The evaluation of kind and frequency of incidence of sport injuries in mountaineers

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Aneta Bac[1], Kinga Kumorek[1], Dorota Czechowska[1], Paweł Sosin[2], Edward Golec[1]

[1] Orthopaedic Rehabilitation Department, Chair of Clinical Rehabilitation, Faculty of Motor Rehabilitation, The Bronislaw Czech University School of Physical Education, Krakow, Poland,
Manager: prof. dr hab. Anna Marchewka
[2] Traumatologic Rehabilitation Department, Chair of Clinical Rehabilitation, Faculty of Motor Rehabilitation, The Bronislaw Czech University School of Physical Education, Krakow, Poland,
Manager: prof. dr hab. Anna Marchewka

Address for correspondence/
Adres do korespondencji:
Dr Aneta Bac
Zakład Rehabilitacji w Ortopedii
Katedra Rehabilitacji Klinicznej
Akademia Wychowania Fizycznego
im. B. Czecha
al. Jana Pawla II 78
31-571 Kraków, Poland
tel. (12) 683 10 72
e-mail: anetabac@interia.pl

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Summary

Introduction. The mountaineering is one of the most loaded sport for joints and soft tissues and this sport arise a possibility of appearance of many different injuries. It is connected with recurrent movements and frequent bearing of body weight on hands or fingers.

Objective. The aim of this research was the evaluation of kind and frequency of incidence of injuries and methods of their treatment in mountaineers and first of all to give an answer to following research questions:

1. What parts of body becomes injured in mountaineers and is the length of their fingers has any influence on frequency of their appearance?
2. What are the most frequent reasons of traumatic injuries occurring in mountaineers?
3. Are the body physics and weight can cause traumatic injuries in mountaineers?

Material and method. The research was carried out among group of 67 mountaineers from Cracow including 14 women and 53 men aged 18 – 40. Additionally 36 men consented to length of fingers examination. The method of the study included own – constructed anonymous questionnaire, examination of fingers length, examination of body height and body weight.

Results. There were observed no connection between the amount of damaged parts of body and weeks time of training and body weight in research group. There was no statistically significant correlation between type of body structure and body weight and the amount of damaged parts of body. The statistically significant correlation was observed among time of training and appearance of analyzed injuries.

Conclusions.

1. The most affected parts of body were middle finger (III), ring finger (IV) and shoulder in research group and length of the fingers had no influence on frequency of injuries.
2. The most frequent reason of sustained injuries was incorrect training and specify of mountaineering.
3. The body physics and body weight have no influence on frequency and nature of susta ined body injuries.

Key words: mountaineering, fingers injuries, joints injuries

INTRODUCTION

Climbing is one of the youngest sports disciplines. It has been rapidly gaining a surprisingly wide circle of enthusiasts which is undoubtedly boosted by more and more frequent TV coverage of climbing competitions, a growing popularity of extreme sports and availability of climbing walls. Indoor climbing gyms enable future climbers to get acquainted with this discipline and to spend spare time on training regardless of the season and weather conditions.[1, 2, 3]

Climbing evolved from alpinism but it is a safer form of mountain tourism, although climbing is not entirely free from injuries and overload risks. [4, 5, 6] This new sports discipline causes overload mostly to the joints and adjoining soft tissues which is connected with constantly repeated movements and quite frequent instances of the whole body weight being borne on hands or individual fingers. [7, 8, 9]

The most predominant causes of injuries observed among climbers result from specific qualities of this sports discipline such as ascending the route without protection (so called "free solo climbing") [7] or attempting an unfamiliar route for the first time without resting on gear such as ropes and anchors (on-sight climbing) [10] which may lead to foot slipping and, in consequence, sudden and unexpected overload of fingers with the full body weight. [5, 7, 11]

During climbing, an increase in hand and arm overload is also connected with an increasing steepness of a wall or a decreasing size of finger holds. [8, 10]

Another reason for injuries that occur during climbing is lack of warm-up or improper warm-up exercises [6], lack of training or too excessive training, as well as specific exercises done during climbing sessions such as pull-ups or practising on a campus board. [1, 11, 12] Shahram, Farzad and Reza [9] state that difficult and specific exercises are inseparably associated with injury incidence.

