Awareness and willingness to perform CPR a survey amongst Flemish schoolchildren teachers and principals.

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Promotor 2: Dr. N. Mpotos

Masterproef voorgedragen in de master in de specialistische geneeskunde Urgentiegeneeskunde
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Awareness and willingness to perform CPR: a survey amongst Flemish schoolchildren, teachers and principals

Lieven De Smedt, Catheline Depuydt, Eva Vekeman, Peter De Paepe, Koenraad G. Monsieurs, Martin Valcke and Nicolas Mpotos

Faculty of Medicine and Health Sciences, Ghent University, Ghent, Belgium
Emergency Department, St. Lucas General Hospital, Ghent, Belgium;
Department of Educational Studies, Ghent University, Ghent, Belgium
Emergency Department, Antwerp University Hospital, Edegem, Belgium
Faculty of Medicine and Health Sciences, University of Antwerp, Wilrijk, Belgium

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Abstract

Objectives: Training children in cardiopulmonary resuscitation (CPR) is one of the strategies to increase bystander CPR in society. Reinforcing knowledge and awareness and increasing willingness to perform bystander CPR contributes to a better outcome after cardiac arrest. We questioned schoolchildren, teachers and principals about their awareness of the importance of CPR and about their willingness to perform CPR.

Methods: During a four-month period, Flemish schoolchildren aged 10–18 years, teachers and principals were invited to complete a survey consisting of three parts: (1) demographics, (2) CPR (training) experience and (3) attitude towards CPR teaching and training.

Result: In total, 390 schoolchildren, 439 teachers and 100 principals completed the survey. Previous CPR training was reported by 33% of the schoolchildren (in 82% as part of the curriculum) and by 81% teachers and 82% principals. Willingness to participate in CPR training was 77% in schoolchildren, 79% in teachers and 86% in principals with 88% of the principals convinced that schoolchildren should learn how to perform CPR. Willingness to perform CPR in a real-life situation was 68% in schoolchildren, 84% in teachers and 92% in principals.

Conclusion: Schoolchildren are well aware of the importance of CPR and are willing to acquire the related knowledge and skills. Noteworthy is the larger awareness among principals and teachers, establishing a strong base for increasing implementation of CPR training in schools. However, a majority of children indicated a lack of training opportunities, highlighting the need for a stronger implementation.
Introduction

In Europe, annually nearly 300,000 people suffer an out-of-hospital cardiac arrest (OHCA) with an average survival rate of about 10%, and even less with favourable neurological outcomes [1–3].

Bystander cardiopulmonary resuscitation (CPR) is an important part of the chain of survival [4,5] and contributes to better outcome after OHCA [6,7]. There is clear evidence that training of lay people improves survival [8,9]; however, implementing CPR training requires changes in the society [10]. This was observed when implementing CPR training in the school curriculum in a number of countries [11,12]. A Danish study found a significant increase in bystander CPR rate for OHCA, but only after mass education combined with a focused media campaign [13,14].

As recognised in the World Health Organisation statement ‘Kids save lives’, training children seems a promising strategy to attain an entire population capable of performing CPR [15]. Educating schoolchildren is one of the most important steps in boosting bystander CPR [10]. This was already advocated by the American Heart Association in 2011, and will in time hopefully increase the rate of bystander CPR and ultimately improve survival [16]. One of the key elements in the 2015 European Resuscitation Council (ERC) guidelines is that CPR training interventions must be based on the willingness to be trained and to start CPR [17].

Several studies showed that children from the age of 10 years old are both willing and capable to learn CPR [18–22]. Baldi and colleagues even stated that CPR knowledge retention is stronger in children as compared to adults [23]. With regard to the training of children, it is not only important to take the physical aspects resulting in good quality CPR into consideration, but also to acknowledge and understand children’s perceptions and willingness with regard to CPR training and performance. Both are strong intrinsic motivators and key factors to lifelong mastery of CPR skills [24,25].

Therefore, the present study aims at exploring the current awareness about CPR importance and the willingness to perform CPR in Flemish schoolchildren. As teachers and principals are key figures in transferring knowledge and training schoolchildren, their opinion was explored as well.
Methods

The study involved schoolchildren of 10 to 18 years old, teachers and principals. They were asked to voluntarily complete an online survey. Data collection lasted from March till June 2015. During this period, a noncommittal survey was sent to all primary (n = 2424) and secondary schools (n = 945) in Flanders with full support of the Flemish Ministry of Education. An accompanying letter to the schools and parents explained the importance of CPR in general and of the implementation of CPR education and training in the school curriculum. The study was approved by the ethics committee of Ghent University Hospital (reference number B670201525996).

The Flemish educational system is divided in primary (6–12 years old) and secondary education (13–18 years old), both divided into three cycles. Since research evidence shows that acquiring CPR skills is physically feasible from the age of 10 [18], only primary schoolchildren of the last educational cycle (age 10–12) were invited to complete the survey; next to all cycles from secondary education. Three versions of the survey were developed, each adapted to targeted group (respectively, a version for schoolchildren, teachers and principals). Case-based questions were gender neutralised and were analysed separately according to gender. To limit reading-related cognitive load in younger schoolchildren, smileys were added next to text when collecting their responses. A survey administration manual was provided to the schools, taking into account the different survey versions. The online research instrument consisted of four parts: (1) Demographics, (2) CPR knowledge level including questions about an Automated External Defibrillator (AED), (3) Attitudes toward CPR-training and performing CPR and (4) Experience with CPR training and performance of CPR. The survey of teachers and principals comported respectively 5 and 9 additional questions on CPR implementation in their schools. The complete survey can be checked in Appendices 1–3.

The knowledge questions were based on the ERC adult CPR/AED guidelines. An expert panel (Koenraad G. Monsieurs, Martin Valcke, Nicolas Mpotos) reviewed the content and completeness of the survey; correctness and potential interpretation difficulties were checked. The survey was accessible online using an open source Hypertext Preprocessor (PHP) web application (LimeSurvey, version 2.0, Hamburg, Germany). For statistical analysis, data were transferred to SPSS (Statistical Package for the Social Sciences, version 24, IBM Company, USA).
Results
A total of 390 schoolchildren, 439 teachers and 100 principals completed the survey. Figure 1 shows the participant flow for schoolchildren, teachers and principals.

The majority of the participating schoolchildren were in the last cycle of primary school (Figure 2). As there were no statistical gender differences, the results described are the sum for both male as female schoolchildren. Teachers’ average teaching experience was 14 years (SD 11 years). Principals’ experience in the educational field was 24 years (SD 9 years) with a mean of 9 years being a principal. Seventy-four per cent was principal in a primary school.

Knowledge and attitudes towards CPR and AED
Table 1 illustrates that 94% of the children were aware of the contribution of CPR to survival after sudden cardiac arrest. The purpose of an AED was known by 59% but only 37% of children were aware that everyone is allowed to use the AED. Schoolchildren’s willingness to participate in CPR training was 77% and when asked about their peers, 88% of the children were convinced they should be able to perform CPR. Learning CPR with friends (68%) or through an external expert (62%) was preferred, compared to learning through teachers (43%) (Table 2).

Knowledge of teachers and principals about the function of an AED is shown in Table 1. A majority of teachers (79%) and principals (70%) understood the purpose of an AED with respectively 32% and 21% of them reported feeling confident to use it in a cardiac arrest situation. This confidence level rose to respectively 70% and 77% after explaining the automatic guidance and instructions.

If offered free of charge, 80% of the principals would consider placing an AED in school. However, if the cost of the AED had to be school-funded, this percentage dropped to 27%. Principals who already had a school-AED reported it being purchased with school funding (47%), whereas government authorities funded 24%. The main reasons to purchase an AED were being able to help schoolchildren and staff when necessary (77%).

Willingness to perform CPR in a real-life situation
Willingness to perform CPR in a real-life situation by schoolchildren, teachers or principals is illustrated in Table 2. Schoolchildren’s willingness to perform CPR on an unknown man, woman or child was, respectively, 69, 67 and 80%. This percentage was even higher when it concerned a family member (96%) or someone familiar (92%). The reasons for not performing CPR are reported in Table 2. The motivation to perform chest compressions only
was as high as 85% whereas motivation to perform compressions and ventilations was only 42%. If guided by phone CPR, the latter improved to 83%. One-third of the schoolchildren (35%) would use an AED. When explained that they only had to turn on the machine to start automated guidance 82% of the children would use the AED. Reasons for not using an AED were lack of knowledge (65%) and fear of hurting the victim (59%).

Teachers’ and principals’ willingness to start CPR when witnessing a cardiac arrest was 85 and 92%, respectively. Chest compressions would be given by 81 and 89%, respectively, mouth-to-mouth ventilation by 71 and 74%, respectively. In contrast phone guidance did not raise the willingness and teachers’ main reasons not to perform CPR were a lack of knowledge (74%) or fear of doing something wrong (65%).

