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The epidemiology of injuries and the first aid knowledge of via ferrata climbers in the European Alps

Thomas Küpper[1,2 A-G], Travis Heggie[3 E,G], Christian Kühn[1 A-C], Ulrich Schwarz[4 A,D], Volker Schöffl[5-8 A,D], Audry Morrison[9 D-G], Julia Kühn[1 A-E]

[1] RWTH Aachen University, Institute of Occupational and Social Medicine, Aachen, Germany; [2] Royal College of Physicians and Surgeons of Glasgow, Faculty for Travel Medicine, Glasgow, UK; [3] Bowling Green State University, School of Applied Human Development, Bowling Green, Ohio, USA; [4] Private Practice, Oberstdorf, Germany; [5] Klinikum Bamberg, Department of Sport Orthopaedics, Bamberg, Germany; [6] Friedrich Alexander University, Department of Trauma Surgery, Erlangen-Nuremberg, Germany; [7] Leeds Becket University, School of Applied and Clinical Sciences, Leeds, UK; [8] University of Colorado School of Medicine Section of Wilderness Medicine, Department of Emergency Medicine, Denver USA; [9] Royal Free London NHS Foundation Trust, London, UK

Original article

Abstract

Background: Via ferrata (VF) climbing is an increasingly popular mountain activity in the European Alps. The purpose of this study was to determine the nature of injuries incurred by VF climbers and to understand the extent of their First Aid (FA) knowledge and training.

Materials and methods: A questionnaire-based cohort study was performed at two alpine locations. Data included basic data (age, gender, climbing activities, exercise), 18 multiple choice questions with 5 answers each concerning First Aid (FA) knowledge and a self-rating of FA knowledge. Statistics were performed with non-parametric tests.

Results: 391 questionnaires were completed. Sunburns (23.9%), contusions (17.7%), open wounds (13.1%), and exhaustion-related injuries were the most reported incidents. Exhaustion was the most common emergency call. Only 52% of climbers wore helmets and gloves, less than 25% had adequate physical conditioning, and 28.1% reported having no FA training. The most common causes of emergencies were weather conditions (19%), stumbles (18.6%), falls (13.4%), and fatigue and deficiency in concentration (13.4%). Only 11 of the surveyed climbers scored 75% on their FA knowledge questions. VF climbers showed significant less FA knowledge than alpine mountaineers. They scored quite high on questions related to general FA but low on questions related to high altitude sickness, back, and thoracic injuries.

Conclusions: VF climbers should seek out FA training every two years with an emphasis placed on sunburns, contusions, open wounds, and exhaustion injuries. The training should also emphasize the prevention of back and thoracic trauma and developing rescue strategies.

Keywords

- via ferrata climbing
- injuries
- first aid knowledge
- European Alps

Contribution

A – Preparation of the research project
B – Assembly of data
C – Conducting of statistical analysis
D – Interpretation of results
E – Manuscript preparation
F – Literature review
G – Revising the manuscript

Corresponding author

Prof. Thomas Küpper, PhD, MD
e-mail: tkuepper@ukaachen.de
RWTH Aachen University
Department of Occupational, Social and Environmental Medicine
Pauwelsstraße 30, 52074 Aachen, Germany

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Introduction

Via ferrata (VF) climbing is an increasingly popular mountain activity in the European Alps. VF climbing refers to climbing mountain routes constructed with steel cables, iron pins, footholds, and ladders that are fastened to rock and allow climbers to harness themselves in order to increase their safety and prevent falls. Iron ropes, spikes, and steps are essentially fixed in rocks which otherwise would be difficult to climb.[1] A forerunner of the via ferrata was commissioned by Charles VIII in 1492 for the first ascent of Mont Aiguille (2078 metres).[2] The first modern VF routes were established at Rankluft (Berchtesgadener Land / Germany) in 1843 and at Grossglockner in Austria in 1869.[2] Another was constructed at Marmolada, Italy in 1903.[2] However, many early VF routes were established during World War I to help move soldiers through the mountains. Today there are more than 1,000 VF trails in the European Alps.[3]

In recent years the popularity of VF climbing in the European Alps has increased.[3] Unfortunately, increased participation in VF climbing has resulted in an increase of VF emergencies and climbing injuries. Establishing baseline data and the epidemiology of VF climbing injuries is difficult but in a 2008–2018 study, Ströhle et al. reported a 60% increase of VF incidents resulting in injury or death.[4] This increase in injuries raises concerns related to emergency response and the First Aid (FA) knowledge of VF climbers. FA in the mountains differs when compared to FA in urban settings because the conditions in wilderness settings and the patterns of injury differ significantly. The injury patterns in VF climbing also differ from other sports.

Due to a longer emergency response time to VF climbing incidents, the FA knowledge of VF climbers and their climbing companions becomes the first line of emergency response. The level of FA education can also influence the severity of the injury outcome. Unfortunately, the level of FA knowledge amongst VF climbers is not well documented. As a result, the purpose of this study is to identify both the nature of injuries among VF climbers and their FA knowledge. Understanding both will help develop future preventive actions and determine the level of FA knowledge required for VF climbers.

Material and methods

The data was collected from mountaineers at two locations where numerous VF climbers are on the move (Fiederepaß Hut, Allgäu Alps / Germany and Tucket Hut, Vedretta di Brenta inferior / Italy) in September 2016. At the Fiederepass Hut the participants had completed the "Mindelheimer Klettersteig", a VF of grade B according to Schall's system (for details about the grading system see Table S1 in the supplemental material). At Tuckett hut they had completed "Bochette Alte" which is grade E according to Schall. All VF climbers at the huts aged 18+ were included. The age limit was given by the ethical commission of RWTH Aachen Technical University (EK 096/09).

The study design was a questionnaire-based cohort study. Age, gender, height, weight, origin, partnership and children were also registered. Participants were asked to describe in detail any incidents they may have experienced on VFs and what action they took. In order to find out the level of training of VF climbers, they were asked about physical demands at work and sporting activities in their free time. In order to break down the years of mountain experience even more precisely, respondents were asked how many days a year they spend in the mountains and how many of these days are spent on VFs. Furthermore, the VF climbers were asked whether they are also rock climbers and at what level of difficulty they climb. They were also asked whether they climb with or without a guide, whether they have attended first aid, mountaineering or other courses and if so, when. Another question focused on any medical training.

