

Accidents, Psychological Incidents and Near Misses – Report 2002/2003

A Survey Compiled by the European Ropes Course Association (ERCA e.V.)

Frank Schweinheim

Since 2002, ERCA has been carrying out an annual survey of accidents, near misses and psychological incidents on ropes courses. The survey includes ERCA members only. Participation is on a voluntary basis. Members' observations about accidents and incidents are recorded via a questionnaire and sent to ERCA's health and safety working party. This working party consists of 4 experts, who conduct a qualitative and quantitative analysis of the reported cases. The aim of this longitudinal study is twofold: a) to record occurrences on ropes courses; b) to undertake research into the causes of accidents on ropes courses. The overall intention is to develop knowledge and expertise, processes and tips for the prevention of accidents on ropes courses.

This report summarises the results of the first two years of the ERCA survey. It is made available to ERCA members for information and discussion purposes.

We would like to thank all those members who generously volunteered critical information about their personal experiences, and especially for their suggestions for health and safety improvements.

When looking more closely at the data provided by the small group of members, it becomes apparent that wherever ropes courses are being operated, similar near misses and mistakes to the ones reported have already happened, or are likely to happen in the future. It is therefore our intention to establish the frequency and extent of accidents for specific activities, to identify the causes of these accidents, and to discuss and develop relevant suggestions for the prevention of these accidents. We also want to draw your attention to the fact that the documentation of near misses and psychological incidents is of equal importance to accidents in terms of understanding health and safety risks. Serious accidents are often a result of multiple incidents occurring either simultaneously or consecutively (chain reaction). They may have been preceded by a number of situations which just about turned out to be okay – near misses in other words!

Near misses are often a result of typical behavioural patterns, technical conditions, a specific situation or organisational circumstances. Experienced ropes course operators and facilitators who are attentive and cautious, recognise

these conditions and take pre-cautionary measures. We can learn from near misses and take pre-cautionary steps, before people get hurt.

Data Analysis

The collation of data resulted in a vast amount of figures, data and facts, which at this stage cannot be presented at the same level of detail. The data may yet be helpful in the future, for a longitudinal study. The statistical data presented here includes details about:

- The type of incident/accident
- The number of incidents/accidents on high and low ropes courses
- A comparison of the number of incidents/accidents on stationary and mobile ropes courses
- The type of injuries
- The point in time during the programme when the incident/accident happened.

We are publishing the quantitative statistical information in order to document first impressions and trends of our analysis, despite the fact that our sample is too small for drawing any wider conclusions. After a general description and summary of the number and types of recorded incidents and accidents, we give a more detailed description of accidents and near misses, followed by a categorisation of occurrences with comments.

The final part briefly describes the different categories and draws conclusions about the prevention of accidents.

Results

In 2002 and 2003, a total of 28 incidents and accidents were reported. In 2002, 17 incidents were reported, 4 near misses (NM), one psychological incident (PI) and 12 accidents (A). In 2003, 11 reported incidents and accidents in total show a decline of occurrences across the board (3 NM, 0 PI, 8 A in 2003).

		Type of Incident/Accident			Total
		Near Miss	Psychological Incident	Accident	
Year	2002	4	1	12	17
	2003	3	0	8	11
Total		7	1	20	28

Chart 1: Number and type of incidents/accidents in 2002 and 2003.

Comparison of Incidents and Accidents on High and Low Ropes Courses

23 incidents and accidents were reported for high ropes courses; in contrast to only 5 on low ropes courses.

Type of Ropes Course			Type of Incident/Accident			Total
			Near Miss	Psychological Incident	Accident	
High Ropes Course	Year	2002	4	1	11	16
		2003	3	0	4	7
	Total		7	1	15	23
Low Ropes Course	Year	2002			1	1
		2003			4	4
	Total				5	5

Chart 2: Incidents and accidents on high and low ropes courses in 2002 and 2003.