**Previous bystander CPR experience**

Previous bystander CPR experience is shown in Table 3: up to 18% of the children reported to have witnessed a cardiac arrest, of which 13% also performed CPR (Table 3). The main reasons mentioned to not perform CPR in this real-life situation were a lack of knowledge (36%) and someone else already performing CPR (52%). Twenty-five per cent of teachers and principals reported witnessing a cardiac arrest, with respectively 22% and 20% of them performing both chest compressions and mouth-to-mouth ventilations.

**Previous CPR training experience**

Although 48% of the schoolchildren (187/390) reported participation in a first aid course, only 69% (128/187) reported CPR as part of these courses. Furthermore, only 31% was shown how to use an AED but 89% had learned to call the emergency phone number. Overall only 33% (128/390) reported previous CPR training (Table 3). Most of the CPR courses were attended as part of the school curriculum (82%) and initiated by teachers (51%), a school nurse (18%) or an external expert (42%). In addition, 29% of the schoolchildren participated in an external CPR course in addition to or as their only CPR experience. The main reasons why schoolchildren did not attend a CPR course are listed in Table 3.

Of all teachers and principals, respectively 81% and 82% attended a CPR course in the past of which 51% and 54% of these courses were attended externally and less than two years ago. Sixty-four per cent of the teachers and 62% of the principals were convinced that they could perform CPR sufficiently well and did not feel the need for extra training.

The reasons for not attending CPR training for teachers and principals can be found in Table 3.
Influencing attitudes and tackling barriers for implementation

When asked about CPR courses in their own school, only 36% of the teachers were aware of training sessions given during the past year. For the teachers and principals respectively 35% and 5% was willing to teach CPR, another 25% and 18% was likely to do it, whereas 10% and 52% explicitly opposed to teaching CPR themselves (Table 3). Only 28% of the teachers did not consider themselves capable of explaining and teaching the use of an AED. Reasons mentioned not to implement CPR training were a lack of knowledge (77% and 83%), not enough time (13% and 22%) or lack of resources (17% and 36%).

When asked about digital self-learning alternatives, 74% teachers would support this and 70% thought the school would find the time and resources to support the schoolchildren to participate.

According to the principals, school-based CPR training targeted schoolchildren (94%) as well as teachers (80%). Table 3 shows a lack of time (43%) and tools and materials to facilitate the education (71%) were the main reasons why principals did not yet engage in the training of their teachers. They reported the courses being instructed by teachers (57%) or external experts (78%). When asked to assess the CPR skills of their teachers, 47% of the principals thought only 0 to 10% of the teachers would be able to perform CPR, 15% estimated this between 11 and 20% and another 16% between 21 and 30% (Table 3).

Eighty-eight per cent of the principals were convinced that schoolchildren should learn how to perform CPR. Their opinion about the ideal age to start CPR education is shown in Figure 3. Principals and teachers were willing to spend on average three hours on CPR training annually.

Discussion

In this study, based on a noncommittal survey, we explored schoolchildren’s awareness of the importance of CPR and their willingness to learn and perform CPR. In addition, teachers and principals were also questioned and we investigated their willingness and motivation to implement CPR in the school curriculum.

Willingness and motivation to perform CPR requires awareness of the importance of bystander CPR. Being aware of CPR is necessary to ‘appreciate’ the importance of CPR in cardiac arrest and simplifies its implementation in the society. We found that 94% of the schoolchildren were aware of the benefits of CPR in sudden cardiac arrest. In addition, 89% of the schoolchildren were aware of the non-exclusivity of CPR and knew everyone is allowed to perform CPR. The study also showed that current CPR training provides sufficient
information on how to alert the emergency services. This demonstrates on the one hand that children have a large level of insight on the importance of CPR. On the other hand, with 59% of the schoolchildren knowing the role of an AED and only 37% being aware that everyone is allowed to use an AED, the knowledge about the role and use of an AED remains as limited as 35%. However, after explaining how an AED provides guidance to the user, the confidence level of schoolchildren to use one raised to 82% (Table 2). As defibrillation is a crucial step in the chain of survival there is a real need to better inform and train people about AED use and safety. Ultimately, this will be a contributing factor boosting the use of the AED [17]. Furthermore, this study confirmed previous findings that principals are aware of the importance of bystander CPR and early defibrillation and are willing to put an AED in their school [26]. Together with local authorities supporting the acquisition of AED devices this can contribute to the implementation of a school based AED programme [27].

Willingness to perform CPR is a first step to enhance the chain of survival through bystander CPR. A Norwegian survey in 376 secondary schoolchildren showed a readiness to perform CPR in 83% of the participants [28]. In our study, we found that only 68% was prepared to do so. The young age of participants in our study (half of the participants was between 10 and 12 years old) might explain this difference. When presented with realistic scenarios, the Norwegian study reports a willingness to engage in CPR of 74% in case of a family member and 67% in case of a child. In contrast, our results demonstrate a higher willingness to perform CPR when the victim was a child and especially a family member. Children reported a larger willingness to perform both chest compressions and mouth-to-mouth ventilation (83%) when phone CPR guidance would be available compared to no guidance (42%). Although a lot of phone CPR protocols use chest compression only techniques [17], our findings suggests that schoolchildren would be willing to carry out both chest compressions and ventilations when guided by phone. In teachers and principals willingness to perform CPR was already as high as 73% and not increased by phone guidance.

Already a minimal CPR training is beneficial to stimulate confidence in CPR skills [29] and is a key predictor for future CPR performance [4]. Willingness to perform CPR has been found to improve by previous and frequent training [28,30−32]. Table 2 shows a distinct willingness of the schoolchildren to participate in training as well as the awareness of school principals of the importance to teach CPR to schoolchildren. Half of the school principals (52%) in our study are convinced that the third grade of primary school (thus from 10 years old) is the best age to start learning CPR, this is in line with the literature reporting that the integration of CPR training is feasible from the age of 9–10 years old in a school curriculum context [33].
However, only one-third of the schoolchildren (33%) reported previous CPR training, the majority of these courses nevertheless being provided at school. These findings highlight the considerable gap between the intention to provide and follow – school based – training and the actual implementation or participation to a CPR course.

As illustrated in Table 2, our results confirm that schoolchildren (and in extension teachers and principals) refrain from CPR for several reasons. This partly reiterates the findings in the literature. Aaberg and colleagues reported that the majority of secondary school students was afraid of exacerbating the situation, of worsening the outcome or causing death by intervening as a bystander [34]. Other CPR related fear factors are: contracting an infection [35], being incompetent, causing damage and getting involved in legal matters [36].

Teachers and principals in our study reported that barriers for implementation of CPR training in schools are a lack of resources, a lack of knowledge and curriculum pressure. This is similar to a British survey by Lockey and colleagues [37].

Nevertheless, school principals were more than willing to organise a yearly CPR training, confirming their awareness of the importance of implementing CPR training at school. Public campaigns and further integration of CPR in the school curriculum on a government level could help overcome some of these barriers; especially focusing on the emotional dimensions in these barriers. This could ameliorate the readiness to perform CPR in a real situation and enforce bystander CPR.

Principal limitation of the study is the limited number of schools that participated. This could have prompted participation of only schools interested in CPR and CPR training, resulting in selection bias. Moreover, participants emanated mainly from primary schools what possibly created unilateral responses. Extending the study in the future to a more comprehensive sample of schools can bypass this limitation and confirming our results.

Another limitation is the apparently high drop-out rate as shown in Figure 1, especially in principals. We found an overlap in IP addresses in the drop-outs and in some participants completing the survey with only a minor time difference in drop-out and restarting the survey, suggesting that in these cases for personal or technical reasons a participant did not complete the survey at the first attempt.

Finally, some questions were subject to interpretation as the survey was online completed without the possibility to ask for clarification if the participants doubted something.
Conclusion
Schoolchildren are well aware of the importance of CPR and willing to acquire the related knowledge and skills. More significant is the even larger awareness among principals and teachers, establishing a strong foundation for further implementation of CPR training in schools. However, a majority of children indicated a lack of training opportunities, highlighting the need for better implementation of more adequate training. Further research should explore how to best integrate CPR in the current educational curriculum.

Disclosure statement
No potential conflict of interest was reported by the authors.

