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Original research article

Preliminary results of teaching first aid to 5–6 year old children – a longitudinal study

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ABSTRACT

Objective: Basic lifesaving activities should be taught in early childhood to develop helping attitude. Our goal was to teach up-to-date theoretical and practical basic first aid using the method of play for kindergarten children.

Methods: 51 children visiting kindergarten in two areas of Hungary were involved in the survey, which took place between September and November 2011. The training consisted of two sessions with theoretical and practical games about first aid. As well as the first steps, which concerned how to examine and handle an unconscious patient and how to call an ambulance, the most frequently occurring injuries were also performed in different playful situations. In the third session, children were tested on their skills and a month later they were re-tested. The tests measured the children's problem-solving skills and their basic knowledge about different scenarios requiring first aid. The statistical analysis was made with the SPSS 17.0 software using the Chi-square test and *t*-test.

Results: The maximum point score of the test was 38 points. The average point score of the first test was 16.94 points and the second resulted in higher scores (17.5 points). The difference between the results was significant ($p < 0.05$). The results showed attitudinal differences between boys and girls ($p < 0.05$).

Conclusions: 5 and 6 year old kindergarten children can learn the basic concepts, but fewer children are able to act adequately in complex situations. A playful method of teaching first aid can improve children's knowledge and helping attitude.

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Introduction

Sudden medical emergencies from various causes are among the most common causes of death all over the world. Most of the accidents occur at home and the victims are usually

children [1]. Based on the WHO data [2], 2000 children (under 18 years old) die from accidental injuries worldwide every day. According to the European Association of Injury Prevention and Safety Promotion (EuroSafe) data, around 3000 children die from injury in the European Union (EU) every year, and this number represents 28% of all deaths

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of children between 1 and 14 years old [3]. The data are similar in Hungary [4]. Based on the available sources of the Central Statistical Office (KSH), 1726 home related accidents occurred in Hungary in 2014, and every year around 24000 children are hospitalized because of various injuries, of which about 300 are fatal [5].

Laypersons have a very important role in first aid situations, because they are usually the first to detect the need for immediate help. It is well known that appropriate initial treatment may increase the patient's chances of survival. The chain of survival contains the following elements: early recognition and call for help, early cardiopulmonary resuscitation (CPR) (chest compression and ventilation), early defibrillation, and post-resuscitation care [6]. First aid activities are very often identified only with cardiopulmonary resuscitation, although first aid activities (Life Supporting First Aid, LSFA) should include other aspects of medical emergencies: calling for an ambulance, using an automated external defibrillator (AED), carrying out CPR – Basic Life Support (BLS) steps, controlling external haemorrhage and handling an unconscious patient [7]. Based on the definition of the European Resuscitation Council (ERC) [8], first aid is the provision of helping behaviour and initial care to a person with acute illness or injury. First aid can be initiated by anyone in any situation. Therefore public awareness of life supporting first aid should be given more attention.

Some researches deal with the first aid knowledge of children and their parents. In Egypt, parents with children under the age of 12 were asked about their children's previous accidents and their knowledge related to them [9]. First aid knowledge is influenced by the age of the mothers and on their educational attainment. In a Hungarian study, similar results were found [10]. Unfortunately, plenty of the parents would choose the incorrect treatment for burns (for example putting sour cream on the wound); only a few people knew the correct treatment, which is cooling with cold water [11]. Choking and suffocation are also very common among children (for example during meals, choking on small toys or drowning in water). It is not only first aid that is important, but also accident prevention [12]. In this area, there are international guidelines that provide evidence-based practices [8].

In Hungary, many people cannot apply the appropriate knowledge in the case of an emergency. Overall, the reason for being inadequately prepared may vary: fear, lack of expertise and practice, "do not harm" [13]. A study in Austria [14] showed that people do not help because they are afraid to cause more injuries. Fortunately, more and more ambulance dispatch centres can provide immediate advice to bystanders via the phone, and advise them on what to do first to help the victim. This may also motivate the first responder to use their previous first aid knowledge [15]. Smart-phone based technology for first aid is also available, but further studies are necessary in the future [16]. Another research presented the experiences of first aid courses for lay people [17].