Comparison of Frequency of Incidents and Accidents on Stationary and Mobile Ropes Courses

Chart 3 shows the frequency of incidents and accidents on stationary and mobile ropes courses. 24 occurrences were reported on stationary ropes courses, only 4 on mobile ropes courses.

Type of Ropes Course			Type of Incident/Accident			Total
			Near Miss	Psychological Incident	Accident	
mobile	Year	2002			3	3
		2003			1	1
	Total				4	4
stationary	Year	2002	4	1	9	14
		2003	3	0	7	10
	Total		7	1	16	24

Chart 3: Frequency of incidents and accidents on mobile and stationary ropes courses in 2002 und 2003.

We would like to issue a word of caution against a more far-reaching interpretation of the data provided, for the following reasons:

- More incidents and accidents were reported for stationary than for mobile ropes courses, and there was a higher number of accidents on high ropes courses than on low ropes courses. These facts are in line with the

- professional profile of our members, with a majority of ERCA members offering high ropes programmes on stationary ropes courses.
- The reported number of incidents and accidents is too small for drawing any conclusions which are statistically reliable or meaningful.
 - The ratio between the number of programme days and the frequency of incidents and accidents is still unknown. First indications show a very high number of programme days on stationary ropes courses in comparison to mobile ones.

We introduced the Annual Accident Survey in 2003. By the end of the year, ERCA members were asked about their total number of participant days of that year. Participation in the survey was on a voluntary basis. In line with ERCA's membership profile (which includes facilitators, training organisations, ropes course builders and ropes course associations), the number of annual participant days per member varies between 24 and 7800. The total number of participant days in 2003 is 24362 days. The analysis of the data provided means a ratio of 1:2214 for incidents and 1:3045 for accidents. This means that based on our Accident Survey 2003 and the information about incidents and accidents provided by members, one incident occurred for every 2214 participant days, and one accident for every 3045 participant days.

	Frequency	Percentage	Valid Percentage	Total Percentage
Valid 24	1	9,1	9,1	9,1
25	1	9,1	9,1	18,2
70	1	9,1	9,1	27,3
180	1	9,1	9,1	36,4
390	1	9,1	9,1	45,5
515	1	9,1	9,1	54,5
1137	1	9,1	9,1	63,6
3000	1	9,1	9,1	72,7
3750	1	9,1	9,1	81,8
7471	1	9,1	9,1	90,9
7800	1	9,1	9,1	100,0
Total	11	100,0	100,0	

Chart 4: Total number of participant days in 2003 = 24.362 days.

Time of the Incident/Accident

The analysis of the timing when an incident/accident happens during a programme shows a direct correlation: the longer the programme, the higher the accident rate. 6 reported cases were without indication of the timing of the incident/accident and length of programme. These cases are listed as 0 in the chart. Both accidents reported during the first hour of a programme occurred as

part of the MohawkWalk. Operational errors and belaying mistakes using Munter hitch belays and figures of eight resulted in near misses. The time when most incidents/accidents happened was during the 5th and 6th hour of programmes.

		Type of Incident/Accident			Total
		Near Miss	Psychological Incident	Accident	
Which Hour	0	1	1	3	5
	1	0	0	2	2
	2	2	0	0	2
	3	0	0	4	4
	4	1	0	1	3
	5	1	0	4	6
	6	1	0	4	5
	8	0	0	1	1
Total		7	1	21	29

Chart 5: Time of incidents/accidents.

Type of Injury

Accidents reported for low ropes courses lead to abrasions, bumps, a sprained back and light headaches. In most cases, these injuries were a result of falling down from low elements. The number and seriousness of injuries on high ropes courses is greater due to participants falling down from greater heights or crashing into ropes course elements.

In addition to shoulder dislocations, contusions and bruising, other injuries like ruptured lungs, spine injuries and one case of fainting were reported. The reports below illustrate the causes and the way the accidents happened in more detail.