References


Figures

Figure 1: Participant flow

3417 primary and secondary schools in Flanders

66 schools

163 schools

108 schools

Started the survey

577 school children

493 school teachers

181 school principals

Completed the survey

187 drop-outs

54 drop-outs

81 drop-outs

390 school children

439 school teachers

100 school principals

Figure 2: Distribution of participants in to educational cycles

<table>
<thead>
<tr>
<th>Educational Cycle</th>
<th>Principals</th>
<th>Teachers</th>
<th>Schoolchildren</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary school</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First grade primary school</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second grade primary school</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Third grade primary school</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary school</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First grade secondary school</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second grade secondary school</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Third grade secondary school</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Percentage
Figure 3: Ideal age to start educating CPR according to school principals (%)
### Tables

#### Table 1: General characteristics, knowledge and attitudes towards CPR

<table>
<thead>
<tr>
<th>Respondents</th>
<th>Children</th>
<th>Teachers</th>
<th>Principals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age (years)</td>
<td>12</td>
<td>39</td>
<td>62</td>
</tr>
<tr>
<td>Mean experience in educational field (years)</td>
<td>N/Q</td>
<td>14</td>
<td>24</td>
</tr>
<tr>
<td>Survival after OHCA is higher when bystander CPR is started (yes/probably yes)</td>
<td>365/390 (94%)</td>
<td>N/Q</td>
<td>N/Q</td>
</tr>
</tbody>
</table>

Would the respondent perform CPR in a real-life situation

<table>
<thead>
<tr>
<th></th>
<th>Children</th>
<th>Teachers</th>
<th>Principals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>151/390 (39%)</td>
<td>183/434 (42%)</td>
<td>29/76 (38%)</td>
</tr>
<tr>
<td>Probably yes</td>
<td>115/390 (29%)</td>
<td>184/434 (42%)</td>
<td>41/76 (54%)</td>
</tr>
<tr>
<td>Probably no</td>
<td>51/390 (13%)</td>
<td>24/434 (6%)</td>
<td>1/76 (1%)</td>
</tr>
<tr>
<td>No</td>
<td>39/390 (10%)</td>
<td>10/434 (2%)</td>
<td>0/76 (0%)</td>
</tr>
<tr>
<td>Don’t know</td>
<td>35/390 (9%)</td>
<td>33/434 (8%)</td>
<td>5/76 (7%)</td>
</tr>
</tbody>
</table>

Only EMS personnel is allowed to perform CPR (yes)

<table>
<thead>
<tr>
<th></th>
<th>Children</th>
<th>Teachers</th>
<th>Principals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>41/390 (11%)</td>
<td>N/Q</td>
<td>N/Q</td>
</tr>
</tbody>
</table>

Confidence level of knowing how to perform CPR (yes/probably)

<table>
<thead>
<tr>
<th></th>
<th>Children</th>
<th>Teachers</th>
<th>Principals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>172/390 (44%)</td>
<td>298/439 (68%)</td>
<td>68/100 (68%)</td>
</tr>
<tr>
<td>Probably yes</td>
<td>275/390 (71%)</td>
<td>312/439 (71%)</td>
<td>80/100 (80%)</td>
</tr>
<tr>
<td>Probably no</td>
<td>25/390 (6%)</td>
<td>22/439 (5%)</td>
<td>2/100 (2%)</td>
</tr>
<tr>
<td>No</td>
<td>4/390 (1%)</td>
<td>3/439 (1%)</td>
<td>0/100 (0%)</td>
</tr>
<tr>
<td>Don’t know</td>
<td>33/390 (8%)</td>
<td>35/439 (8%)</td>
<td>5/100 (5%)</td>
</tr>
</tbody>
</table>

There is an AED present in my institution

<table>
<thead>
<tr>
<th></th>
<th>Children</th>
<th>Teachers</th>
<th>Principals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>76/390 (19%)</td>
<td>122/439 (28%)</td>
<td>17/100 (17%)</td>
</tr>
</tbody>
</table>

The AED was purchased with funding of

<table>
<thead>
<tr>
<th></th>
<th>Children</th>
<th>Teachers</th>
<th>Principals</th>
</tr>
</thead>
<tbody>
<tr>
<td>the school</td>
<td>N/Q</td>
<td>N/Q</td>
<td>8/17 (47%)</td>
</tr>
<tr>
<td>the educational network</td>
<td>N/Q</td>
<td>N/Q</td>
<td>3/17 (18%)</td>
</tr>
<tr>
<td>a non-profit organisation</td>
<td>N/Q</td>
<td>N/Q</td>
<td>1/17 (6%)</td>
</tr>
<tr>
<td>government authorities</td>
<td>N/Q</td>
<td>N/Q</td>
<td>4/17 (23%)</td>
</tr>
</tbody>
</table>

The AED was purchased to

<table>
<thead>
<tr>
<th></th>
<th>Children</th>
<th>Teachers</th>
<th>Principals</th>
</tr>
</thead>
<tbody>
<tr>
<td>help schoolchildren</td>
<td>N/Q</td>
<td>N/Q</td>
<td>13/17 (77%)</td>
</tr>
<tr>
<td>help school personnel</td>
<td>N/Q</td>
<td>N/Q</td>
<td>13/17 (77%)</td>
</tr>
<tr>
<td>help external people</td>
<td>N/Q</td>
<td>N/Q</td>
<td>5/17 (29%)</td>
</tr>
</tbody>
</table>

An AED administers a shock to normalise the heart rhythm

<table>
<thead>
<tr>
<th></th>
<th>Children</th>
<th>Teachers</th>
<th>Principals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>231/390 (59%)</td>
<td>345/438 (79%)</td>
<td>70/100 (70%)</td>
</tr>
<tr>
<td>Probably yes</td>
<td>275/390 (71%)</td>
<td>312/438 (71%)</td>
<td>80/100 (80%)</td>
</tr>
<tr>
<td>Probably no</td>
<td>25/390 (6%)</td>
<td>22/438 (5%)</td>
<td>2/100 (2%)</td>
</tr>
<tr>
<td>No</td>
<td>4/390 (1%)</td>
<td>3/438 (1%)</td>
<td>0/100 (0%)</td>
</tr>
<tr>
<td>Don’t know</td>
<td>33/390 (8%)</td>
<td>35/438 (8%)</td>
<td>5/100 (5%)</td>
</tr>
</tbody>
</table>

Everyone is allowed to use an AED

<table>
<thead>
<tr>
<th></th>
<th>Children</th>
<th>Teachers</th>
<th>Principals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>143/390 (37%)</td>
<td>348/437 (80%)</td>
<td>80/100 (80%)</td>
</tr>
</tbody>
</table>

Reasons why I would like to participate in CPR training

<table>
<thead>
<tr>
<th></th>
<th>Children</th>
<th>Teachers</th>
<th>Principals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowing someone with cardiac disease</td>
<td>36/301 (12%)</td>
<td>21/351 (6%)</td>
<td>4/86 (5%)</td>
</tr>
<tr>
<td>Wanting to be able to save someone’s life</td>
<td>275/301 (91%)</td>
<td>312/351 (89%)</td>
<td>80/86 (93%)</td>
</tr>
<tr>
<td>Other reason</td>
<td>82/301 (27%)</td>
<td>52/351 (15%)</td>
<td>10/86 (12%)</td>
</tr>
</tbody>
</table>

OHCA: out-of-hospital cardiac arrest
CPR: cardiopulmonary resuscitation
EMS: emergency medical services
AED: automated external defibrillator
N/Q: not questioned
Table 2: Willingness to participate in CPR training and to perform CPR in a real-life situation