The medical part of the questionnaire consisted of 18 multiple choice questions (five answers each, resulting in a total of 90 answers per subject, see supplement 1) about the following FA topics: hypothermia, shock, altitude sickness, cardiopulmonary resuscitation, frostbite, acclimatization, cardiac emergencies, head injuries, high-altitude pulmonary and cerebral edema, illnesses en route, fractures, rescue strategies, examination of an injured person, heat stroke and snow blindness. The questionnaire was validated by a control group of 20 physicians who had joined a training in alpine and mountain medicine (see also Figure 7). Finally, the respondents were asked to give a self-assessment of their knowledge of the above-mentioned topics. This was done using a 5-point Likert scale (very good, quite good, fair, incomplete, poor).[5,6]

The data was transferred to an ACCESS database and statistically analyzed using Excel and Origin Pro 8 (Microsoft Office Professional 2010 and OriginLab, Northampton, Massachusetts, USA). The statistics were first performed descriptively and then using non-parametric tests (chi-square test, Mann-Withney U-test) because they were not normal distributed (Kolmogorow test, Levine test). $P < 0.05$ was defined as significant, $p < 0.1$ was interpreted as tendency.

The emergencies were converted to cases per 1000 hours of sport according to the usual standards.[7] This results from the number of emergencies x 1000 divided by the product of the sum of the days that the test subjects spent in the terrain (mountain sports years x tour days per year, for each test subject) and the average number of hours per tour. The injuries were classified according to UIAA recommendation.[8,9] The injuries' location of this recommendation is similar to OSICS.[10,11] The results of the self-assessment were related to those of the FA questionnaire. A deviation of +/−25% was rated as "good self-assessment" of the individual knowledge while more than +/−75% was rated as "poor self-assessment".

Summarized, the methods were the same than used in earlier studies with mountaineers in the Western Alps[12] and in the Annapurna Region / Nepal[13] or Solo Khumbu – Mt. Everest Region / Nepal.[14]

Results

A total of 391 surveys were completed. Out of the total, 280 (71.6%) were completed by men and 111 (28.4%) were completed by women. Their age ranged from 18 to 79 years with an average age of 41 and a median age of 42 years (Figure 1).

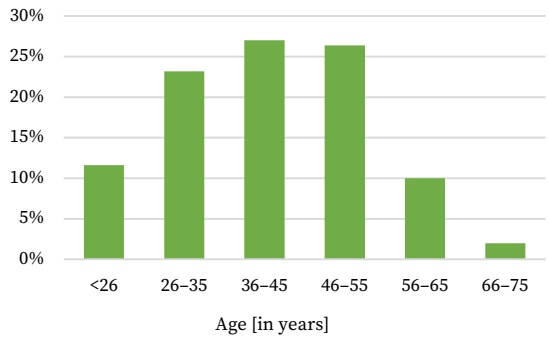

Figure 1. Age distribution of the collective

The BMI calculated for 367 (93.9%) of the participants averaged 23.4 kg/m^2 (17.6 to 32.0). Just under a quarter of participants (23.2%) were considered overweight with a BMI between 25–30. Another 1.4% were considered overweight with a BMI greater than 30 and 9.8% were underweight with a BMI less than 20.

The survey participants reported a number of acute injury and emergency incidents. Sunburns (23.9%), contusions (17.7%), open wounds (13.1%) and exhaustion (10.8%) were the most reported incidents (Figure 2). Injuries to the knee (21), hand (10), forearm (8), foot (7), and head (5) were the most reported injuries (Figure 3).

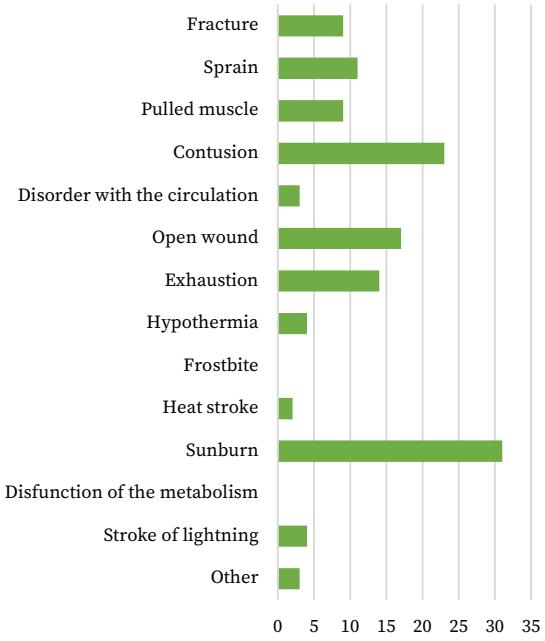

Figure 2. Types of emergencies which occurred in the collective

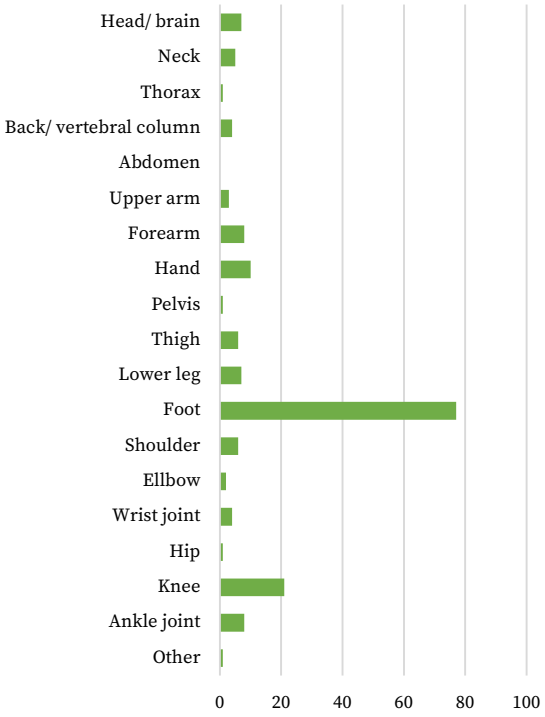

Figure 3. Location of the injuries reported

Weather conditions were identified as the primary contributing injury factor in 19% of all reported incidents. Stumbling (18.6%), falls (13.4%), and mental exhaustion (13.4%) were also identified as major contributing factors (Figure 4).