		1.1 Type of Ropes Course		Total
		High Ropes Course	Low Ropes Course	
Type of Injury	None	9	0	9
	Torn Achilles tendon	1	0	1
	Abrasions, light friction burns of the fingers on both hands, spraining of the spiral column	1	0	1
	Ruptured lungs	1	0	1
	Dislocation of right shoulder, light friction burns of the wrist	1	0	1
	Dislocation of shoulder	1	0	1
	Fainting	1	0	1
	Bruising of testicles	1	0	1
	Vertebral fracture, broken vertebra			
	Damage to the lumbar vertebra, spraining, pulling of muscles or tendons	1	0	1
	Bump, light headache	0	1	1
	Bruise on the calf	1	0	1
	Abrasion	0	1	1
	Small cut above the eye	1	0	1
	Light pain at the back of the neck and the back of the head, light headache	0	1	1
	Light swelling and reddening of the knuckles (right hand)	1	0	1
	Contusion/bruising	1	0	1
	Bruising of the face (above the eye), small bruising	1	0	1
	Reddening of the cheek	1	0	1
	Sprained back with a light headache	0	1	1
	Abrasions	0	1	1
Total		23	5	28

Chart 6: Type of Injury and frequency on high and low ropes courses, 2002 and 2003.

In this report, we are not attempting a more in-depth analysis of the data due to the limited size of the sample.

Accident Reports

The ERCA Accident Survey consists of a range of open and closed questions about the location of the accident, the way the accident happened and other relevant information. Some of the questions were answered in great detail, others were not answered at all. As we describe the cases based on the answers that members provided in their questionnaires, you will find that some cases are described in more detail than others.

Cases were categorised systematically according to the following criteria:

- Incidents/accidents on mobile ropes courses before incidents/accidents on stationary ropes courses
- Incidents/accidents on low elements before incidents/accidents on high elements

In addition, other functional criteria applied are:

- Falls
- Injury as a result of jumps
- Unclear or incomplete safety procedures
- Injuries caused by ropes course construction parts
- Injuries caused by hanging in a harness
- Insufficient health and safety briefings

NB: Incidents/accidents can also be caused by a combination of factors as described above.

Falls from Low Elements

Pendulum Fall off the Mohawk Walk at a Tension Traverse (0204)

Half of the participants were walking on the Mohawk Walk, the other half and the facilitators were spotting. One participant went on the Tension Traverse (low element) and held on to the diagonal support rope. She started wobbling, twisted, and slid sideways off the element at full force. She did not let go of the rope and fell to the ground. The person spotting her in this position was unable to counterbalance the force of the fall. The participant suffered abrasions on her upper leg.

The facilitator gave the following reasons for the accident:

Underestimation of the strong pendulum force on the Tension Traverse; insufficient numbers of spotters positioned at the location of the accident; the participant who spotted was not strong enough to counterbalance the great force of the fall.

Pendulum Fall off the Support Rope on the Mohawk Walk (0311)

The Mohawk Walk (MW) was the first team exercise after warm-up exercises. The facilitator and the person in charge of the group were spotting the participants on the first part of the MW. The group began to spread widely across the different parts of the MH... As a result, the facilitator was unable to spot all participants. When two participants used a support rope for keeping their balance, on the very last part of the MH, they fell. They pulled the rope taut by

leaning slightly backwards (like you do when windsurfing). According to the two injured participants, they both lost their balance and their feet slipped off the steel cable. The injured participant hit the steel cable with her back and head at full force. The second person fell to the ground and was able to get up again. The injured participant was frightened and cried. She suffered from a contusion of her back and a slight headache.

The facilitator made the following comments:

“Two people should not cross the MH with a rope which runs diagonally to the cable. We need to ask ourselves whether this method is only safe for one person, as even then the person can put too much of his/her weight onto the rope, and as a consequence, slip off the cable with his/her feet. A solution would be to clip in a second rope, so that the person crossing the MH can always bring back one rope for the following participant on his/her way back.”

