

First aid as an important traffic safety factor – evaluation of the experience-based training

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Abstract

Introduction First aid is a factor that reduces damage to health and loss of life in traffic accidents. It is therefore necessary to make even the lay population ready to give at least basic first aid. Czech driving schools offer only 4-h first-aid trainings that do not provide the appropriate level of competencies. Our team has designed a new conception of a 16-h experience-based first-aid course and compared its efficacy with the standard 4-h training.

Methods Thirty participants were randomly divided into two groups of 15 participants each. The first group went through the standard training; the second group went through the new experience-based training. Three levels of competencies were tested: 1. Knowledge; 2. Skills; 3. Performance in a simulated situation. The competencies were evaluated by a trained observer.

Results A pilot test showed a remarkable difference in knowledge and skills, as well as the competency to act in a simulated situation between the group of people that had gone through the experience-based training and those that had gone through the standard first-aid course.

Conclusions Experience-based first-aid training, focused on knowledge and skills, as well as the psychological set-up, is an effective part of a driver's education that can help to reduce the numbers of fatalities and serious damage to health caused by traffic accidents. It is an important factor of traffic safety – useful for all drivers – and should become an integral part of all driving (improvement) courses. Further research is still necessary.

Keywords First aid · Driving school · Training

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1 Introduction

In the Czech Republic 25,459 people were injured and 583 people killed in 2013 [23]. Worldwide every year, 1.24 million people are killed and 50 million are injured in road accidents. Road traffic injuries are the world leading cause of death among young people aged 15 to 29 and the second most common cause of death of those aged 5 to 14 [15].

In the event of an accident, the immediate help of bystanders can save lives and reduce damage to health. Providers of first aid can also significantly cut down the time before professional medical assistance arrives by calling professional help immediately. A proper lay first aid, therefore, constitutes one important aspect of road safety.

Table 1 shows the percentages of deaths after a traffic accident – before and after entering hospital. In European countries, where the level of medical care is high, 50% of the fatalities happen before entering hospital. The first few minutes after an

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Table 1 Percentages of fatalities in traffic accidents observed in various countries (WHO data)

	Kumasi (Ghana)	Moterrey (Mexico)	Seattle (United States)	Average values of the European countries
Stage of the development of the country	Low	Medium	High	Very high
Before entering hospital	84	72	59	50
In the hospital	19	28	41	50

Source: Ferraz et al. [10], p. 34

accident are critical and in many cases it is only the immediate action of lay bystanders that can save lives.

The International Federation of the Red Cross and Red Crescent Societies (IFRC) [14] states that over 50% of deaths from traffic accidents occur within the first few minutes after the crash. In the event of cardiac arrest, the brain starts to die within 4 min. Every single minute reduces the chances of survival by 10%. In Europe it takes approximately 8–15 min before the emergency service comes [19]. Many urgent conditions have to be treated much faster, so the help of bystanders is crucial.

The IFRC as well as national Red Cross organizations, therefore, call for a higher percentage of the population to be trained in first aid. However, the numbers of people trained in first aid vary greatly across Europe. The IFRC estimations from 2009 [14] state that 80% of the population of Austria as well as Germany are trained in first aid. This is one of the highest percentages in Europe; the percentages in other countries are (significantly) lower (Fig. 1).

