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## **AN ANALYSIS OF THE SKIING ACCIDENTS THAT HAPPENED ON THE SLOPES OF THE KASPROWY WIERCH**

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### ABSTRACT

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Injuries are much more often incurred by those who practice sports recreationally, which is probably caused by the lack of proper physical fitness and violation of the safety rules, as well as by the fact that mass sports attract much more people. The majority of dangerous, injury-prone situations in skiing are also generated by technical errors, lack of proper coordination, poorly fitted or faulty equipment. Although an accident is defined as a series of causes and circumstances that are difficult to anticipate, a considerable reduction of the number of sports accidents involving the locomotor system while skiing is possible, e.g. by promoting safety rules and analysing accidents that happen on the slopes.

The characteristics of skiers' safety and injury rate have been developed by way of analysing skiing accidents that required rescue team interventions. The analysis comprised 90 skiers from the Kasprowy Wierch; 42 women (46%) and 48 men (54%) who were involved in skiing accidents in the 2008-2009 season, on the basis of accident sheets from the 2008-2009 season routinely delivered to the TOPR (Tatra Volunteer Search and Rescue) stations, which were made available to us.

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### INTRODUCTION

Skiing is a sport practiced by both adults and children in recreational forms, but it is also an inseparable element in the process of training dispositional groups (along with swimming, hand-to-hand combat etc.) Dispositional groups combines predispositions that made them ready to immediate action, undertaking intervention in any conditions. Fighting and counteracting various situations that may affect safety of

complex process and may have influence on the fate of citizens, their lives, health, property as well as efficient functioning of institutions of both state and local government. All this adds up to the existence of the phenomenon of security culture. Spectral definition of **security culture** by Piwowarski and Zaplatynskyi provides: Security culture of any specified individual or collective subject is a phenomenon that enables to accomplish following objectives:

1. Efficient control over possible threats to certain subject, which results in an optimal state of danger to this entity (in certain time and place);
2. Restoring security of certain subject when it was lost;
3. Optimization of levels of multi-sectorally formed and examined process of development of security subject, which aims to harmonization of sectors in the context of prioritizing goals of the entity;
4. Efficient stimulation of consciousness of higher need in both social and individual scale – i.e. the need of self-fulfillment and creation of trichotomous development – a) mental, b) social, and c) material due to supporting beliefs, motivations and attitudes that cause individual and collective actions, which have influence on increase of potential of autonomic defense (self-defense) of individual and group subjects of security<sup>1</sup>.

Therefore, as it is clear from above cited definition, monitoring of security and injuries on slopes are a relevant factor that affect the manner of training among those, who actively train skiing.

Skiing is an outdoor sport that delivers many motor, health and emotional stimuli. However, apart from fun, this sports discipline is also accompanied by the risk of injuries. Human body is subjected to various forms of stress related to perfecting one's fitness and the natural need of physical activity. Too much confidence in one's capabilities on the slope, not adjusting to the conditions, as well as neglecting the basic safety precautions usually result in too much

stress being put on the body and are the causes of the majority of injuries (Chojnacki 1984, 1994). The carving style has influenced the way of skiing, increasing the risk of collisions on the slopes and causing too much load on the knee joints, however it also facilitates learning the basic elements of skiing in a relatively short time (Chojnacki, Orlewicz – Musiał. 2005). During each ski season, many accidents happen that result in numerous traumas and injuries. These most often involve bones and joints, due to the fact that the overload caused by skiing, which affects bones, joints or ligaments, may exceed tissue resistance when mechanical trauma occurs.

#### AIM OF THE PAPER

The aim of the study was to analyse the injury rate among skiers who frequent the Kasprowy Wierch slopes, which is supposed to increase the safety of skiing. In order to achieve the above-mentioned goal, the following study questions were asked:

1. What kind of trauma was seen most often?
2. How many of those involved in accidents were wearing helmets?
3. Which body parts are most often injured in skiing accidents?
4. In which parts of the day accidents occur most often?
5. What is an average patient's condition, according to the NACA IKAR-CISA scale?
6. Do weather conditions influence the accident rate?
7. What kind of events are the most frequent causes of accidents?
8. Which slope of the Kasprowy Wierch has the highest rate of accidents?