<table>
<thead>
<tr>
<th>Respondents</th>
<th>Children</th>
<th>Teachers</th>
<th>Principals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Willing to perform CPR on</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>An unknown man</td>
<td>270/390 (69%)</td>
<td>N/Q</td>
<td>N/Q</td>
</tr>
<tr>
<td>An unknown woman</td>
<td>263/390 (67%)</td>
<td>N/Q</td>
<td>N/Q</td>
</tr>
<tr>
<td>An unknown child</td>
<td>313/390 (80%)</td>
<td>N/Q</td>
<td>N/Q</td>
</tr>
<tr>
<td>A family member</td>
<td>375/390 (96%)</td>
<td>N/Q</td>
<td>N/Q</td>
</tr>
<tr>
<td>Someone familiar (class member, friend)</td>
<td>360/390 (92%)</td>
<td>N/Q</td>
<td>N/Q</td>
</tr>
<tr>
<td>Willing to start CPR when witnessing cardiac arrest.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N/Q</td>
<td>368/433 (85%)</td>
<td>92/100 (92%)</td>
</tr>
<tr>
<td>Willing to perform CPR and do</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chest compressions</td>
<td>333/390 (85%)</td>
<td>351/433 (81%)</td>
<td>89/100 (89%)</td>
</tr>
<tr>
<td>Mouth-to-mouth ventilation</td>
<td>148/390 (38%)</td>
<td>307/433 (71%)</td>
<td>74/100 (74%)</td>
</tr>
<tr>
<td>Chest compressions and mouth-to-mouth ventilation</td>
<td>162/390 (42%)</td>
<td>316/433 (73%)</td>
<td>73/100 (73%)</td>
</tr>
<tr>
<td>Chest compressions and mouth-to-mouth ventilation guided by phone</td>
<td>324/390 (83%)</td>
<td>307/433 (71%)</td>
<td>68/100 (68%)</td>
</tr>
<tr>
<td>Reasons not to perform CPR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lacking knowledge</td>
<td>22/62 (36%)</td>
<td>32/43 (74%)</td>
<td>1/1 (100%)</td>
</tr>
<tr>
<td>Fear of doing something wrong</td>
<td>14/62 (23%)</td>
<td>28/43 (65%)</td>
<td>0/1 (0%)</td>
</tr>
<tr>
<td>Fear of transmissible diseases</td>
<td>1/62 (2%)</td>
<td>0/43 (0%)</td>
<td>0/1 (0%)</td>
</tr>
<tr>
<td>The victim had vomited</td>
<td>1/62 (2%)</td>
<td>0/43 (0%)</td>
<td>0/1 (0%)</td>
</tr>
<tr>
<td>Other reason</td>
<td>15/62 (24%)</td>
<td>4/43 (9%)</td>
<td>0/1 (0%)</td>
</tr>
<tr>
<td>Willing to perform CPR and use an AED</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before explaining the automatic guidance and instructions</td>
<td>135/390 (35%)</td>
<td>140/437 (32%)</td>
<td>21/100 (21%)</td>
</tr>
<tr>
<td>After explaining the automatic guidance and instructions</td>
<td>320/390 (82%)</td>
<td>304/437 (70%)</td>
<td>77/100 (77%)</td>
</tr>
<tr>
<td>Reasons not to use an AED</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lacking knowledge</td>
<td>22/34 (65%)</td>
<td>5/5 (100%)</td>
<td>0/107 (0%)</td>
</tr>
<tr>
<td>Fear of harming the victim</td>
<td>20/34 (59%)</td>
<td>2/5 (40%)</td>
<td>0/107 (0%)</td>
</tr>
<tr>
<td>Other reason</td>
<td>5/34 (15%)</td>
<td>1/5 (20%)</td>
<td>0/107 (0%)</td>
</tr>
<tr>
<td>I want to participate in CPR training (more often)</td>
<td>301/390 (77%)</td>
<td>347/439 (79%)</td>
<td>86/100 (86%)</td>
</tr>
<tr>
<td>I want to participate in CPR training at school</td>
<td>271/390 (70%)</td>
<td>N/Q</td>
<td>N/Q</td>
</tr>
<tr>
<td>I want to learn CPR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>By myself</td>
<td>60/390 (15%)</td>
<td>N/Q</td>
<td>N/Q</td>
</tr>
<tr>
<td>With friends</td>
<td>265/390 (68%)</td>
<td>N/Q</td>
<td>N/Q</td>
</tr>
<tr>
<td>By book</td>
<td>53/390 (14%)</td>
<td>N/Q</td>
<td>N/Q</td>
</tr>
<tr>
<td>Through my teacher</td>
<td>169/390 (43%)</td>
<td>N/Q</td>
<td>N/Q</td>
</tr>
<tr>
<td>Through an external expert</td>
<td>240/390 (62%)</td>
<td>N/Q</td>
<td>N/Q</td>
</tr>
<tr>
<td>By computer</td>
<td>61/390 (16%)</td>
<td>N/Q</td>
<td>N/Q</td>
</tr>
<tr>
<td>I think all children of my class should be able to perform CPR</td>
<td>342/390 (88%)</td>
<td>N/Q</td>
<td>N/Q</td>
</tr>
</tbody>
</table>

CPR: cardiopulmonary resuscitation
AED: automated external defibrillator
N/Q: not questioned
<table>
<thead>
<tr>
<th>Respondents</th>
<th>Children</th>
<th>Teachers</th>
<th>Principals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Witness of sudden cardiac death (yes)</td>
<td>71/390 (18%)</td>
<td>95/369 (25%)</td>
<td>25/100 (25%)</td>
</tr>
<tr>
<td>Respondent did perform CPR in a real OHCA setting after witnessing a sudden cardiac death (SCD)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chest compressions</td>
<td>7/71 (10%)</td>
<td>8/95 (8%)</td>
<td>4/25 (16%)</td>
</tr>
<tr>
<td>Chest compression and mouth-to-mouth ventilation</td>
<td>2/71 (3%)</td>
<td>21/95 (22%)</td>
<td>5/25 (20%)</td>
</tr>
<tr>
<td>Reasons the respondent did not perform CPR in a OHCA setting after witnessing a SCD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Someone else already did</td>
<td>32/62 (52%)</td>
<td>N/Q</td>
<td>N/Q</td>
</tr>
<tr>
<td>Lacking knowledge</td>
<td>22/62 (36%)</td>
<td>N/Q</td>
<td>N/Q</td>
</tr>
<tr>
<td>Fear of harming the victim</td>
<td>14/62 (23%)</td>
<td>N/Q</td>
<td>N/Q</td>
</tr>
<tr>
<td>The victim had vomited</td>
<td>1/62 (2%)</td>
<td>N/Q</td>
<td>N/Q</td>
</tr>
<tr>
<td>Fear of transmissible diseases</td>
<td>1/62 (2%)</td>
<td>N/Q</td>
<td>N/Q</td>
</tr>
<tr>
<td>Other reasons</td>
<td>15/62 (24%)</td>
<td>N/Q</td>
<td>N/Q</td>
</tr>
<tr>
<td>Previous first aid course (yes)</td>
<td>187/390 (48%)</td>
<td>222/439 (51%)</td>
<td>49/100 (49%)</td>
</tr>
<tr>
<td>The first aid course covered</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wounds, burn wounds</td>
<td>163/187 (87%)</td>
<td>278/439 (63%)</td>
<td>40/49 (82%)</td>
</tr>
<tr>
<td>To recognise an emergency situation</td>
<td>144/187 (77%)</td>
<td>269/439 (61%)</td>
<td>42/49 (86%)</td>
</tr>
<tr>
<td>Calling 112/ the emergency telephone number</td>
<td>166/187 (89%)</td>
<td>324/439 (74%)</td>
<td>41/49 (84%)</td>
</tr>
<tr>
<td>CPR</td>
<td>128/187 (69%)</td>
<td>182/439 (42%)</td>
<td>34/49 (69%)</td>
</tr>
<tr>
<td>Explanation how to use an AED</td>
<td>58/187 (31%)</td>
<td>N/Q</td>
<td>N/Q</td>
</tr>
<tr>
<td>Previous CPR training (yes)</td>
<td>128/390 (33%)</td>
<td>357/439 (81%)</td>
<td>82/100 (82%)</td>
</tr>
<tr>
<td>As part of the school curriculum</td>
<td>105/128 (82%)</td>
<td>103/357 (29%)</td>
<td>25/82 (31%)</td>
</tr>
<tr>
<td>Externally</td>
<td>37/128 (29%)</td>
<td>183/357 (51%)</td>
<td>44/82 (54%)</td>
</tr>
<tr>
<td>When did you follow a CPR training?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-6 months ago</td>
<td>70/128 (55%)</td>
<td>82/369 (22%)</td>
<td>22/88 (25%)</td>
</tr>
<tr>
<td>6-12 months ago</td>
<td>10/128 (8%)</td>
<td>38/369 (10%)</td>
<td>6/88 (7%)</td>
</tr>
<tr>
<td>12-24 months ago</td>
<td>23/128 (18%)</td>
<td>62/369 (17%)</td>
<td>15/88 (17%)</td>
</tr>
<tr>
<td>&gt;24 months ago</td>
<td>16/128 (13%)</td>
<td>187/369 (51%)</td>
<td>45/88 (51%)</td>
</tr>
<tr>
<td>Reasons why I never participated in a previous CPR course</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never been introduced to a course</td>
<td>30/48 (63%)</td>
<td>53/84 (63%)</td>
<td>11/19 (58%)</td>
</tr>
<tr>
<td>Not knowing the purpose of a course</td>
<td>148 (2%)</td>
<td>12/84 (14%)</td>
<td>8/19 (42%)</td>
</tr>
<tr>
<td>Not enough time</td>
<td>8/48 (17%)</td>
<td>4/84 (5%)</td>
<td>1/19 (5%)</td>
</tr>
<tr>
<td>Too expensive</td>
<td>2/48 (4%)</td>
<td>16/84 (19%)</td>
<td>2/19 (11%)</td>
</tr>
<tr>
<td>Not knowing where to follow a course</td>
<td>23/48 (48%)</td>
<td>17/84 (20%)</td>
<td>3/19 (16%)</td>
</tr>
<tr>
<td>Other reason</td>
<td>16/48 (33%)</td>
<td>0/84 (0%)</td>
<td>0/19 (0%)</td>
</tr>
<tr>
<td>CPR training at school was initiated by</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A teacher</td>
<td>77/152 (51%)</td>
<td>296/439 (67%)</td>
<td>28/49 (57%)</td>
</tr>
<tr>
<td>Someone of the school board</td>
<td>2/152 (1%)</td>
<td>3/439 (1%)</td>
<td>1/49 (2%)</td>
</tr>
<tr>
<td>A school nurse</td>
<td>2/71 (18%)</td>
<td>31/439 (7%)</td>
<td>5/49 (10%)</td>
</tr>
<tr>
<td>Someone else working at school</td>
<td>8/152 (5%)</td>
<td>47/439 (11%)</td>
<td>3/49 (6%)</td>
</tr>
<tr>
<td>An external expert</td>
<td>63/152 (42%)</td>
<td>147/439 (34%)</td>
<td>38/49 (78%)</td>
</tr>
<tr>
<td>Willing to teach CPR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>N/Q</td>
<td>154/439 (35%)</td>
<td>5/100 (5%)</td>
</tr>
<tr>
<td>Probably yes</td>
<td>N/Q</td>
<td>111/439 (25%)</td>
<td>18/100 (18%)</td>
</tr>
<tr>
<td>Probably no</td>
<td>N/Q</td>
<td>89/439 (20%)</td>
<td>21/100 (21%)</td>
</tr>
<tr>
<td>No</td>
<td>N/Q</td>
<td>44/439 (10%)</td>
<td>52/100 (52%)</td>
</tr>
<tr>
<td>I don’t know</td>
<td>N/Q</td>
<td>40/439 (9%)</td>
<td>4/100 (4%)</td>
</tr>
<tr>
<td>Reasons not to teach CPR themselves</td>
<td></td>
<td>103/133 (77%)</td>
<td>63/76 (83%)</td>
</tr>
<tr>
<td>-----------------------------------------------------------</td>
<td>-------</td>
<td>--------------</td>
<td>------------</td>
</tr>
<tr>
<td>Lacking knowledge</td>
<td>N/Q</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not enough time</td>
<td>N/Q</td>
<td>17/133 (13%)</td>
<td>17/76 (22%)</td>
</tr>
<tr>
<td>Lack of resources</td>
<td>N/Q</td>
<td>23/133 (17%)</td>
<td>27/76 (36%)</td>
</tr>
<tr>
<td>Other reason</td>
<td>N/Q</td>
<td>21/133 (16%)</td>
<td>5/76 (7%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>School-based CPR training targeted</th>
<th></th>
<th>32/34 (94%)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Schoolchildren</td>
<td>N/Q</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teachers</td>
<td>N/Q</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other school personnel</td>
<td>N/Q</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Principals’ reasons not to facilitate CPR education of the schoolchildren</th>
<th></th>
<th>32/34 (94%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of funding</td>
<td>N/Q</td>
<td>0/7 (0%)</td>
</tr>
<tr>
<td>Lacking skilled personnel to teach</td>
<td>N/Q</td>
<td>0/7 (0%)</td>
</tr>
<tr>
<td>Lack of time</td>
<td>N/Q</td>
<td>3/7 (43%)</td>
</tr>
<tr>
<td>Lack of tools and materials</td>
<td>N/Q</td>
<td>5/7 (71%)</td>
</tr>
<tr>
<td>Other reason</td>
<td>N/Q</td>
<td>3/3 (43%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Estimation of teachers’ ability to perform CPR</th>
<th></th>
<th>47/100 (47%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10%</td>
<td>N/Q</td>
<td>47/100 (47%)</td>
</tr>
<tr>
<td>11-20%</td>
<td>N/Q</td>
<td>15/100 (15%)</td>
</tr>
<tr>
<td>21-30%</td>
<td>N/Q</td>
<td>16/100 (16%)</td>
</tr>
<tr>
<td>31-40%</td>
<td>N/Q</td>
<td>8/100 (8%)</td>
</tr>
<tr>
<td>41-50%</td>
<td>N/Q</td>
<td>2/100 (2%)</td>
</tr>
<tr>
<td>51-60%</td>
<td>N/Q</td>
<td>1/100 (1%)</td>
</tr>
<tr>
<td>61-70%</td>
<td>N/Q</td>
<td>3/100 (3%)</td>
</tr>
<tr>
<td>71-80%</td>
<td>N/Q</td>
<td>3/100 (3%)</td>
</tr>
<tr>
<td>81-90%</td>
<td>N/Q</td>
<td>4/100 (4%)</td>
</tr>
</tbody>
</table>