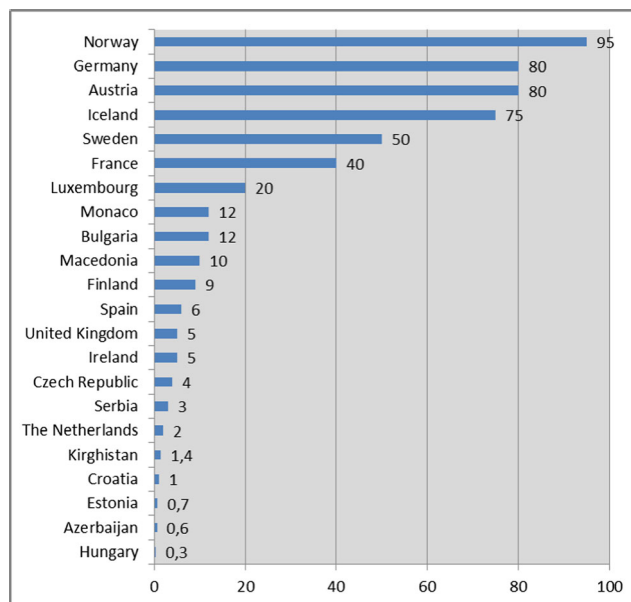


Fig. 1 Percentage of the population trained in first aid. Source: IFRC Health and Care Department, 2009, p. 3

In the Czech Republic, it is estimated that only 4% of the people are systematically trained in first aid (Fig. 1). However, the percentage of people that have undergone first-aid training does not necessarily indicate a high level of competencies, readiness to help on the required level and may have nothing to do with the actual performance of lay first-aid providers. Compared to the Czech Republic, as well as to the rest of Europe, the percentage of the population in Austria and Germany trained in first aid is very high. However, the actual standard of first-aid competencies in Germany and Austria is rather poor [6, 18]. In Austria and Germany, only 12.5% of the people are really ready to help [18]. The first-aid training is usually too theoretical and has no connection to reality. Due to this, many people are not capable of acting properly, although they formally have been trained.

A pilot research in the Czech Republic (Zamecnik, Kureckova & Bohmova, in preparation) showed that novice drivers that have recently passed through the compulsory 4-h driving school first-aid training mostly feel they are satisfied with the training (71% of the respondents, $n = 88$). Fifty-seven per cent feel competent to give first aid, but knowledge tests showed that only 11% of them have at least a basic necessary knowledge of the issue.

It is necessary to develop effective first-aid training methods and evaluate them. Experts agree that the reduction in the amount of information is essential in order for first-aid training to be successful [4, 5, 19]. What is necessary is only the basic knowledge. In many countries, as well as in the Czech Republic, the system of dispatcher-assisted resuscitation is well elaborated. After the emergency numbers are called, the operators are ready to provide help and advice. Therefore there are no high requirements on any special knowledge of the first-aid providers.

Since many of the courses are rather theoretical, there is a lack of skills. From the didactical point of view, there are many methods for forwarding knowledge and providing skills training [e.g. 3, 17, 19]. However, there is one aspect that is much more complicated – the psychological setup of the lay first-aid responders. There is a strong relation between self-efficacy and performance [7, 24]. Bandura [2] considers self-efficacy as a mediator in the translation of knowledge and abilities into skilled performance. Even if people know what to do, their self-efficacy is too low to let them act fast and effectively. This creates problems especially in the first phase in the provision of first aid – people hesitate and start acting too late. In many cases people who have both knowledge and skills fail due to psychological obstacles and lack of psychological readiness for applying first aid. This very much influences both their future self-efficacy and their feelings about the first-aid giving process. Therefore, not only the knowledge and skills but also raising the level of self-efficacy must be a part of effective first-aid training. Gist & Mitchell [12] formulate three main procedures for self-efficacy improvement:

persuasion (counselling, coaching, etc.), training, utilization of strategy.

1.1 First-aid giving as an emotional process

The psychological processes that are in progress during and after giving first aid are a serious theme. Numerous studies [e.g. 8, 22] show that there are many thoughts and feelings running in people's minds; doubts about their own abilities, uncertainty because of differences between training situation and reality; and various emotions such as joy, pride, hope, sadness, fear.

Riegel et al. [21] state that most first-aid providers did not experience a high level of stress. Meron et al. [16] in their analysis of emergency-line records stated that 77% of the first-aid providers seemed to be completely calm. On the other hand, Ranse & Burke [20] consider stress to be a relevant problem. Axelsson, Herlitz & Fridlund [1] reported that many of the interviewees in their research felt powerless, perceived the situation as uncertain and were worried if what they did was right. Hasík [13] states that emotions and the feeling of insufficiency are the key barriers to first-aid giving.