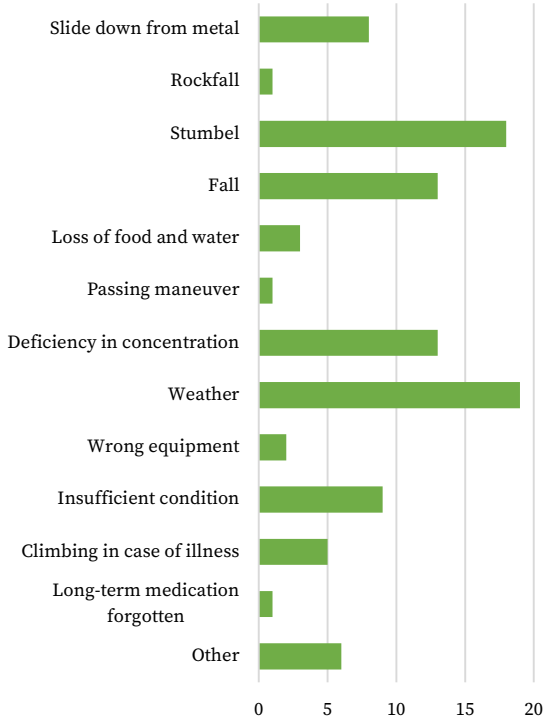

Figure 4. Causes of emergencies on via ferratas

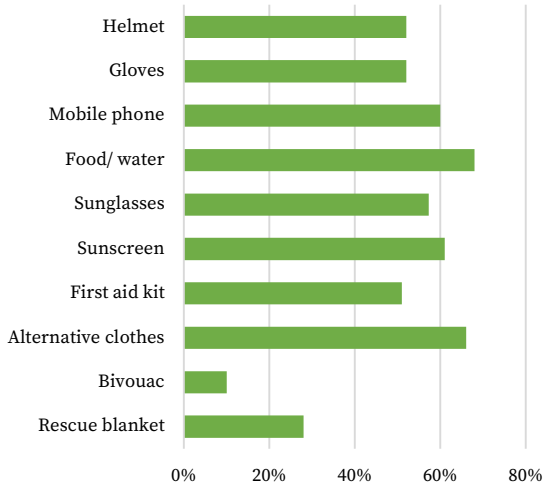

Figure 5. Emergency and safety equipment carried along by the collective

Out of all 391 VF climbers, 52% wore a helmet and gloves (Figure 5). A total of 68% of all climbers carried extra food, 66% carried a change of clothing, 61% had sunscreen, 60% had a mobile phone for emergencies, and 51% carried a first aid kit. Only 28% carried a rescue blanket and 10% had a bivouac bag. Additionally, out of the 196 VF climbers carrying first aid kits, abrasion bandages, dressing material, and sterile compresses was the most common first aid supplies (Figure 6).

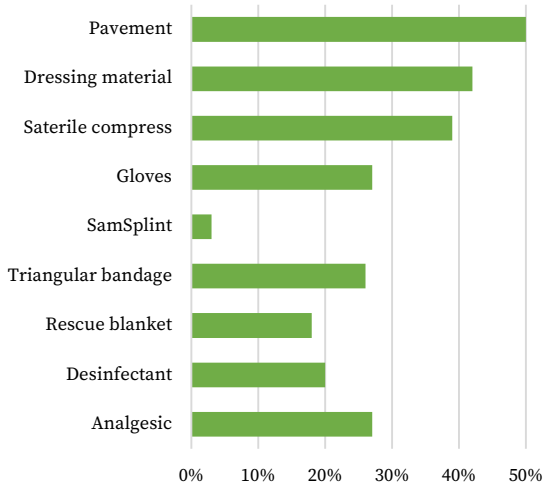

Figure 6. Equipment of the first aid kit

When asked about their prior mountaineering experience and physical fitness, 23.2% of participants reported spending 23 days a year in the mountains and 3.8 days participating in VF climbing. The average number of years spent climbing in the mountains was 19.5 years. One hundred and forty-seven (37.6%) of participants reported experience ice and rock climbing and 93.3% reported climbing without mountain guides. Out of the 391 VF climbers, only 4.4% reported exercising or training on a daily basis. Only 8 (2.1%) reported training six days per week, 22 (5.5%) trained five days per week, 40 (10%) trained four days per week, and 102 (25.9%) trained three days per week. Another 72 (18.3%) trained two days per week and 77 (19.5%) trained one day a week. A total of 53 (13.4%) of VF climbers reported zero training per week. When asked about the physical conditioning required in their profession working career, only 35 (9%) of participants stated the physical requirements of their job were demanding and required endurance training. Another 92 (23.5%) claimed moderate physical conditioning was needed, 140 (35.8%) reported only low levels of conditioning was required, and 124 (31.7%) stated no training was required.

Out of the total survey participants, 281 persons (71.9%) reported completing FA training while 110 (28.1%) reported no FA training. The time for those reporting FA training ranged from three months to 50 years prior. Differences of the results of both groups are given in Table 1. Sixty-one (16.2%) of the participants were paramedics, nurses, or members of a mountain rescue team. Another 15 (4%) identified as physicians or medical students. The remaining 315 participants had no medical education.

Table 1. Comparison of right answers of first-aid questions from people who attended a first-aid course less than three years before (N = 59) and more than three years before (N = 222)

Question no.	Correct answers from persons with a FA training less than three years ago (N = 59)		Correct answers from persons with a FA training more than three years ago (N = 222)		Significance level
	total	[%]	total	[%]	
Q1: Hypothermia	7	11.9	14	6.3	n.s.
Q2: Resuscitation*	6	10.2	6	2.7	$p < 0.05$
Q3: Lightning stroke	8	13.6	26	11.7	n.s.
Q4: Cardiological emergencies	40	67.8	100	45.1	$p < 0.01$
Q5: Injury of the back	2	3.4	2	0.9	n.s.
Q6: Resuscitation*	10	17.0	20	9.0	n.s. ($p < 0.1$)
Q7: AMS	1	1.7	10	4,5	n.s.
Q8: Frostbite	7	11.9	21	9.5	n.s
Q9: Snow blindness	32	54.2	82	36.9	$p < 0.05$
Q10: HAPE	2	3.4	6	2.7	n.s.
Q11: Shock	30	50.9	79	35.6	$p < 0.05$
Q12: Fracture	10	17.0	21	9.5	n.s.
Q13: Strategy of rescue	2	3.4	11	5.0	n.s.
Q14: Injury of the head	37	62.7	76	34.2	$p < 0.001$
Q15: Heat stroke	6	10.2	16	7.2	n.s.
Q16: Injury of the thorax	6	10.2	4	1.8	$p < 0.01$
Q17: Pain treatment	22	37.3	39	17.6	$p < 0.01$
Q18: HACE	46	78.0	79	35.6	$p < 0.001$

Note: Questions 2 and 6 concern various problems related to the topic of resuscitation (see Appendix 2: Questionare).

Twenty-three (5.8%) of participants reported suffering overuse injuries at some point in their VF climbing career. Knee pain, cramps, bursitis, shoulder pain, strains and sprains, and gonalgia were the most common medical situations the survey participants reported ever experiencing. Dehydration, insufficient training, long climbing routes, altitude, and a lack of overall preparation were the factors most reported to be associated with prior incidents.