In Shanghai, the level of first aid knowledge among preschool staffs was investigated. It was found that preschool staff had poor knowledge of first aid in the pre-test, but these results increased after the training

[18]. Several studies have tried to teach BLS for young children (with the aim of defining the age when they can easily acquire this knowledge) [6, 19, 20]. Some studies have investigated at what age schoolchildren can provide effective chest compressions. According to the results, it was mainly the 13–14 years old children who were able to perform adequate chest compressions, but the younger children could learn the principles of chest compression too [19, 21]. The Kids Save Lives project is endorsed by the WHO, which recommends cardiopulmonary resuscitation (CPR) education from the age of 12 (or younger) [22].

One of the most recent studies, completed by De Buck et al. [23], reviewed the current scientific databases on integrating first aid knowledge into the primary school curriculum. They highlighted the importance of teaching first in schools and elaborated the evidence-based pathway for the integration of first aid training into school curricula for each age group.

Play has an important role in the development of young children. They can learn and retain new information with creative play [24, 25]. In relation to first aid, we believe that situational play can be useful for learning new skills. Sometimes the difference between the appropriate age to learn the knowledge and skills can be noticed (e.g. younger children who are unable to provide effective chest compressions or ventilation can learn the cognitive parts of BLS as well as older children) [21, 26, 27].

Our aim in this study was to assess the changes and differences in the attitudes and skills of preschool children immediately after, and one month after the first aid training.

Materials and methods

A longitudinal research was designed to measure the effects of first aid training among preschool children. The research took place in two kindergartens in Hungary (Muraszemenye, Letenye) between September and November 2011. One kindergarten was located in a small rural village, while the other was based in a small-sized town. However, big differences in the socio-economic status of the families cannot be detected.

Participants

Our target group consisted of children aged 5–6 years. Due to the young age of the children, consent from the parents was required in order to carry out the study. Having been provided with the goals of the study and related information, all parents approved the involvement of their children by signing the necessary informed consent form. They also were informed about the right to quit the study at any time without further consequences. The consent of the management of the kindergarten was also acquired. Altogether, 51 children ($N = 51$) met the criteria and were allowed to participate in the study.

On the relevant database, a literature search was carried out related to the types of accidents and emergency situations that may typically occur at this age (e.g. wounds,

bites, bleeding nose, choking, and burns/scalds). Finally, based on the literature search, the teaching material was defined to include the following topics: calling an ambulance, taking care of wounds, burns, bleeding, fainting, aspiration/choking.

The age-specific knowledge transfer technique

In addition to defining the limits of knowledge, it is important to use the appropriate “child-language” (avoiding the use of foreign words and terms). At this age, games have an important role in children’s life [24, 25]. Therefore, the decision was made to mostly use situational play, so the children could learn while they played a game. During these fictional situations, one of the children played an injured person and another helped him/her. Various equipment was used during the training: bandages, various artificial wounds, dressings, disinfectant solution, etc.

Study design

The training was completed twice at each location. The training took 30 min the first time. Based on literature data, kindergarten children are able to listen to a given subject for approximately 20–30 min [24, 25]. The length of the education fitted within this limit in every case, and only the repeated practice did not fit into this period. The lecture began with an interactive conversation. This introduction reduced stress and provided information about the previous first aid knowledge. Based on this conversation, it was noted that participants did not have relevant prior knowledge in first aid. Due to this fact it was not considered necessary to perform a statistical analysis between previous knowledge and the knowledge after training. The topics were divided into two parts. The

first topics covered: the appropriate method of calling an ambulance – based on Fig. 1, managing drowning/choking, and handling an unconscious patient. In the second session the following topics were discussed: wounds, bite wounds, burns/scalds, and bleeding nose. At the end of the courses the children were able to perform the skills. Besides the psychomotor skills, attention was also paid to the effective way of teaching (e.g. improving motivation and helping attitude). In order to test the retention of knowledge one week and one month after the training, children were examined on their skills regarding the topics taught by the instructors. The test was carried out in the form of a conversation and play. The children were assessed individually. The situation-plays were completed in pairs (the injured and the helper). The survey included a total of 19 questions and situations. The maximum available point score in the research test was 38 points. The answers were collected and evaluated by the instructors. The evaluation was also based on a self-made scoring system – checklist (Table 1). The same questions and situations were used in both measurements. In the second test, three additional questions were asked: “Did you enjoy the training?” “Have you played similar situational games after the first aid training in the kindergarten?” “Have you talked to your parents about the first aid training?”