#### STUDY METHODOLOGY

The study consisted in analysing skiing accidents that involved 90 people in the Kasprowy Wierch area, among which 42

<sup>1</sup> J. Piwowarski, *Ochrona VIP-a a czworokąt bushido. Studium japońskiej kultury bezpieczeństwa*, Szczytno 2014., s. 451-452.

were women (46%) and 48 men (54%) who were the victims of skiing accidents in the 2008-2009 season. The analysis was performed on the basis of skiing accident sheets that are routinely submitted to the TOPR (Tatra Volunteer Search and Rescue) stations.

The sheets were completed by the rescuers on the spot and include the following information:

- injury mechanism,
- injury description,

- patient's condition according to the NACA IKAR-CISA scale,
- time of accident,
- sex,
- weather conditions,
- cause of accident,
- how the victim was transported,
- number of victims wearing helmets.

### THE RESULTS

INJURY	N	%
Fracture	18	15
Joint injury	78	67
Contusion	12	10
Hypothermia	0	0
Ailments	0	0
Other	9	8

Table 1. Type of injury

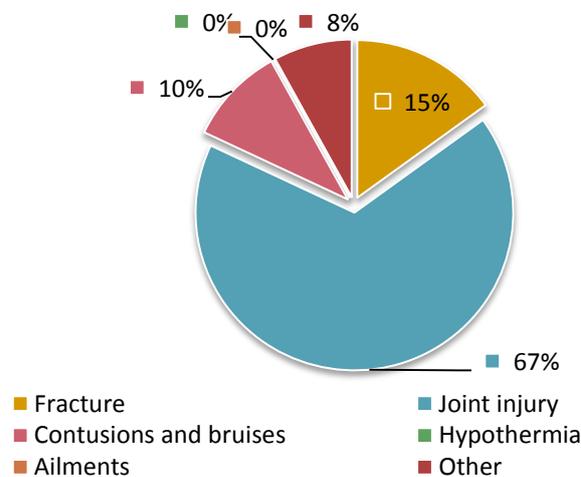


Fig.1. Percentage analysis of the types of injuries

SKIING WITH OR WITHOUT HELMET	N	%
W/HELMET	24	27
W/O HELMET	66	73

Table 2. Number of victims wearing or not wearing helmets

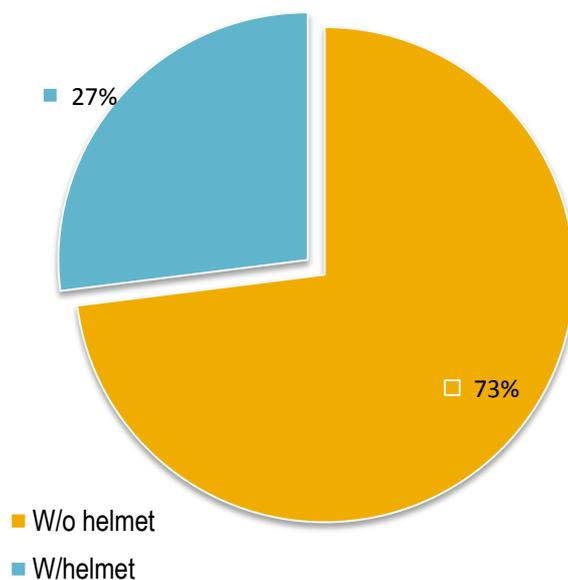


Fig.2. Percentage of victims wearing or not wearing helmets while skiing

BODY PART	N	%
Head	7	29
Chest	2	3
Abdomen	0	0
Pelvis	3	3
Spine	3	3
Right upper limb	5	4
Left upper limb	12	11
Right lower limb	31	29
Left lower limb	45	42