Fall off the Mohawk Walk (0301)

Three participants were standing on the last part of the Mohawk Walk. They stretched forward and the first person managed to reach the tree they were heading for with two steps. The second participant held on the first participant in order to move jointly with her. The first participant reached the tree, the second ran behind her. She was unable to keep her balance, jumped off the MW and twisted round. She fell on her backside and back, and hit the forest ground with the back of her head. At first she was slightly dazed, and got up after a few minutes, suffering from light pain at the back of her back and neck. The facilitator described her own spotting position as “standing on the wrong side of the cable.” There was only one participant on the side where the participant was falling to, and he/she was unable to intervene.

All of the 3 spotters on the ground assumed that only the first participant would move towards the tree, and not both together at the same time. Then everything happened too quickly. “We made the wrong assessment of the situation. The group had already been trying to do the exercise for 45 minutes, and they were tired but too ambitious to stop. Even if a facilitator had been in the right position, he or she would probably not have been able to prevent the fall, but maybe lessen the impact of it.” One of the participants who had expressed feeling uncomfortable with the situation before the accident had been ignored. The participant had indicated that she was overtired and unwell and decided to stop participating actively in the MH, and instead chose to participate as a spotter.

Falling down from the Spider’s Web (0310)

The participant was moved through a hole at the top of the spider's web and put down on her feet on the other side. She was released by the others once she seemed to be standing in a stable position. The participant stated that she held her body tension until the very end, as she thought that her colleagues would also hold her until she was standing upright, like they had done during previous exercises such as the Pendulum. The participant fell awkwardly onto her shoulder, and suffered from minor grazes on both of her hands.

Comment from the facilitator: "The injured participant relied too much on the group. There was no communication. In future, I will ask the person being lifted to give a signal to the group that he or she is ready to be released."

Injuries during Jumps

Being Hit by the Belay Rope during Jump-off (0211)

The facilitator clipped in the participant for the Giant Swing and informed the participant about the procedure of the jump (holding on lightly to the hemp rope, not pulling it towards himself, bottom shuffling off the platform, short free fall until starting to swing). The participant shuffled into the free fall and swung. He then reported that he was hit in the face by the hemp rope, without suffering any serious injury.

Dislocation of Shoulder during the Trapeze Jump (0207)

A participant wanted to jump onto the swinging trapeze for a second time, following a successful first attempt. As he was jumping, he realised that he would not make it and grabbed the belay rope above him. This coincided with the belay rope being pulled tight by the belayers on the ground (team belaying). The participant was lowered down. He played down his pain and injury. After the programme finished, he was diagnosed in hospital with a dislocated shoulder. The participant had been explicitly asked not to reach for the belay rope (cognitive appeal), which the participant chose to ignore.

Torn Achilles Tendon on the Flee Jump (0309)

During a train-the-trainer programme, a 48 year old participant jumped off one side of the Flee Jump (a high station which requires participants jumping from one platform to the other, like jumping over a ditch). When the participant landed, he tore his Achilles tendon. The cause of the accident has not been clarified.

Dislocation of Shoulder whilst Jumping Off the Pamper Pole (0302)

The facilitator reported that a participant had pushed off with full force, bending her knees deep down, stretching her arms out wide and high into the air, and thereby catching a rope which wound round her arm. When the participant was caught, there was a jerk to the right. This report is then followed by a detailed description of the medical treatment following the accident, over several pages long. The dislocation of the shoulder was caused by her arm getting caught in the rope.

Unclear or Insufficient Health and Safety Procedures

Carrying out Instructions Incorrectly Whilst Walking on a Platform (0203)

Being belayed by a top rope, the participant climbed onto the main platform and undid the top rope before he had belayed himself with cowtails. The facilitator intervened immediately. The incident did not lead to any consequences.

Checking Participants' Harnesses during Repeat Climbs (0206)

The participant had already made one attempt, without climbing the pole. Once other participants had climbed up, she made another attempt. When the facilitator lowered her down, he/she noticed that the leg loops of the full body harness were open. The participant was therefore in an uncomfortable position, and was lowered quickly to the ground. The participant had obviously opened the leg loops in between the short spells of activities (she wanted to take the harness off). The lowering down did not result in any injury.