Climbers tend to continue their training despite feeling distinctive pain. They often take anti-inflammatory and analgesic drugs without consulting an appropriate specialist. In this way, they eliminate a certain natural "brake" in the form of pain symptoms and at the same time they disturb the process of regeneration of damaged tissues which leads directly to other, frequently more serious, injuries. [11, 13]

In every sports discipline, there occur so-called typical injuries aside from accidental ones. A remarkable number of injuries that occur during climbing can be associated with tendinopathies which may be caused by strains, sprains and micro damages. [14, 15]

This particular sports discipline is characterized by an affliction known as "climber's finger". Another common injury is a so-called "cracking finger". [11, 14]

Climbers often suffer from ligament damages which mainly concern collateral ligaments of interphalangeal joints. Thickening of interphalangeal joints caused, among other reasons, by chronic joint effusions is also typical among those who practise climbing. [11]

Some of the dysfunctions associated with climbing are: carpal tunnel syndrome, ulnar neuropathy, [16] "golfer's elbow", also known as "climber's elbow" and so-called "tennis elbow". [11, 17] Climbers display a number of enthesopathies such as: damages to the tendon attachment of the brachialis muscle at the ulnar tuberosity and injuries to the tendon attachment of the triceps brachii muscle in the olecranon.

Other observed conditions comprise strain and sprain injuries of a muscle belly and muscle-tendon junction of brachialis and biceps muscles, as well as impingement syndrome in which soft tissue tightness (muscles, bursa and tendons) caused by various reasons affects the whole shoulder area. [11, 18]

INVESTIGATIVE MATERIAL

A research questionnaire was completed by 67 climbers, members of the "Korona" Sports Club based in Kraków. It was carried out among those climbers who successfully completed a red point ascent (RP) graded at least as VI.2 according to the grading system used in the Polish Jura Chain area.

The examined group consisted of 14 women and 53 men (20.9% and 79.1% respectively). The age of participants ranged from 18 to 40 years. An average age was 27.09 with standard deviation of 5.10.

Body weight among men ranged from 56.30 kg to 88.40 kg (average body weight 71.16 kg, standard deviation 7.57) and body height ranged from 165.50 cm to 189.60 cm (average height 177.49 cm, standard deviation 6.20). Body weight among women ranged from 49.30 kg to 61.40 kg (average body weight 54.70 kg, standard deviation 3.04) and body height was within the range of 158.70 cm to 171.60 cm (average height 164.06 cm, standard deviation 4.09).

Length of climbing experience varied from 2 to 23 years (average climbing experience length 8.17 years, standard deviation 4.55). The time spent on training covered from 2 to 20 hours a week (average training length 9.65 hrs, standard deviation 3.61).

Additionally, 36 men gave their permission to have their measurements of hand length taken. They constituted 53.73% of the examined group. An average age in this subgroup was 27.53 years with standard deviation equalling 5.70.

Extreme values of the length of the right second finger were 7.50 cm and 10 cm (average length 8.56 cm, standard deviation 0.55), the third finger - 8.60 cm and 11.10 cm (average length 9.79 cm, standard deviation 0.57) and the fourth finger - 7.90 cm and 10.50 cm (average length 9.21 cm, standard deviation 0.58).

The values for the left hand were as follows: 7.90 cm and 10 cm in the second finger (average length 8.84 cm, standard deviation 0.53), 8.90 cm and 11.10 cm in the third finger (average length 10.07 cm, standard deviation

0.55) and 8.10 cm and 10.70 cm in the fourth finger (average length 9.45 cm, standard deviation 0.55).

In the examined group, 33 men (91.67%) were affected by at least one injury of a locomotive organ and 29 men (80.56%) suffered from finger injuries.

INVESTIGATIVE METHODS

In the present study, the following methods were adopted:

Research questionnainre – carried out from January to March 2009 on the premises of the climbing arena of the "Korona" Sports Club. The questionnaires were handed out personally and the information was gathered through direct interviews. An anonymous questionnaire invented by the author of this study served as a research tool. It consisted of two parts: general and detailed. The initial questions of the general section concerned personal data. Afterwards, the participants described length of their climbing experience, weekly time spent on training and the most difficult redpointed route (RP). Moreover, they were asked about damage prevention they used and knowledge of the PRICE method. At the end of this part of the questionnaire, the respondents were asked if they had ever incurred any climbing injury.