Axelsson, Herlitz & Fridlund [1] identified intuitive acting as one of the important factors in the process of first-aid giving but the well-known concept of diffusion of responsibility [9] is also often mentioned in connection with first-aid providing: The presence of other people reduces the initiative of the individual. People rely on the others and hope that they will help. The potential monitoring by the bystanders also contributes to the inhibitions of the helpers. Very often people are worried about any harm they could cause to others.

1.2 Our qualitative research

A qualitative pilot study of the first-aid giving process was carried out in the Czech Republic. The results showed that there are all sorts of feelings during first-aid giving (block – temporary inability to do anything; limited ability to recall the relevant information learned earlier; decline in the performance of even simple tasks; time distortion – time seems to be running slower than it really is; selective perception – many important pieces of information stay beyond the focus of interest; strong subjective stress; stress due to the presence of bystanders). Various feelings and processes occur not only during the first-aid giving but also afterwards. There are doubts about one's own acts and decisions, feelings of guilt and failure, feeling of disclosure (lay rescuers have no information about what happened next to the rescued person(s)), the development of a relationship between the rescuer and the rescued person – even if they were strangers before, situational trauma – PTSD symptoms.

Stress and confusion were the dominant aspects of the experience. Most of the respondents perceived the situation as extremely stressful and reported a persisting trauma.

It is obvious that there are many cognitive and emotional aspects that have to be investigated more. The feelings, the decision-making process, perception, priorities, communication and interaction between the first-aid provider and the patient, bystanders, paramedics and emergency-line dispatchers can also play an important role in the process. Understanding of the process can help us to establish the system of first-aid training even more effectively.

2 Training conception

Based on the effective principles of first-aid training and current knowledge about the process of lay first-aid giving, we elaborated a new conception of first-aid training that can effectively train the participants to achieve the desired competencies on all levels of preparedness – knowledge, skills as well as the psychological setup.

2.1 The content of the training

This experience-based first-aid training is designed as a 16-h programme and should be conducted in three basic steps: 1. *Check the situation* (safety, number of casualties, the whole scene, context); 2. *Act fast* (if there is anything that can endanger the life of the patient – unconsciousness, massive bleeding, lack of breath); 3. *Care* (if the person is conscious and not bleeding, monitor the situation and ask about everything that can be important) – think about life-threatening situations that might be difficult to notice.

2.1.1 Basic information people have to keep in mind

What to do if there is a traffic accident:

1. Watch out (care about safety of the rescuer as well as the safety of the victims, traffic accidents are usually very dangerous for any bystanders. It is therefore very important to follow all the safety rules.) Basic safety support action also has to be done before first aid – turn off the engine, warning triangle, check the airbags, flammable liquids, blood).
2. Act – when there is a situation that requires immediate help (no breathing, massive bleeding).
3. Think about other risks and life-threatening states that might not be visible on the first sight (internal bleeding, spinal injuries).
4. Call the emergency line as soon as possible.

There are some basic skills that should always be trained – treating the unconscious person, CPR, handling people during the traffic accident.

We aim to develop the necessary attitudes, willingness to help, awareness that it is important to save lives, self-confidence (i.e. believing that one is capable of helping), and acceptance of any emotions that can occur during and after the first-aid process.

Table 2 shows a detailed training schedule that should be followed in order to achieve optimal efficacy.

2.2 Main benefits of (experience-based) first-aid training

First-aid training based on experience principles has many benefits when compared to the traditional frontal and mainly theoretical conception of training. It develops the ability to give first aid and react adequately in acute emergency situations. It also develops self-confidence of the participants. Effective training also reduces the stress during the first-aid giving and also the stress and feelings of guilt and failure afterwards. The participants are much more aware of the potential psychological consequences first-aid giving may have.