Table 3. Body injuries

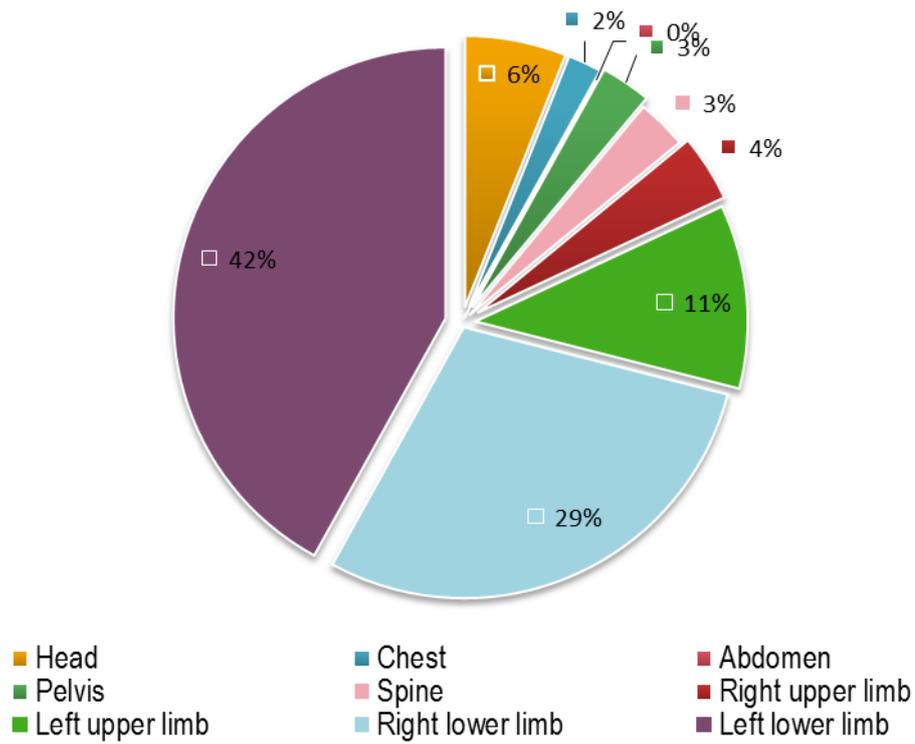


Fig.3. Analysis of injury percentage

TIME OF ACCIDENT	N	%
8.00-12.00 am	40	45
12.00-4.00 pm	50	55

Table 4. Time of the day when accident occurred

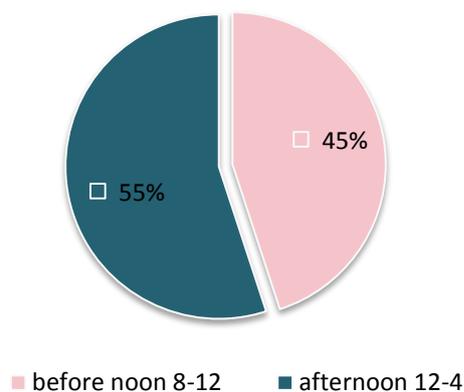


Fig.4. Percentage analysis of hours when accidents occurred

WEATHER CONDITIONS	N	%
Fair	61	55
Cloudy	33	30
Snow	14	13
Rain	0	0
Wind	2	2
Artificial lighting	0	0

Table 5. Accidents and weather

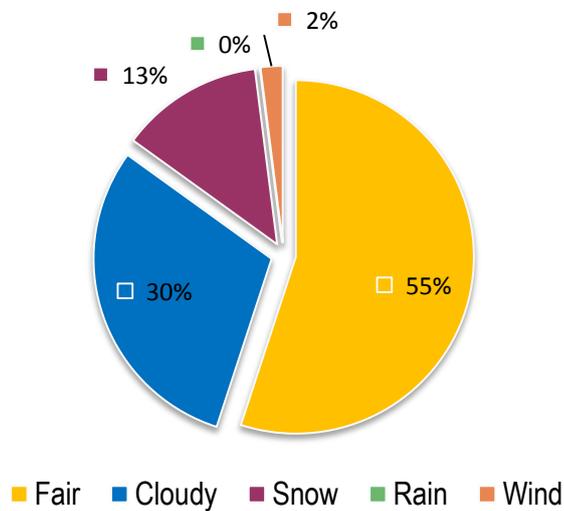
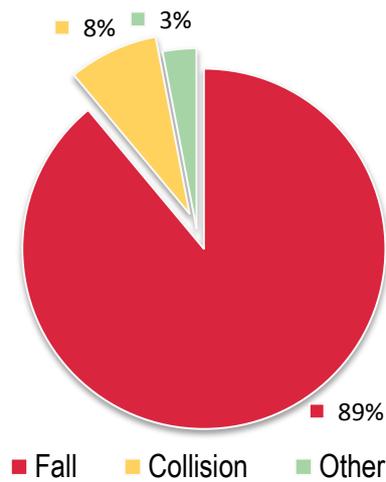