The second part of the questionnaire was directed to those who incurred at least one climbing injury. The questions concerned injured body parts, types of damage, symptoms and methods of treatment and rehabilitation. Climbers were asked about the causes of injuries.

Measurements – the examination consisted in taking measurements of the climbers' body mass and height as well as finger length. Finger length (actual length of the second, third and fourth fingers) was determined by means of a linear calliper (LC). The Martin-type anthropometer was used to measure the climbers' height. In both cases, the examination was carried out following the guidelines presented by Andrzej Malinowski and Władimir Bożiłow in "Podstawy Antropometrii" (The Rudiments of Anthropometry). [19] Body mass was determined with the use of an electronic scale.

RESULTS

a) Descriptive statistics

The first parameter to be measured was an evaluation of injuries with respect to different body parts. In the group of 67 participants, 59 climbers suffered from at least one injury related to climbing and incurred during their sports career. It equalled 88% of surveyed climbers.

The greatest number of the examined group (43 persons = 72.9%) reported changes in the fourth finger and the lowest number (2 persons = 3.4 %) suffered from injuries of the first finger. (see Tab. 1.)

A majority of those injuries could be observed again among the climbers subjected to examination. It was estimated that 42 climbers (71.2%) suffered from at least one injury to the same body part. However, no repeat injuries were observed in the first and fifth fingers. (see Tab. 2.)

Another parameter to be evaluated concerned the types of damages among climbers. The greatest number of climbers suffered from retinaculum damage (36 persons = 61.0%) and no one was diagnosed with carpal tunnel syndrome. (see Tab. 3.)

Other parameters referred to the characteristics of a given damage, pain conditions, application of analgesic ointments and prescribed treatment. (see Tab. 4. and Tab. 5.)

Pain was registered by 34 climbers (57.6%) after they had returned to climbing. It varied in intensity. On a five-point scale, 25 cases (42.4%) reported "no pain", 22 cases (37.3%) "mild pain", 9 cases (15.3%) "moderate pain" and 2 cases (3.4%) "severe pain". No one reported the "unbearable pain".

Nearly all the examined climbers attempted to self-treat their injuries (56 people = 94.9%). (see Tab. 6.)

A significantly smaller number of cases consulted a specialist and/or physiotherapist. This was caused by lack of confidence in a doctor's competence. As few as 33 out of 59 climbers sought medical consultation (55.9%). Various treatment methods were administered. (see Tab. 7.)

Although there was a substantial difference in the number of injured and uninjured climbers, it was decided that the average values of three injury risk factors evaluated in both subgroups should be compared. The average values of weekly training time and length of climbing experience were higher in the group of 59 clim-

Tab. 1. Distribution of injuries in different body parts

	Number of injuries	
	N	%
Finger IV	43	72,9
Finger III	30	50,8
Shoulder	30	50,8
Elbow	19	32,2
Ankle	17	28,8
Wrist	15	25,4
Knee	14	23,7
Finger II	12	20,3
Finger V	4	6,8
Arm	3	5,1
Finger I	2	3,4

Tab. 2. Distribution of recurring injuries among climbers

	Number of injuries	
	N	%
Finger IV	23	39
Finger III	17	28,8
Shoulder	15	25,4
Knee	7	11,9
Wrist	6	10,2
Elbow	4	6,8
Ankle	4	6,8
Finger II	3	5,1
Biceps	1	1,7

Tab. 3. Distribution of types of injuries among climbers

Kind of injuries	Number of injuries	
	N	%
Fingers retinaculums injuries	36	61,0
Tendons of finger flexor injuries	26	44,1
Shoulder overload	24	41
Thickening of finger joints	22	37,3
Ankle joint sprains	16	27,1
Wrist overload	14	23,7
Medial epicondylitis (Golfer«s elbow)	13	22,0
Fingers flexor tenosynovitis	9	15,2
Knee ligaments injuries	8	13,5
Injuries of lateral ligaments of finger joints	7	11,9
Meniscus injuries	4	6,8
Nodules on tendons of finger flexor	3	5,1
Lateral epicondylitis (Tennis elbow)	3	5,1
Biceps injury	3	5,1
Ulnar nerve neropathy	2	3,4
Knee bruise	2	3,4
Elbow bruise	1	1,7
Ankle bruise	1	1,7
Wrist isthmus	0	0,0