The facilitator recommended the following health and safety improvement: " ... Harnesses must be checked every single time before participants start climbing, even if there have only been minutes in between climbs."

Flying Fox, Crash onto a Wooden Platform at Low Sun (0221)

The programme was about to finish, in the evening. The last participant was due to do the Flying Fox exercise. The participant operating the mobile platform was chatting to other participants about the eventful and exciting day. The sun was low, which had a negative impact on visibility.

When the participant rolled down the Flying Fox, he crashed into the wooden mobile platform, which had not been moved out of the way. The platform was a thick wooden construction normally only used for helping participants descend from the Flying Fox, once they have rolled down the Flying Fox and finished swinging. The participant had to be rescued from the ropes course element. He suffered serious injuries (broken ribs and serious contusions). After the cause of the accident was identified, the ropes course provider made the following changes to their health and safety procedures:

- The platform used for coming off the Flying Fox was exchanged for a light aluminum ladder in order to minimise the extent of any potential future crash.
- The safety area around the ladder and the ladder itself were marked with paint so that they are more easily visible from the starting point, even at times of limited visibility.
- Because participants took turns operating the mobile platform, the task itself and responsibility issues were not clarified for all involved. The new procedure ensures that the task of operating the mobile platform is now clearly assigned to one participant only, for the whole duration of the exercise. (If there is no participant available who can carry out this task responsibly, the facilitator at the base will take on this role.)
- The whole Flying Fox process was scrutinised and reconsidered, and contentious issues were explained in more detail in the ropes course manual. The ropes course provider ensured that all ropes course manuals were updated with the new safety procedures.
- Copies of the updated ropes course manual were sent to all ropes course operators and facilitators, referring to the recent accident.
- During a staff training event, all facilitators were informed about the new process and health and safety procedures.
- A full-time facilitator was employed with the specific responsibility for health and safety, including the regular assessment of the technical and non-technical competencies and skills levels of facilitators, and providing technical and health and safety training as required.
- Following the accident, the ropes course provider set up an internal working group for health and safety. The group meets 4 times a year, in order to identify potential health and safety risks, to develop improvements and review their practicality, and to oversee their implementation.

Injury Caused by Construction Parts

Slipping off the Mohawk-Walk with Contusion on a Shackle (0209)

The participant was standing with one foot each on the fixtures of the steel cables, with her back to the tree. The plastic mantling of the fixtures was slightly slippery because of dew. There were 3 participants to her right (facing her direction), and four participants to her left. Because of pulling or a sudden shift of weight by the group (probably on the right hand side), the participant had to adjust and also moved her weight accordingly, to the right. The participant slipped off the plastic mantling of the fixture on her right hand side, scraped along the tree with her back and then fell with her right hip onto the steel cable fixture. The fixture consisted of a steel shackle, with its screw bolt pointing upwards at a 45 degree angle due to the twisted cable (caused by the pulling movement), and sticking out of the shackle by 2 cm. The participant fell onto the screw bolt and suffered from a contusion. ... The ropes course had been built according to professional standards, and had been inspected prior to the start of the programme. Health and safety instructions had been given, and two spotters (facilitators) were within a radius of 1 meter of the participant. Even the facilitators would not have been able to catch the participant because of the awkward way she fell (backwards along the tree). During the review of the accident, all facilitators agreed that based on the technical condition of the ropes course at the time of the accident, the seriousness of the accident could only have been diminished if the ropes course had been upgraded. They suggested replacing the shackle with turn buckles, carabiners or rapid links.

Bruising during Climbing over a Wall (0213)

The element at which the accident happened was a mobile wall, 3.5 meters high. It was made of a tarpaulin stretched between 2 trees, with a platform attached for climbing down. The participant climbed over the wall, rolled over the edge and, with his lower leg, got stuck in the tarpaulin fixed to the platform. He had not seen the rope when he rolled over the edge of the wall. The next day, the participant had developed serious bruising of his leg, to the extent that he was hardly able to walk.