2.3 Key principles of experience-based first-aid training

Experience-based first-aid training is based on basic principles that increase its efficacy. First is motivation – people should be willing to learn, then the reduction of theoretical information – just the absolutely essential information, as much repeating as possible, language as simple and as understandable as possible. The training is focused on skills and key-skills drill. It develops self-confidence (during simulations people can experience that they really are capable of helping, mistakes are presented as an opportunity to learn – “You will never repeat a mistake you made during training in real life.”). The training also continually works with emotions – explaining and talking not only about the situation people can experience, but also about emotions that can occur during or (even long) after the first aid.

2.4 Instructor competencies

According to Czech legislation, the first-aid instructors at driving schools must get a “first-aid member” certification. This means that they have to undergo approximately 120 h of accredited training. Further education should be required of instructors using experience-based methods. A degree in education science or psychology or a psychotherapy background can be helpful too.

Additional trained and skilled staff invited to take part in the simulation help to conduct the training more effectively, but due to the costs they usually act on a volunteer basis only.

3 Pilot evaluation of the training

A pilot testing of the programmes was carried out. The aim of the pilot testing was to see whether there are differences in efficacy between the standard 4-h training that is currently a mandatory part of driving lessons in the Czech Republic and our experience-based 16-h training that should be a new best practice in driving schools.

There were two groups of participants. The first underwent the standard 4-h programme (frontal lecture, mainly theoretical) and the second underwent the 16-h experience-based training (according to the principles and schedule mentioned above).

After the training, the level of knowledge, skills and performance in the simulated situations was assessed in order to see if there are differences between the two groups.

3.1 Participants

Thirty participants of driver-improvement-course first-aid trainings participated in the evaluation. They were randomly divided into two groups of 15 participants each. The first group went through the standard training; the second group went through the experience-based training.

The participants in group 1 (standard training), comprising 13 male and 2 female, were aged 19 to 52 years, the average age being 34 years; the participants in group 2 (experience-based training), comprising 14 male and 1 female, were aged 20 to 52 years, the average age being 35 years. None of the participants had gone through any other first-aid training during the last 2 years.

3.2 Methods

The first group of 15 participants went through the 4-h standard training, conducted by 1 instructor; the second group of 15 participants went through the 16-h experience-based training, conducted by 3 instructors (different from that conducting the 4-h training). One week after the training, the competencies of the participants were tested. Three levels were tested: 1. Knowledge; 2. Skills; 3. Performance in a simulated situation. The knowledge was tested using a short written test. There were six open questions, focusing on the main topics of the first aid (the emergency line number, the proceedings on the traffic accident scene, internal injury issues, spinal injury issues, priorities, taking casualties outside of the car). The accuracy of the answers was then evaluated by the trained instructor and marked on a scale of 1 (best) to 5 (worst) in order to distinguish the accuracy and relevancy of the answers.

Table 2 Detailed training schedule

Time schedule	Activity
Day 1	
09:00–09:15	Kick-off, instructor's introduction, curriculum description, expectations of the participants
09:15–09:45	Opening simulation Unconscious patient treatment
09:45–09:55	Three steps – generally
10:00–10:15	First step – check out the situation, safety issues
10:15–10:40	Second step – (un)consciousness, how to treat an unconscious patient
10:40–11:00	Unconscious patient treatment drill
11:00–11:15	Short break
11:15–11:30	Microsimulations (the participants 1 by 1) – unconscious patient treatment
11:30–11:45	Resuscitation
11:45–12:00	Resuscitation drill
12:00–12:10	How to call the local emergency-line number
12:10–12:30	Spinal injuries
12:30–13:30	Lunch break
13:30–14:30	Roundabout simulations – spinal injury, unconscious patient treatment, safety
14:00–14:15	Internal injury
14:15–14:30	Short break
14:30–14:40	Massive bleeding
14:40–15:20	Massive bleeding – training
15:20–15:50	Simulations – internal injury versus massive bleeding
15:50–16:15	Triage – priorities
16:15–16:30	Day 1 close – feedback: opinions, needs, feelings, requirements...
Day 2	
09:00–09:10	Warm-up
09:10–09:30	Microsimulation – unconscious patient treatment
09:30–10:00	Traffic accident – how to proceed, priorities
10:00–10:30	Roundabout simulations (unconscious patient, resuscitation, massive bleeding, safety)
10:30–10:45	Short break
10:45–11:15	Weak points – revision
11:15–11:30	Head injuries
11:30–12:00	Resuscitation of infants, training
12:00–13:00	Lunch break
13:00–14:00	Big outdoor car accident simulation
14:00–14:20	Analysis
14:20–15:20	Big outdoor simulation
15:20–15:40	Simulation analysis
15:40–16:30	Questions, other themes, ending-close