Tab. 4. Body areas afflicted with injury

Place	Number of mountaineers	
	N	%
Artificial wall	46	78
Rocks	42	71,2
Competitions	11	18,6
Campus	6	10,2

Tab. 5. Most frequent causes of injuries in the group

Reason	Number of mountaineers	
	N	%
Lack of warm – up/ bad warm – up	34	57,6
Overtraining	33	55,9
Climbing with small holds	28	47,5
Falls	27	45,8
Inadequate training	7	11,9
Specialist exercises	6	10,2

Tab. 6. Distribution of self-treatment attempts of injuries in the examined group

Kind of treatment	Number of mountaineers	
	N	%
Analgesic and antiphlogistic ointments	35	62,5
Cooling	22	39,3
Break in climbing	20	35,7
Stiffen	10	17,9
Increasing of training loads	8	14,3
Drugs	7	12,5
Plasters	7	12,5

Tab. 7. Injury treatment prescribed by specialists

Kind of treatment methods	Number of mountaineers	
	N	%
Rest	26	78,8
Analgesic and antiphlogistic ointments	17	51,5
Physical therapy	15	45,5
Orthesis	13	39,4
Plaster cast	12	36,4
Taping	12	36,4
Therapeutic exercises	10	30,3
Massage	5	15,2
Surgery treatmant	3	9,1
Manual therapy	1	3

bers with injuries (88.1%) and the average age of uninjured climbers was slightly higher. The greatest difference in the values concerned length of climbing experience – 8.41 and 6.44. (see Tab. 8.)

A group of 36 men whose finger length had been measured, were subjected to a descriptive analysis. Acting in accordance with the guidelines presented by Mieczysław Sobczyk in "Statystyka" (Statistics) [20], the group was divided into two equal subgroups of 18 participants taking into consideration the middle value known as the median. The aim of the examination was to compare a number of climbers with injuries of the second, third and fourth fingers in both subgroups. The subgroup comprising 50% of cases with lower values was labelled as "short fingers" and the subgroup with higher values – "long fingers". For reasons of clarity, a total number of climbers with injuries of the second, third and fourth fingers who belonged to the analysed group was also presented.

In the case of the right hand, 6 climbers (16.7%) were diagnosed with an injury to the second finger, 16 climbers (44.4%) incurred an injury to the third finger and 19 climbers (52.8%) had an injury of the fourth finger. In both subgroups, the number of people with "short fingers" and "long fingers" was practically identical. (see tab. 9. and Tab. 10.)

A total number of surveyed climbers with finger injuries of the left hand was lower. In this case, the number of climbers with "short fingers" was significantly higher. The findings contradict a theory that finger injury risk increases proportionally to the finger length and they suggest that the distribution obtained in the examination was accidental. (see Tab. 11. and Tab. 12.)

b) Statistical analysis

To verify the research hypotheses, statistical calculation was carried out by means of a Statistica 6.0 PL programme authored by the StatSoft Company. In order to prove that there is a relationship between the collected qualitative data, Pearson's $\div^2$ test was applied on the assumption that two qualitative features are independent. The data was presented in the form of the overall tables.

In the examined group, no dependence between the number of injured body parts and weekly time spent on training was registered. However, it was observed that in the case of older climbers who had longer climbing experience and who completed red point routes (RP) with higher grades, a number of injured body parts was usually higher. (see Tab. 13.)

The connection between an application of analgesic ointments and repeated injuries to the same place proved statistically significant. The majority of examined people who were reported to incur a repeated injury to the same body part, administered analgesic ointments after they had resumed their climbing sessions. (see Tab. 14.)

In the group of 53 male climbers, no dependence between body weight and a number of injuries was registered. A correlation between body type and a number of injured body parts also proved statistically insignificant. Body type was determined on the basis of the Rohrer's index and classified according to Kowalewska. [21] On the basis of this classification, three body types were distinguished: leptosomic, athletic and pycnic. The information presented by Stanisław Gołąb and Maria Chrzanowska in "Podręcznik do ćwiczeń z antropologii" (Handbook of Exercises in Anthropology) [21] served as the guidelines. (see Tab. 15.)