CPR: cardiopulmonary resuscitation  
OHCA: out-of-hospital cardiac arrest  
N/Q: not questioned
Reference

Published online
6 juni 2018

Awareness and willingness to perform CPR: a survey amongst Flemish schoolchildren, teachers and principals

Lieven De Smedt, Catheline Depuydt, Eva Vekeman, Peter De Paepe, Koenraad G. Monsieurs, Martin Valcke & Nicolas Mpotos

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Nederlandse samenvatting

Bewustzijn van het belang van CPR en bereidheid CPR te verichten: een Vlaamse bevraging bij schoolkinderen, leerkrachten en directie.

Inleiding
Cardiopulmonaire reanimatie (CPR) door omstaanders is een essentieel onderdeel van de keten van overleven en verbetert de uitkomst na reanimatie buiten het ziekenhuis. De World Health Organisation erkent dat het trainen van kinderen een veelbelovende strategie is om de bevolking in staat te stellen CPR uit te voeren.

Kinderen onderwijzen is een van de belangrijkste stappen om de frequentie van CPR door omstaanders te verhogen. Met betrekking tot dit onderwijs, is het niet alleen belangrijk fysische aspecten van kinderen te beschouwen maar ook perceptie en bereidheid tot het uitvoeren van CPR in rekening te brengen. Deze studie probeerde het huidig bewustzijn van het belang van CPR bij schoolkinderen en de bereidheid van deze kinderen tot het uitvoeren van CPR in kaart te brengen.

Methoden
In deze studie werden kinderen van 10 tot 18 jaar oud, leerkrachten en directie gevraagd een anonieme online vragenlijst in te vullen. Deze vragenlijst werd naar alle scholen van het basisonderwijs en secundair onderwijs gestuurd (ondersteund door het ministerie van onderwijs van de Vlaamse overheid) en was aangepast aan de doelgroep met een versie voor respectievelijk kinderen, leerkrachten en directie. Gegevens werden verzameld van maart tot en met juni 2015. De studie werd goedgekeurd door het ethisch comité van het UZ Gent. Kennisvragen waren gebaseerd op de richtlijnen van de Europese Reanimatieraad (ERC) en gevalideerd door een panel van experts.

Resultaten
In totaal werd de vragenlijst door 390 kinderen, 439 leerkrachten en 100 directeurs vervolledigd.

Vooreerst werden de algemene karakteristieken van de deelnemers evenals de kennis en de houding ten opzichte van CPR beschreven. Zo bleek 94% van de kinderen zich bewust van het feit dat CPR bijdraagt tot overleven na een plotse hartstilstand. Daarnaast was het doel van een automatische externe defibrillator (AED) bij 59% van de kinderen bekend. Slechts 37% wist echter dat iedereen een AED mag bedienen.
Vervolgens werden de resultaten beschreven met betrekking tot de bereidheid om deel te nemen aan CPR training en de bereidheid CPR uit te voeren in realiteit. Zevenentwintig procent van de kinderen gaf aan bereid te zijn om deel te nemen aan CPR training. Bereidheid bij kinderen om CPR in realiteit te starten bij een onbekende man, vrouw of kind was respectievelijk 69%, 67% en 80%. Deze percentages stegen bovendien wanneer het slachtoffer een familielid of iemand bekend betrof naar respectievelijk 69% en 92%

Daarnaast werden de resultaten van de bevraging over ervaring met CPR door omstaanders besproken: 18% van de kinderen gaf aan getuige geweest te zijn van een hartstilstand. Hiervan rapporteerde 13% CPR uitgevoerd te hebben. Eerdere ervaring met CPR training werd eveneens weergegeven. Ongeveer 48% van de kinderen gaf aan reeds geparticipeerd te hebben aan een les “eerste hulp”. Van deze lessen omvatte 69% ook een deel over CPR. Slechts 31% had in deze lessen ook geleerd hoe ze een AED moesten gebruiken.

Tot slot gaf 88% van de directie aan overtuigd te zijn dat kinderen onderwezen dienen te worden in het uitvoeren van CPR. Zowel directie als leerkrachten waren bereid hiervoor gemiddeld drie uur per jaar uit te trekken.

Discussie

Bereidheid en motivatie om CPR uit te voeren wordt deels beïnvloed door het zich bewust zijn van het belang van CPR door omstaanders. Dit besef vergemakkelijkt de implementatie van CPR door omstaanders in de maatschappij. Deze studie toonde enerzijds dat kinderen een duidelijk inzicht hebben in het belang van CPR. Anderzijds bleek slechts 35% van hen de rol en het belang van een AED te kennen. Gezien defibrillatie een cruciale stap is in de keten van overleving, lijkt het nodig kinderen en volwassenen beter te informeren over het gebruik en de veiligheid van een AED.

Bereidheid CPR uit te voeren verhoogt de frequentie van CPR door omstaanders en is een eerste stap om de keten van overleving te verbeteren. Indien telefonisch begeleid, waren kinderen vaker bereid CPR uit te voeren.

Onze resultaten komen overeen met voorgaande studies, die aantonen dat ook een minimale CPR training het uitvoeren van CPR als omstaander doet toenemen. Onze studie vond een duidelijke bereidheid bij kinderen om deel te nemen aan CPR training. Uit de resultaten komt eveneens naar voor dat leerkrachten en directeuren het belang van CPR onderwijs beseffen. Desondanks gaf slechts 33% van de kinderen aan in het verleden deel te hebben genomen aan CPR training. Deze bevindingen illustreren de discrepantie tussen de intentie om CPR training te voorzien of er aan deel te nemen, en de eigenlijke implementatie of deelname aan CPR
training. De voornaamste drempels om CPR training te implementeren op school zijn een gebrek aan middelen, kennis en tijd in het curriculum. Deze vaststellingen komen overeen met voorgaande studies. Overheidscampagnes en integratie van CPR in het leerplan, kunnen mogelijk helpen deze barrières te overwinnen en de frequentie van CPR door omstaanders bevorderen.