Stretching of Belay Top Rope (0223)

A participant jumped from a platform onto a wooden beam, slipped and suffered serious contusions due to the malfunctioning of the top rope belay. The stretching of the belay rope led to the participant crashing into the wooden beam.

Hitting a Pole whilst Being Lowered Down (0212)

The participant climbed up the station until the end of the pole, and was then lowered down from the top. The participant had his legs straight and wide apart, and was being lowered to the ground in a backward position. His feet then quickly lost contact with the pole. When he started swinging, he hit the pole lightly with his right hand. His hand turned slightly red and started swelling. The swelling went down after his hand was treated with cold water.

Accidents Caused by Hanging in a Harness

Fainting whilst Hanging in a Harness during Training of a Rescue Operation (0215)

During a health and safety training programme for facilitators, the person to be rescued had put on a full body harness ... and was waiting to be rescued, being clipped into the steel cable of the rescue line by a locking carabiner. After a short while the participant complained about numbness in both of his legs, and something cutting into his groin. A stepladder was positioned under his feet to support his weight, which eased his discomfort until the rescuer was positioned above him. As soon as the stepladder was removed, the participant said that the numbness and restraint in his groin became worse, and announced "I think I am about to faint". A few seconds later the participant did indeed faint... The rescuer was able to cut the rope within 20 seconds, so that the person could be treated on the ground within 30 seconds. (shortened version)

Insufficient Health and Safety Briefings

Near Miss during Top Rope Belay (0219)

A participant belayed another participant on a high element. When the climber stood on the fifth step of the ladder, the belayer touched her eye and let go of the belay rope. The back-up belayer also let go of the rope to help her examine her eye. The facilitator had to take over the belay. The facilitator described the following indicators of a potentially dangerous situation: "There was too much going on for the group, there was too much parallel activity, all over the place, which was difficult to keep under control. The group was over-active, people were climbing up several elements, all at the same time, which caused a lot of hustle and bustle.

Accident during Top Rope Belay (0208)

A similar incident was reported in 2001 (case 20028). During a one-day programme, the facilitator moved to a high rope exercise (Two Line Bridge) after some games, trust exercises and low elements. The group showed a serious lack of concentration. ... Two participants went on the Two Line Bridge. Whilst the first participant was being lowered down, the second participant also jumped off the rope without any prior warning. Both belayers (the belayer and back-up belayer) let go of the rope at the same time. The facilitator was only just about able to prevent the participant from hitting the ground by capturing the belay rope.

Both cases occurred during one-day programmes, with the groups showing a lack of concentration and high levels of unfocused activity. Then something unexpected happened (object in the eye, or sudden jump without prior warning). The belayers (both persons) forgot to belay and let go of the rope. The redundant safety measure, assumed to be safe and reliable, faltered because both belayers responded to the distraction at the same time.

Fall whilst Being Lowered with a GriGri during Rain (0220)

During the afternoon, after an environmental awareness event for a school class:

It had been raining all day. A co-facilitator (a helper without a ropes course health & safety qualification) was meant to lower the facilitator from a tree using a GriGri fixed at ground level. The context was the dismantling of a mobile high ropes course element in a tree, at the end of a one-day programme. Lowering the facilitator down proved to be extremely difficult as the wet rope did not run smoothly/easily through the GriGri. As the rope went through the GriGri, water poured out of the rope. At the beginning of each lowering procedure/phase, the GriGri had to be opened widely for the rope to be able to run through. The facilitator gave instructions from above to the co-facilitator. They had discussed the alternative of lowering with a figure of eight, but the co-facilitator had preferred to use the GriGri, with which he was familiar. Then the fall happened: After lowering the facilitator several times with great jerks, the facilitator fell to the ground from five meters above. The facilitator suffered from serious injury to the spine.

Due to the wet rope (and possibly also due to fact that the rope was dirty), the characteristics of the GriGri as a belay device were different from normal.