Tab. 8. Comparison of average values of injury risk factors among injured and uninjured climbers

	Injured climbers	**Uninjured climbers**
Weekly time of training (hours per week)	9,73	9,06
Practice (years)	8,41	6,44
Age (years)	27,02	27,63

Tab. 9. Distribution of cases with injuries to 2nd, 3rd and 4th right fingers in the group of 36 men

	Number of examined persons with injury	
	N	**%**
Finger II	6	16,7
Finger III	16	44,4
Finger IV	19	52,8

Tab. 10. Comparison of distribution of cases with injuries to 2nd, 3rd and 4th right fingers between subgroups with "short fingers" and "long fingers"

		Number of persons with injury	
		N	**%**
Finger II	Short	3	8,3
	Long	3	8,3
Finger III	Short	8	22,2
	Long	8	22,2
Finger IV	Short	9	27,8
	Long	10	25,0

Statistical calculation did not prove the hypothesis that climbers with longer fingers were subjected to more frequent injuries. In the group of 36 men who agreed to have their finger length measured, a statistically significant dependence could be observed only between the length of the fourth right finger and its injury proneness. (see Tab. 16. and Tab. 17.)

Tab. 11. Distribution of cases with injuries to 2nd, 3rd and 4th left fingers in the group of 36 men

	Number of examined persons with injury	
	N	%
Finger II	2	5,6
Finger III	11	30,6
Finger IV	20	55,6

DISCUSSION

Sportsmen who practise climbing are extremely prone to injury. The examination carried out among English and American climbers shows that during their sports career 40-80% of them suffered from climbing-related injuries. They comprised acute damages caused by falling off the wall and falling down, as well as by overload syndrome resulting from too serious overexertion during training sessions. Over 60% of competitors who were examined during the Polish Senior Sport Climbing Championship that took place in June 2005, were diagnosed with at least one injury caused by training, nearly 40% suffered from damages of various body parts, whereas 18% of climbers experienced a repetitive injury to the same body part. [1]

Tab. 12. Comparison of distribution of cases with injuries to 2nd, 3rd and 4th left fingers between subgroups with "short fingers" and "long fingers"

		Number of persons with injury	
		N	%
Finger II	Short	2	0,0
	Long	0	5,6
Finger III	Short	4	19,4
	Long	7	11,1
Finger IV	Short	7	36,1
	Long	13	19,4

Tab. 13. Statistical analysis of injury risk factors in the examined group

Factor	Categorization	χ^2	p
Age (years)	<25 25-29 >29	15,348	0,018*
Practice (years)	<6 6-9 >9	13,868	0,031*
Weekly time of training (hours per weeek)	<7 7-11 >11	3,902	0,690
Way (RP; jurasic scale)	VI.2/VI2+ VI.3/VI.3+; VI.4/VI.4+; VI.5/VI.5+; >VI.5+	27,592	0,006*

*p<0,05

Tab. 14. Statistical dependence between analgesic ointments applied by climbers and repetitive injury to the same body part

Factor	Categorization	χ^2	p
Analgesic ointments	Yes No	6,547	0,011*

*p<0,05

Tab. 15. Statistical dependence between weight and body type of examined men and injury incidence

Factor	Categorization	χ^2	p
Body weight (kg)	<65 65-74 >74	3,727	0,714
Type of physique	Leptosomic type Athletic type Pyknic type	12,025	0,061

*p<0,05

The present study illustrated that the total number of injuries was significantly higher and the most vivid difference concerned the number of climbers with recurring injuries (over 60% of the examined group). A similarity was observed in the prevalence of injuries of the third and fourth fingers. The study showed a remarkably greater number of shoulder injuries, while the number of elbow, brachiocarpal joint and the second finger injuries was lower.

A large number of finger injuries results from a specific nature of climbing. The movement of a climber consists in a characteristic, unusual for other sports disciplines, involvement of hands. The ascent is made in such a way that the body weight is constantly borne by the climber's hands. It causes large overload within the upper limb, mainly within the hand. [1]

According to Szyguła and Kujawa [14] three-quarters of climbers, both competitive and amateur, will suffer from conditions resulting from upper limb injuries. The above mentioned authors stated that over 60% of total injuries incurred in sport climbing affects the upper limb. The most prevailing ones are hand and wrist injuries and the remaining damages concern the elbow joint and shoulder. The results of this study are closer to the findings presented by Shahram et al. [9] Their research material consisted of 70% of injured climbers. Over half of the injuries concerned fingers, while the remaining part - the elbow with forearm and the shoulder girdle. In the case of the hand, injuries of the third and fourth fingers prevailed. Lower values were reported for the second and fifth fingers.