Deze studie vertoonde ook enkele beperkingen. Zo participeerde slechts een beperkt aantal scholen en waren het vooral deelnemers van het basisonderwijs die de vragenlijst invulden. Tot slot waren enkele vragen ook voor interpretatie vatbaar.

**Conclusie**

Kinderen zijn zich bewust van het belang van CPR en zijn bereid de nodige kennis en vaardigheden op te doen. Nog belangrijker is het duidelijke besef bij leerkrachten en directie dat CPR training de hoeksteen vormt voor verdere uitbouw van CPR door omstaanders. Het merendeel van de kinderen gaf aan dat er op heden nog een tekort is aan trainingsmogelijkheden en benadrukt zo de nood aan verbeterde implementatie van adequate training. Verder onderzoek naar deze implementatie in het huidige curriculum lijkt dan ook noodzakelijk.
Appendix A: Schoolchildren’s questionnaire

1. What is the number of your educational institution?
2. What is your Zip code?
3. Are you a boy or a girl?
   a. A boy.
   b. A girl.
4. How old are you?
   a. 7
   b. 8
   c. 9
   d. 10
   e. 11
   f. 12
   g. 13
   h. 14
   i. 15
   j. 16
   k. 17
   l. 18
   m. 19
   n. 20
5. In which educational cycle are you?
   a. 3rd year of primary school
   b. 4th year of primary school
   c. 5th year of primary school
   d. 6th year of primary school
   e. 1st year of high school
   f. 2nd year of high school
   g. 3rd year of high school
   h. 4th year of high school
   i. 5th year of high school
   j. 6th year of high school
   k. 7th year of high school
6. What is your type of education
   a. Mainstream primary education
   b. Special primary education
   c. General secondary education
   d. Technical secondary education
   e. Vocational secondary education
   f. Artistic secondary education
   g. Special secondary education

You are walking in the street. Suddenly you see a woman/man falling on the ground. She/he is feeling not well. Out of the blue she does not respond anymore. People are gathering. Lin/Lau tries to wake the woman/man but doesn’t succeed.

Lin/Lau starts to resuscitate the unconscious woman/man. She compresses the thorax manually and performs mouth-to-mouth ventilation. We call this CPR (cardiopulmonary resuscitation).

7. The woman/man in the story has a higher chance to survive because Lin/Lau tries to resuscitate her.
   a. Yes (including smiley*)
   b. Probably yes (including smiley**)
   c. Probably no (including smiley***)
   d. No (including smiley****)
   e. I don’t know
8. Only EMS (emergency medical system) personnel is allowed to perform CPR
   a. Yes *(including smiley*)
   b. Probably yes *(including smiley)**
   c. Probably no *(including smiley***)
   d. No *(including smiley****)
   e. I don’t know

In fact everyone is allowed to perform CPR, including children.

9. I am able to perform CPR
   a. Yes *(including smiley*)
   b. Probably yes *(including smiley)**
   c. Probably no *(including smiley***)
   d. No *(including smiley****)
   e. I don’t know

10. I do not know how to perform CPR but in my opinion everyone should be able to perform CPR.
    a. Yes *(including smiley*)
    b. Probably yes *(including smiley)**
    c. Probably no *(including smiley***)
    d. No *(including smiley****)
    e. I don’t know

11. I think all children of my class should be able to perform CPR
    a. Yes *(including smiley*)
    b. Probably yes *(including smiley)**
    c. Probably no *(including smiley***)
    d. No *(including smiley****)
    e. I don’t know

12. Do you ever have been witness of a sudden loss of consciousness in the street like the story?
    a. Yes
       i. At that moment, did you have participated in CPR training?
          1. Yes
          2. No
    b. No
    c. I don’t know

What happened?

13. Was there an adult present?
    a. Yes
    b. No
    c. I don’t know

14. Did you recognize the emergency situation?
    a. Yes
    b. No
    c. I don’t know

15. Did you call for help?
    a. Yes
    b. No
    c. I don’t know
16. Did you perform CPR (chest compression or mouth-to-mouth ventilation)?
   a. Yes
      i. What did you do?
         1. I did perform chest compressions
         2. I did mouth-to-mouth ventilation
   b. No
      i. Why didn’t you perform CPR?
         1. I did not perform CPR because someone else already did.
         2. I did not perform CPR because I did not know what to do.
         3. I did not perform CPR because I was afraid of doing something wrong.
         4. I did not perform CPR because the victim had vomited.
         5. I did not perform CPR because I was afraid of getting ill by approaching the victim closely.
         6. Other reasons.
   c. I don’t know

17. If you were a witness of a sudden collapse as described in the story, at this moment, would you perform CPR?
   a. I would perform CPR to a man I don’t know.
      i. Yes (including smiley*)
      ii. Probably yes (including smiley**)
      iii. Probably no (including smiley***)
      iv. No (including smiley****)
      v. I don’t know
   b. I would perform CPR to a woman I don’t know.
      i. Yes (including smiley*)
      ii. Probably yes (including smiley**)
      iii. Probably no (including smiley***)
      iv. No (including smiley****)
      v. I don’t know
   c. I would perform CPR to a child I don’t know.
      i. Yes (including smiley*)
      ii. Probably yes (including smiley**)
      iii. Probably no (including smiley***)
      iv. No (including smiley****)
      v. I don’t know
   d. I would perform CPR to a family member.
      i. Yes (including smiley*)
      ii. Probably yes (including smiley**)
      iii. Probably no (including smiley***)
      iv. No (including smiley****)
      v. I don’t know
   e. I would perform CPR to someone I know (a classmate, a teammate…).
      i. Yes (including smiley*)
      ii. Probably yes (including smiley**)
      iii. Probably no (including smiley***)
      iv. No (including smiley****)
      v. I don’t know

18. What would be a reason not to perform CPR?
   a. I would not know what to do.
   b. I would be afraid of doing something wrong.
   c. I would not know the consequences of my actions.
   d. I would fear infections by approaching the victim closely.
   e. I would always initiate CPR.
19. Image you are Lin/Lau in the story. What would you be willing to do?
   a. I would perform chest compressions.
      i. Yes *(including smiley*)
      ii. Probably yes *(including smiley**)
      iii. Probably no *(including smiley***)
      iv. No *(including smiley****)
      v. I don’t know
   b. I would do mouth-to-mouth ventilation
      i. Yes *(including smiley*)
      ii. Probably yes *(including smiley**)
      iii. Probably no *(including smiley***)
      iv. No *(including smiley****)
      v. I don’t know
   c. I would perform chest compressions and do mouth-to-mouth ventilation
      i. Yes *(including smiley*)
      ii. Probably yes *(including smiley**)
      iii. Probably no *(including smiley***)
      iv. No *(including smiley****)
      v. I don’t know
   d. I would perform chest compressions when someone explains to me what to do by telephone
      i. Yes *(including smiley*)
      ii. Probably yes *(including smiley**)
      iii. Probably no *(including smiley***)
      iv. No *(including smiley****)
      v. I don’t know
   e. I would perform chest compressions and do mouth-to-mouth ventilation when someone explains to me what to do by telephone
      i. Yes *(including smiley*)
      ii. Probably yes *(including smiley**)
      iii. Probably no *(including smiley***)
      iv. No *(including smiley****)
      v. I don’t know

20. Did you ever participate in a first aid course?
21. What were the topics of the first aid course?
   a. Wounds, burns…
      i. Yes
      ii. No
      iii. I don’t know
   b. To recognize an emergency situation.
      i. Yes
      ii. No
      iii. I don’t know
   c. Calling the emergency phone number.
      i. Yes
      ii. No
      iii. I don’t know
   d. CPR
      i. Yes
      1. What were the topics of the CPR training?
         a. Someone demonstrated how to perform CPR (chest compressions and/or mouth-to-mouth ventilation)
         b. I performed CPR on a manikin
         c. I did mouth-to-mouth ventilation on a manikin
      2. Where did you participate in a CPR course?
         a. I participated a CPR course at school.
         b. I participated a CPR course apart of school.
3. How long ago did you participate in a CPR course?
   a. Between 0 and 6 months ago.
   b. Between 6 and 12 months ago.
   c. Between 1 and 2 years ago.
   d. Over 2 years ago.
   e. I don’t know anymore.

ii. No
1. Why could you never participate in a CPR course?
   a. It is not yet been offered to me.
   b. I don’t know what it is or what purpose it serves.
   c. I have to little time.
   d. It costs too much.
   e. I don’t know where to participate in such course.
   f. I am physically limited.
   g. Other reason.

iii. I don’t know
22. I would like to participate in CPR courses (more often).
   a. Yes.
   b. No.