There were three main skills evaluated – checking of the life functions (unconscious-casualty treatment, approx. 1 min), CPR – artificial breathing and CPR – chest compressions (approx. 2.5 min). The performance was evaluated and marked by a skilled observer.

Then a simulated situation was arranged – a traffic accident scene with casualties to whom the participants were to give first aid. There were three participants at a time and the simulation lasted approximately 5 min. The performance in the simulated situation was observed and

evaluated by a trained observer (first-aid instructor, different from the instructors of both groups). The same observer observed all participants in both groups and had no information about what kind of training the participants went through. A video recording was used to check their performance. There were four main aspects evaluated – the activity, the speed of reaction, accuracy of the action and awareness of safety risks. The results were marked on the same scale as above). The observer also noted any non-standard reaction (emotions, stress) – manifested visibly or spontaneously reported by the participants.

3.3 Results

The ratings that the participants of the 16-h experience-based training had achieved, were compared to those of the participants that had gone through the standard 4-h first-aid course. Due to the number of participants, only basic descriptive statistics were done. In order to assess the degree to which the two groups differ statistically, hypothesis testing was employed. To achieve this goal, a series of Mann Whitney U-tests was performed. This decision resulted from the considerable data skew (i.e. assumption of normality is violated) as well as from the limited sample size. Moreover, multiple comparisons increase the probability of the type I error. As a result, rather than focusing on the level of statistical significance, analyses concentrated on the magnitude of the effect [11]. Most importantly, however, the results should be interpreted with consideration.

Table 3 shows the differences in knowledge between longer- and regular-training participants. In all of the results, there is a remarkable difference between the

groups. The results of the 4-h standard-training participants were rather poor, on the other hand the results of the 16-h experience-based training were very good. In internal injury issues and spinal injury issues, the differences were enormous, since such topics are not considered in most of the short 4-h trainings, so none of the participants of the 4-h training knew the right answers. It was also obvious that the knowledge of the participants of the standard 4-h training was also influenced by many myths and misunderstandings.

Table 4 shows the comparison of the basic skills. Here, a remarkable difference between the 16-h experience-based training and the standard conception is clearly visible. The biggest difference is in the life functions check – unconscious casualty treatment where the performance of the participants of the standard training was poor. The smallest difference was in the chest compression. This is probably due to the fact that the chest compression is one of the few practical activities that are trained during the 4-h standard training. However, the performance of the participants of the standard 4-h training continued to be worse and they also spontaneously mentioned more tension and stress during the activities.

When the participants were asked to act in the simulated situation (traffic accident with casualties), some differences in activity and speed of reaction became visible. However, there was an even bigger difference in the accuracy of performance and especially in the awareness of safety risks. The participants of the experience-based training, where the risks for lay first-aid providers is one of the crucial themes, were much more aware of potential hazards than people that had not passed such training. Many of the standard-course

Table 3 Comparison of the level of knowledge (average ratings: 1 = the best; 5 = the worst)

Type of Training	Emergency line number	Desired proceedings on the scene of traffic accident	Internal injury issues	Spinal injury issues	Priority issues – massive bleeding or resuscitation	When to take the casualty outside of the car?	Average knowledge rating
Improved							
Mean	1	1.6	1.1	1	1	1.53	1.21
Std. Deviation	0	0.83	0.26	0	0	0.52	0.23
Median	1	1	1	1	1	2	
Standard							
Mean	2.33	4	5	2.33	2.33	3.93	3.8
Std. Deviation	1.45	1	0	1.95	1.95	0.96	0.62
Median	3	4	5	5	1	4	
Difference (n1 = n2 = 15)							
Mann-Whitney U	52.5**	10.5***	0***	0***	75*	0***	
r	0.59	0.79	0.97	0.97	0.44	0.87	

