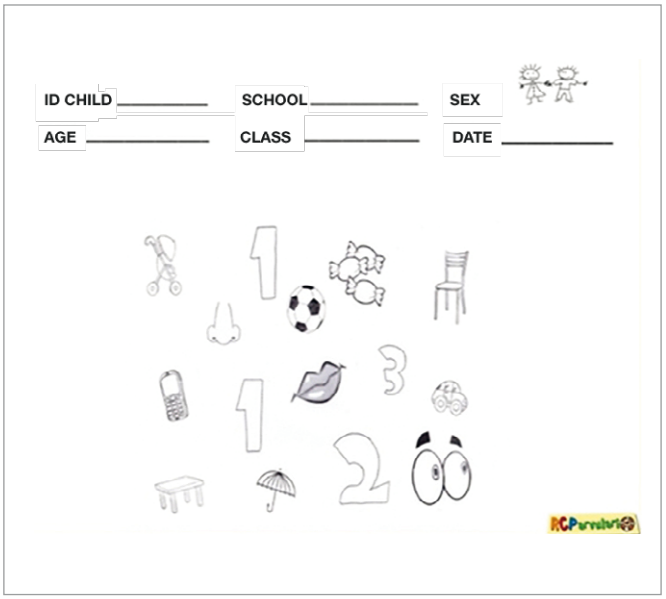
The questionnaire was firstly validated by questionnaire methodology experts (GPs, paediatricians, CPR experts, educational psychologists and educators). A pilot of the questionnaire was next conducted in a preschool class to ensure adequate comprehension.

Intervention

The intervention, named *RCParvulari methodology*, is based on teaching knowledge and interventions related to the first link in the chain of survival (Figure 1).

The training consists of a lesson followed by the projection of the video of a song and role-playing.

Supplementary Material 1



Supplementary Material 2

Two 41.2 x 18.7 cm EVA foam and rubber telephones (Supplementary Material 2) were designed and built to explain the call to emergency services (112) and to use in role-playing.

Supplementary Material 3 includes the video of a song that explains how to act in the event that a teacher or family member loses consciousness.

Children will respond to the questionnaire before the intervention, at the beginning and end of each session and 6-12 months after the intervention.

Timeline

Phase 1:

March - April 2016: literature review conducted to formulate the theoretical framework for the study.

May - June 2016: design of the questionnaire, story, and giant phones for role playing.

Phase 2:

April 2016 - June 2017: protocol designed and submitted to the Ethics Committee.

June 2016 - February 2017: pilot tests of the questionnaire.

Step 3:

Fieldwork will take place between September and December 2017.

Results will be generated from February 2018.

Statistical analysis

We will conduct a comparative analysis of the data obtained from the intervention and control groups. A univariate and bivariate analysis will be performed according to the variables; numerical variables will be expressed using mean and standard deviation, median and interquartile range if distributions are non-parametric, and absolute and relative frequency for qualitative variables. Student's t-test or Mann Whitney U test will be used for numerical variables, and chi-square test for qualitative variables. Statistical significance will be set at 5% (two-sided).

ETHICS

The study protocol has been approved by the Clinical Research Ethics Committee of the Institut Universitari d'Investigació en Atenció Primària Jordi Gol (IDIAPJGol) (code P17 / 175). The study is registered at ClinicalTrials.gov with the identifier: NCT03443167.

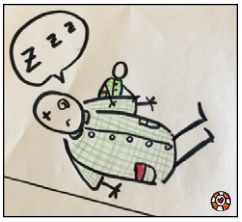
All participating schools and families will receive information about the study. Parents or legal guardians need to sign an informed consent form authorizing the child's participation in

Supplementary Material 3

112: the life-saving numbers

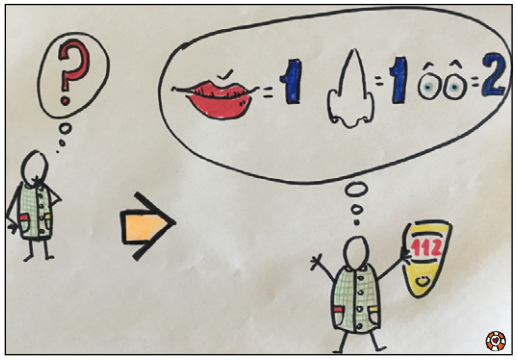
RCParvulari

1. One day during class, the teacher fell suddenly to the ground!

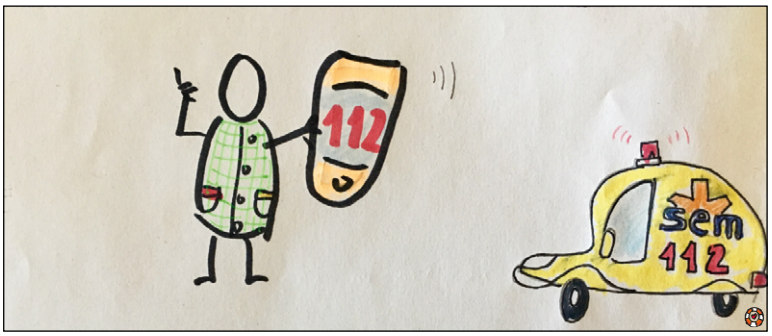


2. They seemed asleep, but couldn't wake up

3. We quickly asked for help, shouted SOS and run to find an adult



4. What else could we do? We remembered how to recall the emergency number: MOUTH-NOSE-EYES: 112



5. We remembered: MOUTH-NOSE-EYES: 112, took the phone and called, the ambulance arrived in no time and cured our teacher

the community intervention study. Participants can withdraw at any time.

The data collected and all the documents related to each participant will receive a numerical code, to guarantee anonymity and confidentiality of data in accordance with the Organic Law 15/1999 on the Protection of Personal Data.

DISSEMINATION

The results of this trial will be published in national and / or international scientific journals.

The results of the study will be presented to the educational institutions and the schools involved. If the results are positive, the aim is to apply the RCParvulari methodology to a larger population.

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