23. Why would you want to attend CPR courses?
   a. I know someone with a cardiac disease.
   b. I want to learn how to help someone.
   c. Other reasons.

24. How do you want to learn CPR?
   a. I would like to learn it on my own.
   b. I would like to learn it with my friends.
   c. I would like to learn it by reading a book.
   d. I would like to learn it through my teacher.
   e. I would like to learn it through volunteers (from hospitals, fire workers.).
   f. I would like to learn it by computer.

25. Are there CPR courses at your school?
   a. Yes
      i. Who teaches the CPR courses?
         1. A teacher.
         2. Someone of the school board.
         3. A school nurse.
         4. Someone else working at school.
         5. Someone who does not work at school.
   b. No

26. I think every student should learn at school how to perform CPR.
   a. Yes *(including smiley*)
   b. Probably yes *(including smiley)**
   c. Probably no *(including smiley***)
   d. No *(including smiley****)
   e. I don’t know.

27. I would like to participate in CPR courses at school to be able to perform CPR.
   a. Yes *(including smiley*)
   b. Probably yes *(including smiley**)
      i. How often would you like to participate in a CPR course at school?
         1. I would like to participate every month.
         2. I would like to participate every 3 months.
         3. I would like to participate every 6 months.
         4. I would like to participate every year.
         5. I would like to participate when I am reminded of it.
         6. Other.
   c. Probably no *(including smiley***)

Appendices - 5
d. No (including smiley****)
   i. Why would you not want to participate in CPR courses at school?
      1. We don’t have enough time at school.
      2. I don’t find it useful to learn it at school.
      3. I only would participate if there were a rewarding.
      4. Other.

28. Do you have an Automatic External Defibrillator (AED) at your school? You find a picture and the logo
    of an AED below.
    a. Yes.
    b. No.
    c. I don’t know.

29. What is the purpose of an AED?
    a. An AED is used to perform chest compressions.
    b. An AED is used to analyse the heart rhythm.
    c. An AED is used to deliver an electric shock to normalize the heart rhythm.
    d. I don’t know.
    e. I don’t understand the question.

30. Who is allowed to use an AED?
    a. A doctor, a nurse or EMS personnel is allowed to use an AED.
    b. Someone with special training is allowed to use an AED.
    c. Everyone is allowed to use an AED.
    d. I don’t know.

31. If we tell you everyone is allowed to use an AED including children, would you use an AED yourself at
    this moment?
    a. Yes (including smiley*)
    b. Probably yes (including smiley**)
    c. Probably no (including smiley***)
    d. No (including smiley****)
    e. I don’t know.

32. If we tell you it takes only turning the machine on to be automatically and safely guided to save
    someone as Lin/Lau in the story, would you use it then?
    a. Yes (including smiley*)
    b. Probably yes (including smiley**)
    c. Probably no (including smiley***)
    i. Why wouldn’t you use an AED?
       1. I have to little knowledge of the machine
       2. I am afraid of harming the victim
       3. Other.
    d. No (including smiley****)
    e. I don’t know.

Smiley’s used

* ☺ ** ☻ *** ☺ ☻ **** ☻ ☻ ☻ ☻
Appendix B: Questionnaire for the teachers

1. What is the number of your educational institution?
2. What is your sex?
   a. Female
   b. Male
3. How old are you?
4. What is your highest degree?
   a. Professional or academic bachelor’s degree
   b. Master’s degree
   c. Other
5. How many years of experience in education do you have (including this year)?
6. At which group(s) of children do you teach?
   a. 1st-2nd year of primary school
   b. 3rd-4th year of primary school
   c. 5th-6th year of primary school
   d. 1st-2nd year of high school
   e. 3rd-4th year of high school
   f. 5th-6th year of high school
   g. Higher education.
7. Which courses do you teach?
8. Have you ever participated in CPR courses yourself?
   a. Yes
      i. When did you participate in a CPR course?
         1. In primary school
         2. In secondary school
         3. In higher education
         4. At school when I was working as a teacher
         5. Apart of school (Red cross, private organization…)
      ii. How long ago did you participate in a CPR course?
          a. Between 0 and 6 months ago.
          b. Between 6 and 12 months ago.
          c. Between 1 and 2 years ago.
          d. Over 2 yours ago.
   b. No
      i. Why could you never participate in a CPR course?
         1. It is not yet been offered to me.
         2. I have to little time.
         3. I am not interested.
         4. I don’t know where to participate in such course.
         5. It is too expensive.
         6. I am physically limited.
         7. Other reason.
9. Would you be able to resuscitate a victim at this moment?
   a. Yes
   b. No
10. Do you want to participate in CPR courses (more often)?
    a. Yes
       i. Why do you want to attend CPR courses (more often)?
          1. I know someone with a cardiac disease.
          2. I want to learn how to help someone.
          3. Other reasons.
    b. No
       i. Why don’t you want to attend CPR courses (anymore)?
          1. I am able to perform CPR sufficiently.
          2. I am not able to due to a physical limitation.
          3. It is too expensive.
          4. I don’t know where to follow CPR courses.
          5. I don’t have enough time.
          6. Other reasons.
11. CPR courses are integrated in the educational curriculum. Were there courses organized at school recently?
   a. No
   b. Yes, in the past year.
   c. Yes, in the past two years.
   d. Yes, three years or longer ago.
12. What kind of first aid courses are taught at your school?
   a. Information about wounds, burn wounds…
   b. Recognizing an emergency situation
   c. Calling the emergency phone number
   d. CPR
13. Who teaches the CPR courses?
   a. A teacher
      i. Which teacher teaches these courses?
         1. Science teacher (biology, chemistry, physics)
         2. Physical education teacher
         3. Healthcare teacher
         4. Class teacher
         5. Every teacher teaches CPR
         6. Other
   b. Someone of the school board
   c. A school nurse
   d. Someone else working at school.
   e. Someone who does not work at school.
14. Would you be willing to teach CPR courses?
   a. Yes
   b. Probably yes
   c. Probably not
   d. No
      i. Why would you not be willing to teach CPR courses?
         1. I have to little knowledge
         2. I don’t have time
         3. I don’t have the resources at school
         4. Other
   e. I don’t know
15. Besides teaching CPR by instructors, there are other equivalent methods to teach CPR. Your school chooses a new approach to teach children CPR by a digital self-learning platform. This comprehends knowledge transfer and skills training by computer. Do you support this?
   a. Yes
   b. Probably yes
   c. Probably not
   d. No
   e. I don’t know
16. Do you think your school is willing to provide time and resources to let children use such digital self-learning platform?
   a. Yes
   b. Probably yes
   c. Probably not
   d. No
   e. I don’t know
17. Do you have an Automatic External Defibrillator (AED) at your school? You find a picture and the logo of an AED below.
   a. Yes.
   b. No.
   c. I don’t know.
18. What is the purpose of an AED?
   a. To deliver CPR (perform chest compressions).
   b. To analyse the heart rhythm.
   c. To deliver an electric shock to normalize the heart rhythm.
   d. I don’t know.
19. Who is allowed to use an AED?
   a. A doctor, a nurse or EMS personnel.
   b. Someone with special training.
   c. Everyone.
   d. I don’t know.

20. If you know everyone is allowed to use an AED, would you be able to use an AED yourself at this moment?
   a. Yes
   b. Probably yes
   c. Probably no
   d. No
   e. I don’t know.

21. If you know it takes only turning the machine on to be automatically and safely guided to save the victim, would you use it then?
   a. Yes
   b. Probably yes
   c. Probably no
   i. Why wouldn’t you use an AED?
      1. I have to little knowledge of the machine
      2. I am afraid of harming the victim
      3. Other.
   d. No
   e. I don’t know.

22. With the knowledge you now have, would you be able to explain the difference between performing CPR and using an AED?
   a. Yes
   b. Probably yes
   c. Probably no
   d. No
   e. I don’t know.