Based on the 18 questions about wilderness first aid, a total of 35,190 answers could be analyzed. For most surveys the participants answered between 1–5 questions. Only 11 participants gave correct answers for 75% of their questions. Twenty-five participants were correct in 50%–75% of their answers, and thirty-four participants were correct in less than 25% of their answers. Figures 7 and 8 display the FA questions that were answered correct the most. Questions related to cardiac emergencies (49.6%), high altitude cerebral edema (43.2%), snow blindness (40.9%), injuries to the head (37.1%), and hemorrhagic shock (35.3%) were answered best. First Aid questions related to back and spinal injuries (1.0%), injuries of the thorax (2.8%), frostbite (9.0%), acute mountain sickness (4.1%), and rescue procedures were the least correct questions.

The actual data was compared with those of earlier studies. Therefore data from mountaineers in the

Western Alps[12] and trekkers in the Himalayas (Annapurna Region,[15] Everest Region[14]) were re-evaluated. All collectives did not differ significantly concerning their low level of specific FA skills (VF climbers vs. mountaineers $p = 0.998$, VF climbers vs. trekkers $p = 0.999$ and 0.829; mountaineers vs. trekkers $p = 0.992$ and 0.836, Figure 9).

The self-assessment "very good" of the FA knowledge is summarized in Figure 10. Significant differences between the self-assessment and the real performance were found for several topics.

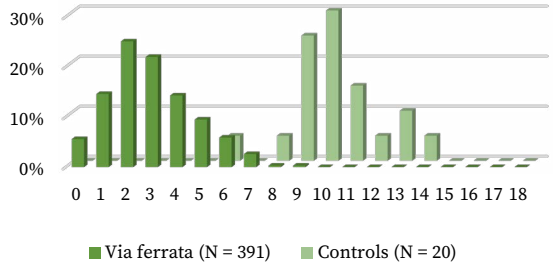

Figure 7. Correct answers per person (VF climbers of the actual study and a control group which had the same questionnaire (data from,[12] $p < 0.001$)

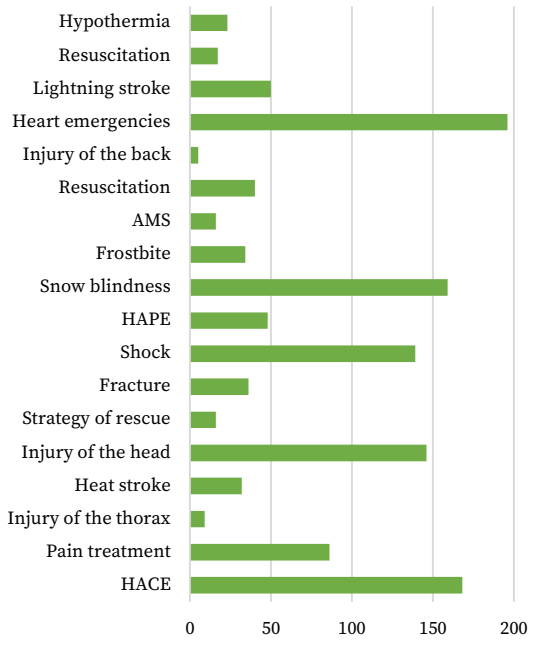

Figure 8. Correct answers of the First Aid questionnaire. AMS: acute mountain sickness; HAPE: high altitude pulmonary edema; HACE: high altitude cerebral edema

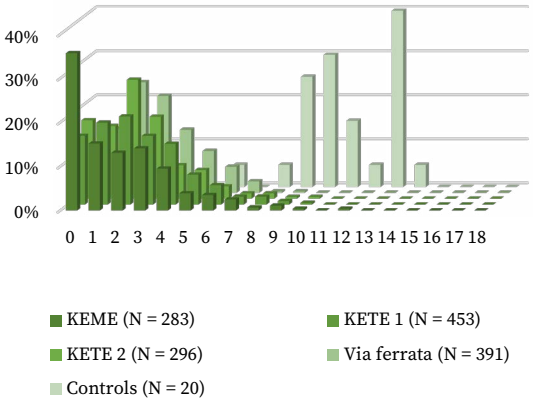

Figure 9. Correct answers of VF climbers and those of earlier studies with mountaineers in the Western Alps and trekkers in Nepal. KEME – Knowledge and Education in Mountaineering Emergencies – which studied mountaineers in the Western Alps;[16] KETE – Knowledge and Education in Trekking Emergencies – which studied trekkers in the Himalayas;[17] KETE1 in the Annapurna Region; KETE2 in the Everest Region

Discussion

While there is an existing body of research reporting alpine recreation injuries, there is a paucity of information focusing specifically on VF climbers and the FA knowledge of VF climbers. For example, The German Alpine Club (DAV) reports having the highest number of members worldwide and maintains a large database on alpine incidents and emergencies.[18] However, this database fails to report minor injuries making it difficult to calculate incident rates and rates that can be compared to other sporting activity.[7] It also fails to identify specific activities such as VF climbing. Thus, the findings of this study are unique and provide insight into the development of future safety and first aid training.

In the present study 71.6% of the VF participants were men and 28.4% were women. This supports a gender participation distribution consistent with several existing studies examining sport climbing and rock climbing injuries.[7,19–22] Additionally, the present study identified 20.2% of VF climbers as having some type of medical training. This trend is also identified in several studies examining mountain emergencies.[12–14,17] Finally, the age of VF climbers in the present study had a mean of 41 years of age. This is somewhat higher than other climbing research such as that by Küpper et al. who identified an average age of 36.8 years in climbers reaching the Margherita Hut in Switzerland and an average age of 29 and 27 in existing rock climbing