Ethical considerations

As this survey evaluated a first aid teaching programme, it did not fall within the mandate of the research ethics committees in Hungary. Therefore no approval was needed according to Hungarian law and regulations. The participants, their parents, and teachers received written and oral information prior to the commencement of the study. They were informed of their right to withdraw from

Fig. 1 – Illustration for the first aid training for preschool children: How to call the ambulance? (“SEGÍTSÉG” = “HELP”; “104” = the emergency call number in Hungary)

Table 1 – The checklist in the measurements

	0 point	1 point	2 points
Theoretical			
Correct emergency phone number	Incorrect	–	104 or 112 (in Hungary)
Proactive factors for help	Incorrect	One correct	Two or more correct
What can cause choking?	Incorrect	One correct	Two or more correct
What can cause wounds?	Incorrect	One correct	Two or more correct
What is the aim of disinfection?	Incorrect	One correct	Two or more correct
Risk of bite wounds?	Incorrect	–	High infection risk
What can cause bleeding?	Incorrect	One correct	Two or more correct
What can cause burns/scalds?	Incorrect	One correct	Two or more correct
Degrees of burn	Incorrect	–	Four degrees
Examples for degrees of burn	Incorrect	Three or less examples	Four correct examples
What is 1%? (burn)	Incorrect	–	Patient's palm
Risk of spinal injury?	Incorrect	–	Paralysis
Situations			
Call the ambulance (according to Fig. 1)	Incorrect order	Partly correct order	Correct order
Call the ambulance (with phone)	Incorrect order	Partly correct order	Correct order
Foreign body in airways	Incorrect	Shout for help	Shout for help + five beats, five Heimlich manoeuvre
Fainting	Incorrect	Shout for help	Shout for help + lying position and raise the lower extremities
Wound management	Incorrect	Shout for help	Shout for help + disinfection and wound bandage
Nose bleeding	Incorrect	Shout for help	Shout for help + sitting position and head forward
Burn/scald	Incorrect	Shout for help	Shout for help + cooling with cold water and bandage

the study at any time with no personal consequences. The children's parents gave written informed consent before their child entered the study.

Statistical analysis

Statistical analysis was completed with SPSS 17.0 (Statistics Package for Social Sciences, Chicago, IL, USA) statistical software. It was made using descriptive statistics, Chi-square-tests, ANOVA, one and two sample *t*-test. The $p < 0.05$ was taken as being significant.

Results

A total of 51 kindergarten children (5–6 years old) participated in the study ($N = 51$), 26 girls (50.9%) and 25 boys (49.1%). 28 children (54.9%) attended an urban kindergarten and 23 children (45.1%) attended a rural kindergarten (Table 2).

During the first examination, the average point score reached 16.94. The worst performing child scored 0 points, and the best scored 33 points (of a total of 38 points). Looking at the geographical origin (urban vs. non-urban) of the children, the highest average points were scored by children from an urban background (18.64 points), while the other kindergarten children scored 14.87 points. According to the results there was a difference between the two groups, but based on the *t*-test the difference was revealed to be not significant ($p = 0.110$) (Table 3).

During the second examination the average points scored were 17.45. The worst performing child scored 0 points, and the best performing child scored 36 points. The average point score of the urban kindergarten children reached 16.36, while the other kindergarten children scored 18.78 points. There was not a significant difference

Table 2 – The main socio-demographic variables of the children ($N = 51$)

	Number ($N = 51$)	%
Gender		
Girls	26	50.9
Boys	25	49.1
Location		
Urban	28	54.9
Rural	23	45.1
Highest educational attainment of parents ($n = 102$)		
Primary school	36	35.2
Secondary school	23	22.5
High school	33	32.4
College/university	10	9.9
The child talked about the education at home		
Yes	47	92.1
No	4	7.9
The children played first aid situations in the kindergarten after the first exam		
Yes	41	80.3
No	10	19.7

between the location and the completed scores ($p = 0.360$). In the second survey the children performed better (the score increased from 16.94 to 17.45). The difference between the first and second examination was significant based on the *t*-test ($p < 0.01$) (Table 3).

Due to the lack of prior knowledge it was not considered necessary to perform statistical analysis between previous knowledge and the knowledge after training.