23. Have you ever been a witness of a cardiac arrest, or did you ever sense someone was in need of CPR?
   a. Yes
      i. What did you do?
         1. I called the emergency services
         2. I performed chest compressions
         3. I performed chest compressions and did mouth-to-mouth ventilation
         4. Other
   b. No

24. If you witnessed a cardiac arrest, would you start CPR?
   a. Yes
   b. Probably yes
   c. Probably no
   d. No
   i. Why wouldn’t you start CPR?
      1. I have to little knowledge about CPR.
      2. I am afraid of wounding the victim.
      3. I am afraid of the consequences for the victim if I do something wrong.
      4. I am afraid of infection.
      5. Because I don’t know the consequences of my actions.
   e. I don’t know

25. What do you think about following statements
   a. In a real situation I perform chest compressions
      i. Totally agreed
      ii. Agreed
      iii. Not agreed
      iv. Not agreed at all
      v. I don’t know
b. In a real situation I do mouth-to-mouth ventilation
   i. Totally agreed
   ii. Agreed
   iii. Not agreed
   iv. Not agreed at all
   v. I don’t know

c. In a real situation I do both
   i. Totally agreed
   ii. Agreed
   iii. Not agreed
   iv. Not agreed at all
   v. I don’t know

d. In a real situation I perform chest compressions and mouth-to-mouth ventilation when guided by telephone
   i. Totally agreed
   ii. Agreed
   iii. Not agreed
   iv. Not agreed at all
   v. I don’t know

e. In a real situation I perform chest compressions when guided by telephone
   i. Totally agreed
   ii. Agreed
   iii. Not agreed
   iv. Not agreed at all
   v. I don’t know
Appendix C: Principals’ questionnaire

1. What is the number of your educational institution?
2. What is the educational network
   a. GO! (The official education organized by the Flemish Community)
   b. Government-aided public education
   c. Government-aided private
3. What is your type of education at your institution
   a. Mainstream primary education
   b. Special primary education
   c. General secondary education
   d. Technical secondary education
   e. Vocational secondary education
   f. Artistic secondary education
   g. Special secondary education
4. How old are you?
5. What is your sex?
   a. Female
   b. Male
6. What is your highest degree?
   a. Professional or academic bachelor’s degree
   b. Master’s degree
   c. Other
7. How many years of experience in education do you have (including this year)?
8. How many years are you a member of the school board at this school?
9. Have you ever participated in CPR courses yourself?
   a. Yes
      i. When did you participate in a CPR course?
         1. In primary school
         2. In secondary school
         3. In higher education
         4. At school when I was working as a teacher
         5. Apart of school (Red cross, private organization…)
      ii. How long ago did you participate in a CPR course?
         a. Between 0 and 6 months ago.
         b. Between 6 and 12 months ago.
         c. Between 1 and 2 years ago.
         d. Over 2 years ago.
   b. No
      i. Why could you never participate in a CPR course?
         1. It is not yet been offered to me.
         2. I have to little time.
         3. I am not interested.
         4. I don’t know where to participate in such course.
         5. It is too expensive.
         6. I am physically limited.
         7. Other reason.
10. Would you be able to resuscitate a victim at this moment?
    a. Yes
    b. Probably yes
    c. Probably no
    d. No
    e. I don’t know.
11. Do you want to participate in CPR courses (more often)?
    a. Yes
       i. Why do you want to attend CPR courses (more often)?
          1. I know someone with a cardiac disease.
          2. I want to learn how to help someone.
          3. Other reasons.
    b. No
i. Why don’t you want to attend CPR courses (anymore)?
   1. I am able to perform CPR sufficiently.
   2. I am not able to due to a physical limitation.
   3. It is too expensive.
   4. I don’t know where to follow CPR courses.
   5. I don’t have enough time.
   6. Other reasons.

12. CPR courses are integrated in the educational curriculum. Were there courses organized at school recently?
   a. No
   b. Yes, in the past year.
   c. Yes, in the past two years.
   d. Yes, three years or longer ago.

13. What kind of first aid courses are taught at your school?
   a. Information about wounds, burn wounds…
   b. Recognizing an emergency situation
   c. Calling the emergency phone number
   d. CPR

14. Who is taught?
   a. Children
   b. Teachers
   c. Other people working at school

15. Why weren’t there courses for teachers yet?
   a. Lack of budget
   b. Lack of knowledge of people at school to teach
   c. No time at school
   d. Lack of usable tools to facilitate the education
   e. Lack of resources
   f. Other

16. Why weren’t there courses for children yet?
   a. Lack of budget
   b. Lack of knowledge of people at school to teach
   c. No time at school
   d. Lack of usable tools to facilitate the education
   e. Lack of resources
   f. Other

17. Who taught the CPR courses?
   a. A teacher
      i. Which teacher teaches these courses?
         1. Science teacher (biology, chemistry, physics)
         2. Physical education teacher
         3. Healthcare teacher
         4. Class teacher
         5. Every teacher teaches CPR
         6. Other
      b. Someone of the school board
      c. A school nurse
      d. Someone else working at school.
      e. Someone who does not work at school.

18. Estimate the percentage of teachers who is able to perform CPR
   a. 0-10
   b. 11-20
   c. 21-30
   d. 31-40
   e. 41-50
   f. 51-60
   g. 61-70
   h. 71-80
   i. 81-90
   j. 91-100
19. What about this statement: I think it is important to teach students how to perform CPR.
   a. Totally agreed
   b. Agreed
   c. Not agreed
   d. Not agreed at all
   e. I don’t know

20. At which age do you think children should start to learn to perform CPR?
   a. 1st-2nd year of primary school
   b. 3rd-4th year of primary school
   c. 5th-6th year of primary school
   d. 1st-2nd year of high school
   e. 3rd-4th year of high school
   f. 5th-6th year of high school

21. How many hours a year would you like to spend on CPR courses for children?
   a. One hour annually
   b. Two hours annually
   c. Three hours annually
   d. Four hours annually
   e. Other

22. How many hours a year would you like to spend on CPR courses for teachers?
   a. One hour annually
   b. Two hours annually
   c. Three hours annually
   d. Four hours annually
   e. Other

23. With your current knowledge, would you be able to teach CPR courses on this moment?
   a. Yes
   b. Probably yes
   c. Probably not
   d. No
      i. Why would you not be willing to teach CPR courses?
         1. I have to little knowledge myself
         2. I don’t have time
         3. I don’t have the resources at school
         4. Other
   e. I don’t know

24. Do you have an Automatic External Defibrillator (AED) at your school? You find a picture and the logo of an AED below.
   a. Yes.
      i. Who did pay the AED?
         1. The school itself
         2. The educational network
         3. External/Non-profit organization
         4. Other
      ii. Why was the AED purchased?
         1. To help students at school if necessary
         2. To help personnel at school if necessary
         3. To help other people visiting school if necessary
   b. No.
   c. I don’t know.

25. What is the purpose of an AED?
   a. To deliver CPR (perform chest compressions).
   b. To analyse the heart rhythm.
   c. To deliver an electric shock to normalize the heart rhythm.
   d. I don’t know.

26. Who is allowed to use an AED?
   a. A doctor, a nurse or EMS personnel.
   b. Someone with special training.
   c. Everyone.
   d. I don’t know.
27. If you know everyone is allowed to use an AED, at this moment, would you be able to use an AED on a victim of a cardiac arrest?
   a. Yes
   b. Probably yes
   c. Probably no
   d. No
   e. I don’t know.

28. If you know it takes only turning the machine on to be automatically and safely guided to save the victim, would you use it then?
   a. Yes
   b. Probably yes
   c. Probably no
   i. Why wouldn’t you use an AED?
      1. I have to little knowledge of the machine
      2. I am afraid of harming the victim
      3. Other.
   d. No
   e. I don’t know.

29. An AED is a portable machine used during CPR. After analysing the heart rhythm of the victim, the AED delivers an electric shock to stop a disturbed heart rhythm. As mentioned in the previous question, it takes only turning the machine on to be automatically and safely guided to save the victim. Would you be willing to provide an AED at your school?
   a. Yes, if it provided for free.
   b. Yes, and we are willing to provide a budget ourselves.
      i. How much are you willing to pay monthly?
         1. Less than 10 euros a month
         2. Between 10 and 30 euros a month
         3. Between 30 and 50 euros a month
         4. Between 50 and 100 euros a month
         5. Over 100 euros a month
   c. No

30. Have you ever been a witness of a cardiac arrest, or did you ever sense someone was in need of CPR?
   a. Yes
      i. What did you do?
         1. I called the emergency services
         2. I performed chest compressions
         3. I performed chest compressions and did mouth-to-mouth ventilation
         4. Other
   b. No

31. If you witnessed a cardiac arrest, would you start CPR?
   a. Yes
   b. Probably yes
   c. Probably no
   d. No
   i. Why wouldn’t you start CPR?
      1. I have to little knowledge about CPR.
      2. I am afraid of wounding the victim.
      3. I am afraid of the consequences for the victim if I do something wrong.
      4. I am afraid of infection.
      5. Because I don’t know the consequences of my actions.
   e. I don’t know

32. What do you think about following statements
   a. In a real situation I perform chest compressions
      i. Totally agreed
      ii. Agreed
      iii. Not agreed
      iv. Not agreed at all
      v. I don’t know
b. In a real situation I do mouth-to-mouth ventilation
   i. Totally agreed
   ii. Agreed
   iii. Not agreed
   iv. Not agreed at all
   v. I don’t know

c. In a real situation I do both
   i. Totally agreed
   ii. Agreed
   iii. Not agreed
   iv. Not agreed at all
   v. I don’t know

d. In a real situation I perform chest compressions and mouth-to-mouth ventilation when guided by telephone
   i. Totally agreed
   ii. Agreed
   iii. Not agreed
   iv. Not agreed at all
   v. I don’t know

e. In a real situation I perform chest compressions when guided by telephone
   i. Totally agreed
   ii. Agreed
   iii. Not agreed
   iv. Not agreed at all
   v. I don’t know