Fig.5. Percentage analysis of atmospheric conditions accompanying accidents

EVENT	N	%
Fall	80	89
Collision	7	8
Other	3	3

Table 6. Cause of injury



**Fig. 6.** Percentage analysis of the causes of injuries

NACA IKAR-CISA SCALE	N	%
1	5	6
2	9	10
3	71	78
4	6	6
5	0	0
6	0	0
7	0	0

**Table 7.** Patient condition according to the NACA IKAR-CISA scale

1. Superficial trauma or mild ailments, epidermal abrasions, mild contusions.
2. Large superficial injuries, contusions, sprain, fractured fingers/toes. Outpatient treatment indicated.
3. Open wounds with blood vessel or nerve trauma, fractures (arm or shin), dislocations, 1st or 2nd degree hypothermia, high fever, appendix inflammation. Hospital treatment indicated.
4. Head injury with a period of unconsciousness lasting > 15 min., thigh fracture, limb amputation. Potential life hazard.
5. Spinal trauma with neurological signs, multiple rib fractures with respiratory insufficiency, open wounds on chest, multiple bone fractures, shock, severe cardiac rhythm disorders, pulmonary oedema, 3rd and 4th degree hypothermia. Life hazard.
6. State after a successful resuscitation.
7. Death on the spot or death after an unsuccessful resuscitation.

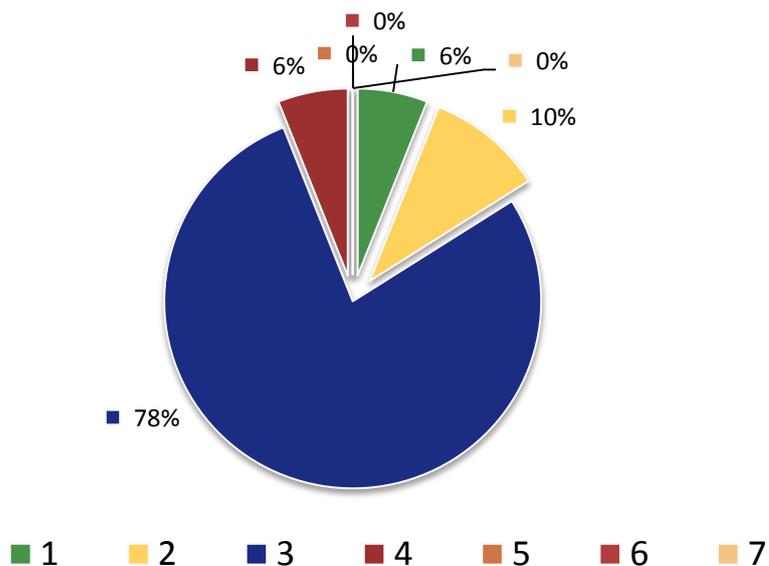


Fig.7. Percentage analysis of patient condition according to the NACA IKAR-CISA scale

LOCATION	N	%
Hala Gąsienicowa	35	39
Hala Goryczkowa	54	60
Traverse over the Cicha Valley	1	1