Holtzhausen and Noakes [22] stated that the injuries of elbow, forearm, wrist and hand amounted to 62% of total number of damages, whereas Rooks et al. [23] maintained that 89% of cases incurred at least one damage, while hand and wrist injuries accounted for the half of the total number of damages. The present study observed slightly more injuries to those body parts. Kwolek et al. [1] registered finger injuries in 60% of cases. This percentage, although very high, was still lower than the value reported in this study.

The examination results obtained in the group of young climbers aged 8 to 19 years proved interesting. [24] In comparison with the data presented in this study, the number of injured climbers was significantly smaller. At the same time, the percentage of lower limb injuries among young climbers was higher. The group examined for the purpose of this study presented a lot more injuries to talocrural joint than the group examined by Kusztelak. [25] It was associated with a high percentage of falls during climbing. In each case, injuries to the talocrural joint were diagnosed as sprains. A relatively low percentage of knee injuries was also reported and in almost every case dysfunctions were connected with ligament or meniscus ruptures.

The competitors who took part in the Polish Senior Sport Climbing Championship, suffered from tendon and

Tab. 16. Statistical dependence between length of right fingers and their injury proneness in the group of 36 men

Factor	Categorization	χ^2	p
Lenght of finger II (cm)	<8,5 8,5-8,9 >8,9	4,712	0,095
Lenght of finger III (cm)	<9,5 9,5-9,9 10,0-10,4 >10,4	4,702	0,44
Lenght of finger IV (cm)	<9,0 9,0-9,4 9,5-9,9 >9,9	8,481	0,037*

*p<0,05

Tab. 17. Statistical dependence between length of left fingers and their injury proneness in the group of 36 men

Factor	Categorization	χ^2	p
Lenght of finger II (cm)	<8,5 8,5-8,9 >8,9	2,965	0,227
Lenght of finger III (cm)	<9,5 9,5-9,9 10,0-10,4 >10,4	1,583	0,663
Lenght of finger IV (cm)	<9,0 9,0-9,4 9,5-9,9 >9,9	5,914	0,116

*p<0,05

ligament injuries within the hand and carpal joint. They accounted for three-quarters of all injuries. Tendon injuries in fingers amounted to 37.5% and ligament injuries equalled 26.4% of total injuries. Also, there were numerous cases of enthesopathies of the elbow region. [1] In the present examination, collateral ligament injuries of finger joints were decidedly less common. Additional difference concerned the fact that no elbow ligament injuries were registered. The incidence of tendon and ligament conditions to fingers was also lower than in the findings submitted by the American and British authors. [1]

The research carried out by Logan et al. [8] reported that the greatest number of injuries occurred to finger tendons, whereas there were relatively few retinaculum damages. In the present study the situation was different because in the case of fingers it was the retinaculum injuries that were predominant. At the same time, they constituted the most frequent type of a locomotive organ defect in the examined group. Contrary to the examinations carried out among the climbers from Great Britain [8], no subluxations of finger joints as well as hand and wrist fractures were reported. Carpal tunnel syndrome was diagnosed in the group examined by both Shahram et al. [9] and Rooks et al. [23]. In the present study, no case of this type of damage to the peripheral nervous system was observed.

Wright et al. [26] carried out a statistical analysis of data gathered on the basis of 295 questionnaires. They were distributed among the competitors who participated in the Entre-Prises World Climbing Championship in Birmingham in December 1999. As in the present study, they reported a dependence between the length of training experience and a number of injuries to various body parts (the longer the training experience period, the more injuries occurred). However, they did not observe any connection between the climbers' age and total number of injuries. A comparative examination of two groups, 23 young climbers and 20 older ones, showed that the older ones suffered from more frequent hand and finger injuries than their younger counterparts. [9] The presented statistical analysis shows a similar correlation. The older the participants, the more injured body parts they reported. Shahram et al. [9] noticed the difference between a number of injured and uninjured climbers which they associated with the difficulty grade given to an ascended route. The present study showed that the more difficult the red-pointed route (RP) was, the greater number of injured body parts was observed. However, no relationship between weekly training time and a number of injured body parts was registered. Such a significant correlation was described by Kwolek et al. [1] They compared average values of several injury risk factors in the groups of climbers with and without injuries.