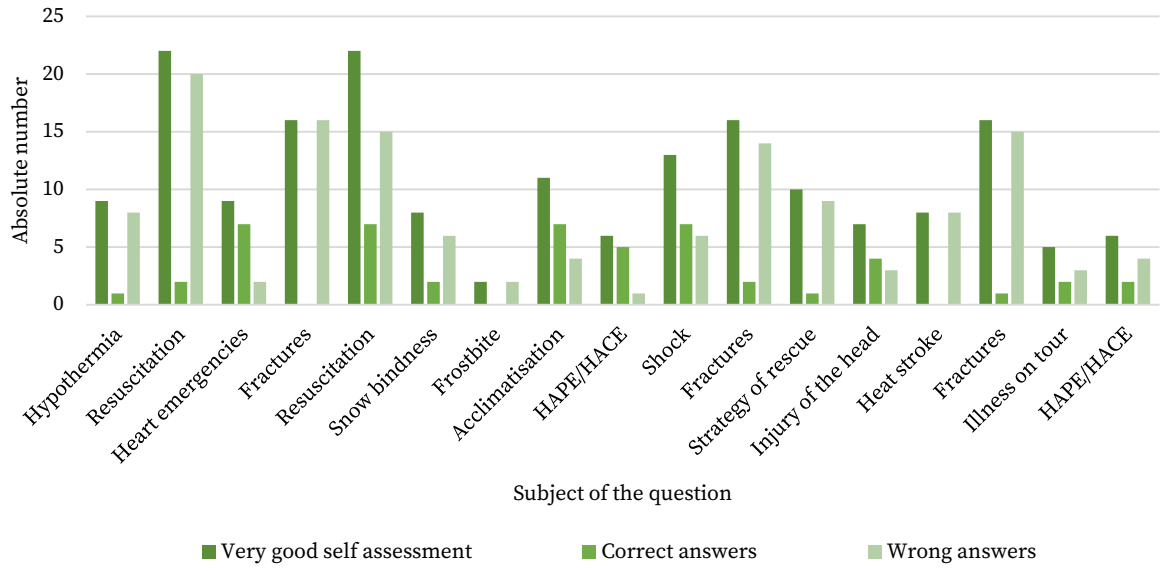

Figure 10. Comparison of the self-assessment "very good" with the corresponding correct and wrong answers. HAPE – high altitude pulmonary edema; HACE – high altitude cerebral edema

studies.[12,19,20,22] An explanation for this is the younger climbing demographic may be more interested in mainstream rock-climbing activities than VF climbing while older climbers may prefer VF climbing because it is perceived as a safer climbing activity.[23] As well, VF climbers younger than 18 were excluded from the present study as a condition of the ethical commission granting permission to this study. Other than this, it is reasonable to conclude the collective presented in this study is representative of the climbing community and the VF climbing community in general. Sunburns, contusions, open wounds, and issues related to exhaustion were the most reported incidents by the VF climbers in this study. Compared to existing studies of ice climbers, open wounds, frostbite, and hematomas were the most occurring incidents.[24–26]

In a general mountaineering investigation, Küpper et al. identified that almost 50% of mountaineering injuries were trauma related and 23% were medical/ internal incidents.[12] In the same study, only 13% of emergencies were related to heat stroke, sunstroke, hypothermia, and exhaustion and 8% were related to altitude sickness.[12] Thus, this study establishes an incident and injury pattern among VF climbers that is different from other mountaineering studies. This pattern combined with injuries to the knees, hands, forearms, feet, and head should play a significant role in future FA training for VF climbers. An emphasis on the prevention of these incidents should also be included. With only 52% of the VF climbers in the current study reportedly wearing a helmet and gloves, it is obvious that the number of hand and head injuries could easily be reduced if FA training emphasizes the importance of helmets and gloves. Only 37% of the VF climbers in the current study identified as regular mountain climbing participants and possibly explains why so few VF climbers were not utilizing safety equipment or even experienced with such safety equipment. Existing research does suggest that approximately 10% of VF climbers use inadequate safety equipment.[27]

The role exhaustion plays in mountaineering incidents is well documented.[28–34] Thus, it is not surprising that stumbling, general falls, and mental exhaustion were identified as major contributing factors to the injuries reported by the VF climbers participating in this study. However, the poor physical conditioning reported by the VF climbers in the study is alarming. The vast majority of the participants reported having no physical conditioning required as part of their day-to-day employment and the low number of VF climbers reporting regular physical training is an obvious link to exhaustion related injuries. It also suggests a lack of proper self-assessment in relation to the physical conditioning required for VF activities. This phenomenon as also found in other studies.[35] Furthermore, it is likely most of VF climbers were inexperienced in environmental conditions in which they were climbing and not prepared for higher altitudes and the steep, vertical, and overhanging terrain. Thus, it easy to understand how the demands of a VF route can easily exceed the

ability of the individual VF climber. This lack of physical conditioning and predisposition for exhaustion that results in injuries has been identified as a chain of causation.[28,30,31]

Along with the findings related to physical conditioning, the examination looking at climbers FA knowledge identified some interesting trends. First, just over 25% of the climbers reported never taking part in any FA training course. This is somewhat surprising provided most climbers held a European drivers license from a country requiring drivers to have FA knowledge. Second, the most correct answers were related to questions about cardiac emergencies, high altitude cerebral edema (HACE), snow blindness, head injuries, and haemorrhagic shock. The most incorrect answers were related to questions about back injuries, thoracic trauma, frostbite, acute mountain sickness, and rescue strategies. Given the predominance of cardiac emergencies in modern society, it is understandable that individuals have a basic understanding of how to respond to cardiac incidents. Likewise, an understanding of high altitude-related conditions can be expected among climbers. The answers that were answered incorrect are generally conditions not prevalent in more urban settings and are generally absent from most FA training. This does not negate their importance as situations such as back injuries and thoracic trauma are common in VF climbing and can be life threatening. In addition, a general lack of knowledge related to rescue procedures can be life threatening. In these situations injured and ill climbers often become dependent on the knowledge and ability of their climbing companions along with the time to rescue.[36] For example, a climber with significant back or thoracic trauma will have a decreased chance of survival without quick medical aid and a rescue time which is over 30 minutes even in a region with perfect infrastructure (Zermatt with its helicopter base).[36]

There was no significant difference of the FA knowledge between the actual and all the other re-evaluated groups of climbers indicating a general deficiency of problem awareness. Beside others an important factor may be that there is a lack of specific courses. Climbers realize that a standard FA training, designed for urban emergencies, does not fit with the demands of climbing. Therefore differentiated trainings should be available which address the specific conditions of the respective discipline. It is recommended that climbers intending to participate in VF climbing activities take part in FA training prior to VF climbing regardless of their level of experience. Along with regular FA training, VF climbers should seek out training related to preventing and managing sunburns, contusions, open wounds, and exhaustion and how to pack proper first aid kits and use helmets and climbing gloves. Likewise, based on the findings of this study, any training should seek to fill knowledge games about head, back, and thoracic injuries, mountain sickness, and frostbite. It should also include a section on First Responder and rescue training strategies and the importance of physical conditioning and correct self-assessment prior to participating in VF climbing activities.[37] Participants of trainings need to realize the problem and must be given a solution together with an explanation.[38–43] Existing research has identified a general decrease in knowledge post training.[37,44–48] Therefore, training and refresher courses are recommended every two or three years.

Conclusion

The purpose of this study was to identify the nature of injuries to VF climbers in the European Alps and examine the depth of their FA knowledge. The study identified sunburns, contusions, open wounds, and a chain of injuries related to exhaustion as the major injuries incurred by VF climbers. It also identified that only half of VF climbers wore safety helmets and gloves, only 25% of the climbers remembered having any FA training, very few had recommended physical endurance training, and that most VF climbers were void of knowledge related to treating back and thoracic injuries and their associated rescue needs. FA training that stresses adequate fitness, the major injuries incurred by VF climbers as well as mountain sickness, frostbite, head, neck, and thoracic injuries is recommended at least every two or three years.