Afterwards, the co-facilitator described the way the accident happened as a malfunctioning of the GriGri. The injured facilitator saw the causes of the accident as the wet equipment due to the rain and the tiredness of both the facilitator and the co-facilitator. Previous to the accident, the facilitator had

recommended to use the figure of eight as a belay device, as the rope kept getting stuck. In addition, the group was waiting for the facilitator to go home together after the dismantling of the element.

The injured facilitator gave the following additional information about the accident:

- Insufficient or total lack of health and safety briefing of the co-facilitator
- Sticking too much to given instructions
- Inappropriate decision-making and conflict resolution, as well as indecisiveness. The suggestion to belay using a figure of eight because the rope was not running well was disregarded
- Working in hazardous weather conditions.

Conclusions:

- Wet ropes are difficult to break with a GriGri. Similar problems of handling a GriGri can occur with old ropes (eg creep – the sheath moving separately from the heart strands). As a result, the rope will not run through smoothly. The belayer then opens the safety handle even further, so that the rope suddenly runs through a great deal. As the wetness of the rope changes the way the GriGri operates, it is difficult for inexperienced facilitators to adapt their way of operating the GriGri under those weather conditions. The sudden movement of the rope takes the facilitator by surprise, and as a result he or she brakes the rope inadequately.
- From a health and safety viewpoint, belaying under difficult external conditions must be part of health and safety training for facilitators. A back-up belay for a heavy going rope could be achieved for instance by self-belaying or by using a back-up belayer.

Exam Rescue Operation: Fall during Abseiling (0222)

During an examination (a rescue operation), a trainee facilitator fell when she abseiled from an element, without self-belay, and sprained her spinal column. She had been asked to demonstrate the correct abseiling technique before the rescue operation, because her training instructor was dissatisfied with her technique. Despite using the correct breaking technique before the rescue operation, the trainee later on fell during the rescue operation. The exact reason has not been identified, and no observations of the accident were reported.

A fact that is worth bearing in mind is that the participant used the wrong abseiling technique in the morning, and after checking her technique, the participant had to pass a test as part of a rescue operation without any self-belaying technique, which then went wrong. The training instructor explained the

decision to ask the participant to abseil without self-belaying that that it saved time and simplified the complex rescue operation. Yet, in this case, the result was the rescuer's exposure to risk.

Final Conclusion about the Accidents

We have focused in particular on the question of which overall categories of causes and connections can be identified, which aid the understanding and interpretation of accidents.

We arrived at the following categories:

Falling off Low Elements:

Four injuries were caused by falling off low elements. Participants on Mohawk Walks were particularly affected. Spotting carried out by facilitators or fellow participants was ineffective in these cases, because the participants balancing on the MH rope either fell off too quickly or fell into a direction that none of the spotters expected. The use of support ropes for balancing across elements lead to unexpected directions of the falls. The participants often did not fall to the ground backwards in a straight line, but sideways away from the spotter. There are three key measures that can reduce the potential risk of injury:

- A sound health and safety briefing about spotting and a sufficient number of spotters
- The choice of location and equipment (soft ground without obstacles)
- Concentration and focus during the exercises (having breaks when participants becomes tired or their concentration levels drop)

When members of the group start to lose concentration, violate rules and regulations or start messing about, "time out" (i.e. a break during an exercise) can be a particularly effective means of preventing accidents.

Injury as a Result of Jumps

Jumps often resulted in accidents when participants crashed into something, got stuck in objects or suffered sprains and when the sheer force of the fall led to the dislocation of limbs (shock load). On the basis of our current knowledge, elements involving a jump of any kind or form show a greater risk than other elements. The reported shoulder dislocations in our survey were caused by getting stuck in the belay rope. Jumping off the Pamper Pole with arms crossed was a technique that reduced this kind of risk, if they were clipped in from the rear.

Top rope belaying can increase the danger of crashing into objects during jumps or falls, if people can fall onto objects like beams due to overstretching ropes. In this case, a risk analysis specific for a given ropes course must be carried out, and relevant and appropriate health and safety procedures must be introduced.