Average values of weekly time spent on training, length of climbing experience, age and weight were higher among injured climbers, whereas statistically significant difference referred only to the length of climbing experience. [1] Similarly, in the present research, average values of the length of training sessions and climbing experience were higher among injured climbers.

According to Swędzioł [11], people with long and slim fingers are more predisposed to injuries than those with short and sturdy fingers. In this study, the measurements of second, third and fourth fingers, both right and left, were taken and no statistically significant difference between their length and injury incidence was observed. Thus, the above mentioned hypothesis could not be confirmed.

Besides, Swędzioł argued that an application of anti-inflammatory and analgesic medications eliminates a certain type of natural "brake" in the form of various pains. [11] A majority of the climbers examined for the purpose of this study, who incurred an injury to the same body part, used analgesic ointments after they had resumed climbing.

In the work by Kusztelak [25], the most frequent cause of finger injuries in the group of sport climbers was connected with gripping a small climbing hold. In numerous cases, insufficient warm-up, excessive training and exhaustion were also observed. In the examination carried out by Kwolek et al. [1], the most injured climbers were convinced that the damage resulted from excessive training. Moreover, they mentioned lack of appropriate warm-up exercises, slipping from a hold or a fall. Rooks et al. [23] stated that almost one-third of climbers experienced a fall. In the questionnaire carried out for the purpose of the present study, the respondents gave similar answers. More than half of the climbers mentioned inaccurate warm-up and overtraining, while the other reasons were using small climbing holds and falling.

Damages that were incurred during artificial wall or rock climbing training sessions were predominant both in Kusztelak [25] and in the present study. A comparatively insignificant difference consisted in the fact that the above mentioned author reported the same number of injuries during the competitions and when using a climbing training board, whereas the present study observed that the injuries incurred during the competitions slightly prevailed.

In her works, Kusztelak [25] also undertook an issue of finger injury symptoms and subsequent treatment. In more than one-third of cases, finger joint mobility was limited and in one-fourth of cases, a decrease in muscle strength was noticed. Both symptoms were also registered in this study, however, the other two, such as pain caused by back overloading and limitations of daily functions, prevailed. Almost 60% of those who suffered from injuries consulted a specialist and almost all of them attempted to self-treat their damages. In the group of 58 sport climbers, the situation was similar. [25] According to Shahram et al. [9], sportsmen who consulted a specialist constituted a remarkably low fraction of injured climbers (8.75%)

Kusztelak [25] stated that the treatment was reinforced by physiotherapy (laser therapy, kriotherapy, ionto-

phoresis, sollux lamp treatment, peloid packs and ultrasound therapy) only in the case of 10% of climbers. In the present study, almost half of those who consulted a doctor were referred for physiotherapy treatment. Following the indications of sport medicine professionals, the dominating treatment comprised kriotherapy, laser and magnetic field therapy. In general, climbers admitted that the rehabilitation brought about positive effects.

No data concerning types of the lower limb injuries among climbers were found in the available literature. The present study reveals that there is a remarkable percentage of climbers who incurred injuries to those body parts and, therefore, closer attention should be paid to this issue. Also, few authors undertook the subject of injury prevention as well as injury treatment and rehabilitation.

Owing to a huge disproportion between injured and uninjured climbers as well as the number of male and female participants, the present study provided no comparison of injury incidence in those subgroups. It seems, however, that a more accurate determination of possible differences in the frequency and types of injuries to the locomotive organs among male and female climbers would prove very interesting. Besides, each attempt to collect a more numerous research group than that presented in the study might provide the source of more diverse and innovative findings.

The above mentioned arguments stand behind the fact that despite numerous publications, a wide concept of injury incidence as well as sports medicine and rehabilitation of climbers remains inexhaustible.

CONCLUSIONS

1. The injuries to the third and fourth fingers as well as the shoulder girdle are the most frequent conditions observed among climbers and finger length has no influence on the frequency of injuries.
2. The most common cause of injuries was an inappropriate training and the specific nature of this discipline.
3. Body build and body weight have no influence on the frequency and type of injuries.
4. In the examined group, finger length did not influence overall injury incidence.

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