Additional information

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Ethical Board of RWTH Aachen Technical University, Aachen / Germany (Ref. No. Ek 096/09)

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data are available on request.

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Appendix 1

Table S1. The international difficulty scale of via ferratas

Category	Factors	Description
A	Path	Easy, challenging parts secured, well marked
	Terrain	Adequate holds and steps, little steps. Short outsettled spots, climbing is possible mosto f the time without securing.
	Securing	Wire ropes, chains, ladders, bridges, iron clamps
B	Path	Easy to alpine, exposed spots secured, well marked.
	Terrain	Flat and steep terrain interplay, exhausting and power robbing passag-es alternate with easy, relaxing ones. Good standing and resting spots.
	Securing	Wire ropes, ladders, bridges, iron clamps. Steps in a combination that asks for more body control than grade A.
C	Path	Alpine, step security, orientation ability are prerequisite.
	Terrain	Steep terrain, exposed passages and vertical parts. Grips and steps are small. Exhausting and power robbing passages are common.
	Securing	Wire rope, ladders, bridges, iron clamps and steps. In this combination one requie more power and courage.
D	Path	Alpine, step security, orientation ability are prerequisite. Short parts of easy grade freee climbing without secouring possibilities can occur.
	Terrain	Precipice extreme! Exposed and overhanging spots. Exhausting and power robbing passages are common. For experienced climbers only.
	Securing	Wire ropes, ladders, bridges, hardly any iron clamps and steps. Even the difficult parts are often secured only by wire ropes.
E	Path	Alpine, step security, orientation ability are prerequisite. Short parts of easy grade freee climbing without secouring possibilities can occur.
	Terrain	Precipice extreme! Exposed and overhanging spots. Spotted with exhausting and power robbing passages are common. For experienced and well trained climbers only.
	Securing	Almost only a through passing wire rope. Hardly any ladders and bridg-es. Steps only in exceptional cases. There are seldom any emergency exits.

Source: Bressan G, Melchiorri C. *Via Ferrata: A short introduction.* CAI – Club Alpino Italiano. https://theuiaa.org/documents/sport/Via-Ferrata-Brief-History-and-Difficulties.pdf. Accessed August 21, 2023.

Appendix 2

Questionare

Cover letter

Dear climber,

in the last 10 years were plenty researches on rock climbing were done and many of them have improved the savety and the treatment options of climbing injuries.

The situation on so-called "via ferrata" is completely different. There are no data about typical injuries, accidents or rather overuse injuries. This causes a biased view and it is also not possible to develop a specific first-aid ouse for your sport.

In public this kind of sport is often presented as a high-risk extremsport. Leading insurances judge this sport as very dangerous -without having any data! As a climber you know, that this generalization is not acceptable.

To get valid data, we as sport medicine specialists of the University of Aachen in close cooperation with the Medical Commission of the UIAA (Union Internationale des Associations d'Alpinisme), perform an international study about these topics. An essential element of this study is the present questionnaire. It would be nice, ifyou offer some minutes to answer the questionnaire as accurately as possible. Note: Please answer also the questionnaire if you never had an injury or overuse injury!

We assure, that your data won't be passed to any third person. The personal data will be deleted after analysis. This is a rule which has to be fulfilled for the ethics commission of the university (the entire study was controled and approved by the ethical commission).

For any questions, please contact us directly. In the case of subsequent questions please use the following email addresses.

Thank you very much for your cooperation!

.....

(Signatures)

No.: .....

Surname: .....

Name: .....

Letter of consent (participant's part)

I agree that the data I have given in the "questionnaire going via ferrata" can be saved and analyzed fort he study dealing with "injuries and overdue injuries while going via ferrata".

The investigators assured me, that the analysis of the data will be done anonymously and that the personal data will be deleted after the exploration.

No personal data will be given – exept the demand from by law authorized institutions (for example the ethics commission of the RWTH Aachen) – in any form to a third person.

.....

(date, place, signature of the participant)

.....

(date, place, signature of the investigator)

No.: .....

Surname: .....

Name: .....

Letter of consent (inverstigator's part)

I agree that the data I have given in the "questionnaire going via ferrata" can be saved and analyzed fort he study dealing with "injuries and overdue injuries while going via ferrata".

The investigators assured me, that the analysis of the data will be done anonymously and that the personal data will be deleted after the exploration.

No personal data will be given – exept the demand from by law authorized institutions (for example the ethics commission of the RWTH Aachen) – in any form to a third person.

.....

(date, place, signature of the participant)

.....

(date, place, signature of the investigator)

Please answer the questions, which are marked with a small box, with a cross ("X") and questions with a free space ..... by filling in numbers or keywords. Please answer the questions without team work (after filling in we can talk about "right" and "wrong").

Personal questions

Age: ..... Years .....

Male ❒ Female ❒

Size: ..... cm Weight: ..... kg

Country: D ❒ CH ❒ A ❒ F ❒ I ❒ or: .....

Realationship? Yes ❒ No ❒

Children? Yes ❒ No ❒

How much is your physical demand when you are active in your profession?

Very much ❒ Medicore ❒ Little ❒ Not at all ❒

Do you do regularly (in season) perform endurance sports? No ❒, or:

Daily ❒ 6x/week ❒ 5x/week ❒ 4x/week ❒ 3x/week ❒ 2x/week ❒ 1x/week ❒

Mountaineering experience (years): .....

How often are you in the mountains per year?..... Days

How many of these days do you go via ferrata? ..... Days

Are you also a rock climber? Yes ❒ No ❒

If yes:

What is your limit leading? ..... (UIAA or french scale)

What is your limit seconding? ..... (UIAA or french scale)

Predominant alpine? ❒

or predominant indoor climbing or rocks/ cliffs? ❒

Do you go predominantly WITH ❒ or WITHOUT ❒ guide?

Did you have ever participate in a couse?

Climbing ❒ When? ……..

First-aid ❒ When? ……..

Other ❒ When? ……..What kind of couse? ……..

Do you have medical knownoledge as

First-aid attendant/nurse/mountain rescue service ❒

Medical student/doctor ❒

No medical profession ❒

Actual via ferrata(s) (planned or recently done):

Mindelheimer Klettersteig ❒

Sentiero Alfredo Benini ❒

Sentiero delle Bocchette Centrale ❒

Sentiero delle Bocchette Alte ❒

Via delle Bocchette SOSAT ❒

Sentiero Osvaldo Orsi ❒

Sentiero Livio Brentori / delle Ideale ❒

Sentiero Ettore Castiglione ❒

Sentiero Gustavo Vidi / Claudio Constanzi ❒

other: ……..