Table 8. Place of accident

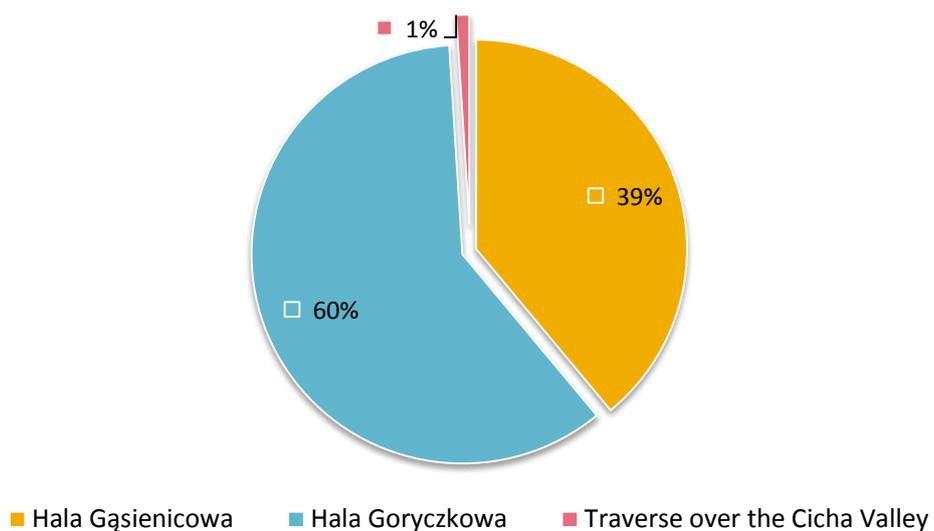


Fig.8. Percentages of accident locations

## **SUMMARY**

Physical fitness is one of the basic conditions to ensure safety on the ski slopes. Sporadic skiers do not know how to behave in unfavourable weather conditions, and given that the slopes are not always perfectly prepared and they are usually relatively crowded, sometimes a sudden change of direction is required. Modern skiing equipment allows to perform more and more sophisticated evolutions, tempting the users with the new capabilities, however one must always bear in mind the risk associated with skiing.

The analysis shows that in the case of the Kasprowy Wierch area, the majority of accidents happened in the Goryczkowa Valley (60%), 39% happened in the Gąsienicowa Valley, while only a small percentage of accidents took place on the traverse above the Cicha Valley (1%).

The most frequent injuries involved joints - 67%, fractures amounted to 15%, contusions and sprains - 10%, whereas 8% of the skiers had other problems. As for the location of the injuries, it mainly concerns bones and joints, that is the skeletal part of the body. 71% of the accidents resulted in injuries of lower limbs, from which 29% concerned the right and 49% the left limb. Upper limb injuries were observed in 15% cases, where 11% concerned the left and 4% the right limb. Only as little as 6% of the accidents involved head injuries, pelvic and spinal injuries each amounted to 3% and chest injuries - 2%. No abdominal injuries were noted.

27% skiers wore helmets, whereas as much as 73% did not use them. Determining the direct cause of an accident can be extremely difficult at times. There are various factors that matter. The most frequent cause of injuries in the studied group were falls - 89%, as a consequence of losing control over the skis, collisions with obstacles or other skiers

amounted to 8% and 3% of the injuries had other causes.

An inseparable element of the accidents that happen on the ski slopes is the weather. 55% of the accidents happened in favourable weather conditions, in 30% cases the weather was cloudy, 13% of the accidents happened during snow falls and 2% in windy conditions. The highest percentage of injuries - 55% was noted in the afternoon hours, i.e. between 12 and 4 pm, whereas 45% of the accidents happened in the morning hours, between 8 and 12 am. According to the NACA IKAR-CISA scale for the evaluation of the patient's condition, the highest percentage of the accidents, that is 78%, resulted in open wounds with blood vessel or nerve trauma, fractures (arm and shin fractures), sprains, dislocations, 1st and 2nd degree hypothermia, high fever, appendix inflammation. Patients were hospitalised. A smaller group of patients, 10%, suffered from large superficial injuries, contusions or finger/toe fractures. 6% of all injuries involved head traumas with periods of unconsciousness of up to 15 minutes, thigh fractures and limb amputation, where a potential risk of death occurred, while in 1% cases the victims suffered from superficial wounds and mild ailments with epidermal abrasion. There were no injuries classified in groups V, VI and VII.

## **CONCLUSIONS**

The following conclusions were drawn based on the results of the study:

1. Joint trauma is the most frequent type of injury among skiers (67%).
2. Among skiers involved in accidents, as many as 73% were not wearing helmets.
3. Skiing accidents most often result in lower limb injuries - 71%
4. Most accidents happen in the afternoon, between 12 and 4 pm.
5. According to the NACA IKAR-CISA scale, most skier patients were rated 3.

6. Falls are the most frequent cause of injuries - 89%.
7. Most skiing accidents happened in favourable weather
8. conditions - 55%.
9. 60% accidents on the slopes of the Kasprowy Wierch happened on the Hala Goryczkowa slope.

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