The average point score of the girls in the first survey was 19.42. The boys performed worse, their average points score was 14.36. In the second survey, the results were

Table 3 – Presentation of the differences between the result of the first and second measurements (full scores, gender, location) (N = 51)

	Number	%	Average points	p-value
1st test	51	100	16.94	<0.01
2nd test	51	100	17.45	
1st test (boys)	25	50.9	19.42	0.029
1st test (girls)	26	49.1	14.36	
2nd test (boys)	25	50.9	17.72	0.842
2nd test (girls)	26	49.1	17.19	
1st test (urban)	28	54.9	18.64	0.110
1st test (village)	23	45.1	14.87	
2nd test (urban)	28	54.9	16.36	0.360
2nd test (village)	23	45.1	18.78	

similar with regard to gender: girls scored 17.19 points and boys scored 17.72 points. The gender difference was significant in the first case ($p = 0.029$) (Table 3), but in the second test there was no significant difference between the boys and girls ($p = 0.842$).

Considering the questions separately, in the first test the most correct answers were given related to possible causes of wounds (76.5% of participants). Most wrong answers were given in the first test related to the degrees of burn (5.9% of participants). Results of the second test were similar: 71.5% and 13.5%.

Answers to additional questions (“Did you enjoy the education?”, “Have you played similar situational games in the kindergarten?”, “Have you talked to your parents about the education?”) were positive. Based on conversations with children, kindergarten teachers and parents of the participants played first aid situations in small groups in kindergarten and at home after the training.

Discussion

The experiences we acquired during our test showed that first aid can be successfully taught to young children. Many other studies prove that teaching in younger age can be useful [26–28], but only a few deal with the first aid training for preschool children [29]. In Austria, six and seven year old children were able to learn and use first aid activities, for example, call an ambulance, CPR, AED, recovery position, minimise bleeding and burns [26]. In our study, 45.1% of the children managed burns adequately, and in the previous investigation this number was 58.7%. Bollig et al. [28, 29], used the same method to teach basic lifesaving activities to 4–5 and 6–7 years old children, and this method was successful – the children scored better after the training. We did not include the BLS in the education, because children of this age are not mature enough to learn the theoretical and practical parts of basic life support [6]. Similar to the Italian research [26], we also talked about bleeding noses and other frequently occurring injury types. In our study it was found that in the first measurement, 31.4% of kindergarten children could manage properly the epistaxis, and in the second measurement 25.5%. The answers to the question “Would

you help an injured man?” were positive in most cases (94.5%). Most of the previous studies performed in primary schools (8–11 years old children) suggested that 6–7 years old (or younger) children cannot be taught first aid [26, 27]. Based on another study [29], the results showed, similar to our study, that it is possible to teach first aid to kindergarten children. The main outcome of this can be the development of helping aptitude.

Our results show that the children in the first test scored 16.94 points and that their retention of knowledge was better one month later (17.45 points). The children scored better one month after the training and the difference was significant ($p < 0.01$). This may be explained by children becoming interested in this topic, motivating them to deepen their knowledge with exercise between the two examinations. The difference between boys and girls may be explained by differences in the ways of thinking. In our opinion, the children are able to learn the basic concepts of first aid (e.g. the reasons for wounds), but complex situations are complicated for them (organisation of care, difficult questions such as different degrees of burn).

Limitations

The study covers only a small number of children ($N = 51$) and therefore it might not be representative for the whole population of kindergarten children in Hungary. We repeated the test after one month, but we do not know the effects of the training after a longer time. We did not make a formal pre-test about the children’s basic knowledge before the examination, and it was only carried out in an informal conversation about the training topics. Despite these limitations the results from our study are promising.

Conclusion

Our research showed that kindergarten children are able to learn first aid. First aid knowledge acquired by preschool children can provide a good basis for the future. Since 2011, we have organised similar successful trainings for preschool children in different Hungarian kindergartens to spread first aid knowledge and skills to young children.

In accordance with our original aims, during this study we gathered experiences we may use for further training in the future. Further trainings (involving other topics) are recommended to collect more information about the knowledge and skill retention of this age group, and then we will be able to develop the appropriate first aid curricula.

Conflict of interests

The authors declare no conflict of interests regarding this article.

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