Please discribe your injuries or othe incidences, which occured while doing a via ferrata. You have to distinguish between two kinds of health impairment: urgent or overdue.

Urgent events occure while or in direct connection with going a via ferrata and have to be treated in some way (e.g. wounds, torn ligaments, fractures etc.) or have a noticeable impairment (e.g. sunburn).

Overdue injuries are physical damages (especially incessant pain), which make one or more of the following necessary: treatment, hospitalisation, a break of climbing for at least one week, unfit for work, consultation of a physician or physiotherapist (e.g. problems of tendons, muscles or joints) and which are occured without a direct force or impact (fall, rockfall).

Overdue injuries

Did you ever have an overdue injury caused by going a via ferrata?
Yes ❒ No ❒

If "Yes", how many injuries like this did you have? ……..

Did you have more than one overdue injury?

❒ No ❒ Yes. In this case please contact us immediately!

Kind of overdue injury			
Possible cause			
Attended a physician?	Yes ❒	No ❒	
Attended a physio-therapist?	Yes ❒	No ❒	
Attended a naturo-pathic doctor?	Yes ❒	No ❒	
Unfit to work?	Yes ❒	No ❒	How long?:
Treatment necessary?	Yes ❒	No ❒	How long?:
Hospitalization?	Yes ❒	No ❒	How long?:
Break of climbing?	Yes ❒	No ❒	How long?:
Chronic symptoms?	Yes ❒	No ❒	Which one?:
Remark?			

Did ever occure overdue injuries in any other sport?

Yes ❒ No ❒

If "Yes": Which one? / In wich kind of sport?

……

Acute emergency

Did you have more than one emergency?

❒ No ❒ Yes. In this case please contact us immediately!

Kind of emergency?	❒ Fracture	❒ Spain
	❒ Strein	❒ Contusion
	❒ Cirulatory distur-bulance/ collapse	❒ Open wound
	❒ Faintness/ exhaus-tion	❒ Hypothermia/ undercooling
	❒ Frostbite	❒ Heat stroke
	❒ Sunburn	❒ Metabolic dis. (e.g. diabetes)
	❒ Lighning stroke	
other:	……..	……..
Location of the injury? (if necessary mark several boxes with a cross)	❒ Head/brain	❒ Neck
	❒ Chest/ thorax	❒ Back/ vertebral column
	❒ Abdomen/ lower abdomen	❒ Upper arm
	❒ Forearm	❒ Hand
	❒ Pelvis	❒ Upper leg
	❒ Lower leg	❒ Foot
	❒ Shoulder	❒ Elbow
	❒ Wrist joint	❒ Hip
	❒ Knee	❒ Ankle joint
other:	……..	……..

Cause? (if necessary mark several oxes with a cross)	❒ Slip off from metal steps etc.	❒ Rockfall
	❒ Strumble	❒ Fall
	❒ Hunger/ energy deficiency	❒ Passing manoeuvre
	❒ Fatigue/ lack of concentration	❒ Weather conditions
	❒ Inadequate equipment	❒ Lack of fitness
	❒ Climbing with illness	❒ Long-term medication forgotten
other:	……..	……..
Existing equipment? (if necessary mark several boxes with a cross)	❒ Helmet	❒ Gloves
	❒ Mobile phone	❒ Provisions/ beverage
	❒ Sunglasses	❒ Sunscreen
	❒ First-aid kit	❒ Clothes/ weather protection
	❒ Bivouac sack	❒ Emergency blanket
other:	……..	……..
What contained the first-aid kit? (if necessary mark several boxes with a cross)	❒ Pavement	❒ Dressing meterial
	❒ Sterile compresses	❒ Hygienic gloves
	❒ SamSplint	❒ Triangular bandage
	❒ Emergency blanket	❒ Desinfection agent
	❒ Analgetic, which one?: ……..	
other:	……..	……..
Emergency treated by? (if necessary mark several small with a cross)	❒ Myself	❒ Comrade/ other climber
	❒ Emergency medical services	❒ No treatment

Please answer the following questions by marking the correct statements. Remark: more than one may be correct!

1)	**In bad weather you meet an uninjured person wearing shorts and T-shirt. He isn't able to descent further. He isn't completely conscious.**	
a	The person is not suffering from severe (dangerous) hypothermia.	
b	The person should be forced to descent as fast as possible.	
c	Kneading and massage improves the situation.	
d	If a bivouac can't be avoided, protection against moist is more important than against wind.	
e	If possible the person should not be moved.	

2)	**You find an unconscious mountaineerer who has neither pulse nor signs of respiration.**	
a	During resuscitation pulse control should be performed at the person's wrist.	
b	The pressure point for cardiac resuscitation is localised at the left side of the breast above the heart.	
c	The normal exspiratory volume of the assistant is sufficient to breathe the unconscious person.	
d	If the cardiopulmonary resuscitation is sufficient, the previously dilated pupils contract again.	
e	Superextension of the head to clear the airways should be avoided since there is a risk of a fractured neck and superextension would lead to a damage of the spinal cord.	

3)	**A mountaineerer was hit by a lightning.**	
a	Even if he should feel well, he must be monitored for several days (hospital).	
b	Such an incident normally will not be survived.	
c	Also without a fall the victim must be checked for fractures.	
d	Attention: if one touches this person one can suffer from an electric shock.	
e	Danger to life can be excluded if the person wasn't hit directly.	

4)	**While descending you meet a 50-years-old hiker. He is nervous, agitated, and reports about chest pain.**	
a	You tell him to descent slowly, because the problems will become better then.	
b	He should lie on his back with heightened legs (shock position).	
c	Probably he has a problem of the airways, e.g. a bronchitis.	
d	He must be carried down. He should not exhaust himself any more.	
e	If the pain doesn't radiate to the left arm it is probably not a cardiac disease.	

5)	**After a fall a mountaineerer reports of back pain at his thorax.**	
a	There is a particular risk of hypothermia.	
b	You should test whether there are deficiencies of the tactile sense or of the muscles of the legs.	
c	Involuntary urination may be a sign for a severe back injury.	
d	Until a final diagnosis was done (hospital) any movement should be avoided.	
e	Normally injuries of the back are easy to recognize because of the pain.	