* $p < .05$; ** $p < .01$; *** $p < .001$

Table 4 Comparison of the level of skills (average ratings: 1 = the best; 5 = the worst)

Type of training	Life functions check – unconscious casualty treatment	CPR – artificial breathing	CPR – chest compression
Improved			
Mean	1.2	1.6	1.1
Std. Deviation	0.41	0.74	0.26
Median	1	1	1
Standard			
Mean	3.67	3.47	2.27
Std. Deviation	0.72	1.2	0.96
Median	4	3	2
Difference (n1 = n2 = 15)			
Mann-Whitney U	121.5***	20.5***	20.5***
r	0.88	0.72	0.77

*** $p < .001$

participants also experienced panic or an enormous emotional reaction that influenced their performance. They spontaneously reported a strong tension and stress as well as the feeling of failure that persisted after the simulation.

There were 12 out of 13 comparisons identified as statistically significant. In other words, the two compared groups of the respondents (based on their type of training) do not come from the same population in the case of almost all observed categories of knowledge, skills, and performance. The magnitude of these differences is presented in Table 3, Table 4, and Table 5. There was only one case in which the difference was not statistically significant: *Reaction Fast-Slow*.

4 Conclusion

Effective lay first aid is a factor that reduces damage to health and loss of life in traffic accidents. It is therefore necessary to make the population ready and willing to give effective first aid. In the Czech Republic, the 4-h first-aid trainings that are an inherent part of driving-school courses do not provide the appropriate level of competencies. We have therefore designed a new conception of a 16-h experience-based first-aid course that can provide better training for driving license candidates, as well as for licensed drivers. The training contains a reduced amount of information that is well-structured and understandable. Drill of the necessary skills is also part of the course. The most important part of the experience-based first-aid training are the simulated situations and detailed analysis of both the performance and efficacy and the emotional processes. All of these activities help the participants to manage the emergency situations effectively.

The pilot testing showed remarkable differences in knowledge and skills as well as the competency to act in the simulated situation among the people that had gone through the experience-based training and the people that had gone through the standard first-aid course. Compared to the 4-h standard trainings, the 16-h experience-based-training participants demonstrate more knowledge as well as better skills. They also perform better during simulated emergency situations and declare better comfort and fewer inadequate emotional reactions.

Since the evaluation was done on a small group, further testing and comparison of the experience-based approach for various target groups on bigger samples is necessary. It also seems useful to monitor the further performance of the participants in real situations and

Table 5 Comparison of the performance (average ratings: 1 = the best; 5 = the worst)

Type of training	Reaction (active – passive)	Reaction (fast – slow)	Accuracy of performance	Safety risk awareness
Improved				
Mean	1.53	1.73	1.2	1.36
Std. Deviation	0.74	0.8	0.4	0.63
Median	1	2	1	1
Standard				
Mean	2.73	2.53	3.47	4.6
Std. Deviation	1.62	1.55	1.1	0.51
Median	2	2	3	5
Difference (n1 = n2 = 15)				
Mann-Whitney U	65.5*	82.5	4.5***	0***
r	0.38	0.24	0.85	0.87

* $p < .05$; *** $p < .001$

to continue further elaboration of methods based on the evaluation.

Higher costs and greater demands on the trainers must also be considered.

The pilot testing proved that the experience-based first-aid training focused on knowledge and skills as well as the psychological set-up is an effective part of a driver's education. It can be useful for novice drivers as well as part of the life-time driving training or driver improvement courses.

Experience-based first-aid trainings for drivers can help to reduce the number of fatalities and serious damage to health caused by traffic accidents and they should be considered as an important factor of traffic safety.

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