Accidents caused by Hanging in a Harness

Even for short periods of time, hanging in a harness can result in severe circulatory problems, leading to states of shock and fainting fits. These types of injuries are life threatening and must be avoided at all cost. The quality of the harness and the correct fitting minimises the danger of circulatory problems by many times. Physical complaints can start after a very short time. The facilitator must immediately respond to any signs of circulatory problems and relieve the strain. We have come across this phenomenon during a rescue operation as part of a facilitator training course. These exercises are physically and emotionally demanding and often take longer than originally planned. The training instructor should pay attention to the time that the person to be rescued is hanging in a harness and reduce it to a minimum. In addition, the fact that a practice rescue operation can turn into a real risk situation at any time should never be forgotten. This was demonstrated by the reported case of an abseiling accident during a practice rescue operation. Based on the enormous physical and emotional demands put on trainees, we regard rescue operations as one of the most dangerous activities as part of a facilitator training course.

Insufficient Instructions on Health and Safety Procedures

The insufficient instruction of health and safety procedures increases the risk of accidents, which shows especially combined with trigger factors such as weather conditions (rain, low sun) or other distractions (such as hyperactivity, noise, jumping without prior warning, an insect in the belayer's eye).

Participants must be instructed with great care about health and safety procedures. They need an environment free of distractions in order to understand and apply basic safety techniques. Despite thorough health and safety briefings, a risk of error will always remain, especially on one-day programmes. Hyperactivity of the group was the main reason why participants were out of their depth when belaying, and as a result just let go of the belay rope.

- The facilitator must oversee participants at any time and be able to intervene immediately.
- There is also the possibility of improving the classic back-up belay procedure by using a Prusik belay system of the brake rope fixed to the harness of the back-up belayer.

The back-up belayer usually holds the rope in his/her hand behind the belayer as an additional safety measure. With the short Prusik, the rope runs through the back-up belayer's hand and braking knot and therefore braking forces continuously apply, even if both the back-up belayer and the belayer happen to let go of the rope. This belaying technique is often used with under-age participants. But it is also advisable to use this redundant back-up belay technique for short programmes with limited scope for in-depth health and safety briefings.

Exam Situations, Weather Conditions, Acting under Time Pressure

The factors above have often played an important role as triggers or direct causes of accidents. In an exam situation (rescue operation), a trainee facilitator fell when abseiling. A facilitator crashed to the ground during rain fall when the GriGri did not operate as usual.

All these factors can lead to extreme demands, miss communication and risky behaviour. Great care must be taken to control or rather minimise these factors. The basis for the prevention of accidents consists of three elements: the principle of redundancy (eg abseiling and setting up/taking down of ropes course elements with self-belay); sound professional facilitator training, and strictly carrying out of health and safety procedures.

- Redundant safety procedures reduces the danger caused by human error
- Sound and in-depth training programmes for facilitators and
- Carrying out health and safety procedures enhance the ability to perform under difficult conditions and during times of crisis.

Outlook

The feedback from our members proved that the reporting procedure for our Annual Accident Survey is very time-consuming and that the questionnaire is too complex. In order to motivate more members to participate in the survey, we introduced wide-ranging changes for 2004:

- We have developed an online questionnaire, which can be filled in and submitted directly on the ERCA website, after logging in
- Near misses and psychological incidents can be reported via email and can be described in the member's own words. A simple message with a description of the occurrence is sufficient.

- In addition, we reduced the length of the original questionnaire by taking out some of the questions, which is meant to shorten the time it takes for members to fill in the questionnaire.

As a result of these changes, we hope that in 2004, more members will be motivated to participate in the ERCA survey of accidents, near misses and psychological incidents on ropes course. We look forward to continuing with the longitudinal ERCA study. In future, we will publish a survey once a year, which will be shared at the ERCA Annual General Meeting in Spring. Our aim is the dissemination of an up-to-date report about the latest causes of accidents and incidents, which can be shared and discussed in a workshop before the beginning of the new season.