6)	**A mountaineerer breaks through a snow bridge and falls into the creek below. Because of technical problems the comrades need about ¼ hour to get him out. After rescue he is unconscious without respiration and his pulse is extremly slowly and irregular.**	
a	Regarding the situation in the mountains there is no hope for a success of resuscitation performed by the comrades.	
b	At all events one must supply as much warmth as possible.	
c	Resuscitation must be started at once.	
d	In this concrete case resuscitation is promising even if rescue took some time.	
e	Awaking of the patient indicates the success of the resuscitation.	

7)	**In the evening a mountaineerer reports about severe stabbing frontal headache and eye's pain (at a hut in 3400 m).**	
a	Snow blindness is unlikely, because the whole day was misty.	
b	It should be exertion or altitude related headache.	

c	One should give him a tablet against headache and can expect that there will be no symptoms at the next morning.	
d	First Aid is laying down in a dark room and cooling eyes and forehead.	
e	Normally there will be a slow improvement of the symptoms within some days.	

8)	**A mountaineerer suffers from frostbite of his fingers.**	
a	Early signs of a severe frostbite are blisters and red skin.	
b	Also after reaching a hut alcohol is strictly forbidden.	
c	Moderate frostbite should be treated by massage or rubbing with snow.	
d	Analgetics should not be used.	
e	A frostbite should be waded and bandaged loosely.	

9)	**In the evening a mountaineerer suffers from lack of appetite, slight nausea, and headache at the Mantova Hut (3400m).**	
a	Probably he suffers from influenza.	
b	If the symptoms don't become worse continuing to Margherita Hut (4560m) should be possible without problems.	
c	He should stay at least one day at the Mantova Hut (rest day).	
d	The sickness can be avoided by ascending to high altitudes during several days.	
e	If the symptoms should become worse, he must descent.	

10)	**At the Margherita Hut 4560 m) a mountaineerer reports about air hunger. His breath rattles, sometimes he coughs.**	
a	Although he seems to be absolutely inconspicuously and he is conscious, there is acute danger for life.	
b	In most cases such a situation will improve spontaneously until the next day.	
c	After transportation to sea level (or in the next valley) the symptoms will be much better.	
d	Although the person is conscious, he should get oxygen immediately (at Margherita Hut available!).	
e	The person should be placed with a heightened chest.	

11)	**A victim has lost much blood.**	
a	One should expect the following additional symptoms: paleness, raised pulse rate.	
b	One should expect the following additional symptoms: normal pulse, but dry and warm skin.	
c	The victim should be placed in horizontal position and with heightened legs (shock position).	
d	The victim should drink as much as he can to compensate the loss of blood.	
e	Cold-moist skin would contradict a shock.	

12)	**After a fall a mountaineerer reports about severe pain in his thigh. He is unable to move the leg as well as to load it.**	
a	A shock is possible although no external (visible) injury are obvious.	
b	By fixation and a slight pull at the foot a reduction of pain can be obtained.	
c	Deviations from the leg's axis should never be corrected on scene.	
d	It should be a severe contusion.	
e	The injured leg should be placed heightened.	

13)	**Strategy in cases of emergencies.**	
a	Each injury registered during checking the patient must be treated at once.	
b	If one expects a victim could die during a bivouac, the only chance is to force a transport to the next hut performed by the comrades.	
c	The safety of the rescuer is without any exception more important than the immediate medical attendance of the victim.	
d	An objective danger may demand an immediate transport of the victim without treatment.	
e	A retreat with a victim in easy terrain often strengthens more than in steep terrain.	

14)	**A hiker fell down and is unconscious.**	
a	Victims with head injuries should be placed flat.	
b	A fall on a smooth surface (e.g. a moss patch) would exclude dangerous head injuries.	
c	A cerebral trauma could be recognised by wounds of the head.	
d	It has to be considered that injuries of the head are often associated with injuries of the cervical vertebra.	
e	Dilated pupils indicate that there is no damage of the brain.	

15)	**After a several-hours walk shortly above tree limit at summer-like conditions a hiker collapses with the sign of a deep red head.**	
a	If he has a dry and hot skin, he probably suffers from a heat-stroke.	
b	The fastest improvement could be obtained by cooling the person with water as cold as possible.	
c	A cardiac disease can be excluded.	
d	This disease could be avoided by wearing a headgear.	
e	After a long rest and complete recovery a slow descent without any luggage is usually possible.	

16)	**After a fall the victim complains of severe pain in the right breast and difficulties to breathe.**	
a	The hurt person should be laid on his injured right side.	
b	Probably there is a fracture of several ribs.	
c	Since only one side of the breast is injured, one shouldn't expect a danger of life.	
d	If air exits out of the wound, it has to be closed by a tight bandage.	
e	To avoid secondary injuries, the person should be laid on his uninjured left side.	

17)	**Analgesia in the wilderness.**

a	In case of severe abdominal pain relaxing the abdominal wall and heighten the legs would help.	
b	Aspirine and similar analgetics do not have adverse effects.	
c	In emergencies the use of strong analgetics persons with less medical experience could be recommended.	
d	Severe pain could be induced by warming up a frostbite.	
e	Circulation and respiration could be impaired by pain.	

18)	**Check these statements for correctness!**	
a	In high altitude severe headache could be caused by a sunstroke as well as by a high-altitude cerebral edema.	
b	In high altitude (snow/ice) a heat stroke is not expectet.	
c	An alpinist with a high-altitude cerebral edema attracts attention e. g. with an incertitude of gait or unexpected reactions and acts.	
d	Nightly sharp headache is normaly a sign for a high-altitude sickness and never for snow blindness (darkness).	
e	The measure to ameliorate a high-altitude cerebral edema are oxygen therapy, transport in lower level and – if available – administration of cortisone.	

Please assess your knowledge on first aid in mountaineering emergencies of the following subjects. (Please mark only one category in each row.)

	Very Good	**Well**	**Average**	**Fragmentary**	**Little**
Hypothermia	❒	❒	❒	❒	❒
Shock	❒	❒	❒	❒	❒
Mountain sickness	❒	❒	❒	❒	❒
Cardiopulmonary resusitation	❒	❒	❒	❒	❒
Frostbite	❒	❒	❒	❒	❒
Acclimatisation	❒	❒	❒	❒	❒
Emergencies of the heart	❒	❒	❒	❒	❒
Head injuries	❒	❒	❒	❒	❒
Fractures	❒	❒	❒	❒	❒
Rescue strategies	❒	❒	❒	❒	❒
Checkup of injured person	❒	❒	❒	❒	❒
High-altitude pulmonary edema/ cerebral edema	❒	❒	❒	❒	❒
Illness on the way	❒	❒	❒	❒	❒
Heat stroke	❒	❒	❒	❒	❒
Snow blindness	❒	❒	❒	❒	❒

Remarks/ suggestions for future education:

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If you want to know the result of the study, please write down your email address:

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Thank you very much for your cooperation!