The characteristics of Poland's alpine skier's (students) related to the frequency of accidents

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Abstract

Purpose: The purpose of this research was to record the characteristics of Poland's alpine skier's (students) in relation to the frequency of accidents. In this research 66 skiers participated (50 men and 16 women).

Material: The specimens came by recreational skiers (beginners – advanced) in the ski resort in Passo Tonale (Italy). The research material came from analysis of completed questionnaires from 66 Polish skiers. They have recorded four categories of factors: a) individual factors b) factors of preparation in the snow in relation to injuries c) factors of preparation in dry ground in relation to injuries d) factors of injuries.

Results: About 6,3% Polish skiers respondents had in the past, an accident in alpine skiing. In the Polish population the number of beginner skiers is overriding, with a few years of training in skiing, however with several days training a year using a ski instructor teacher for warming up and individual form of learning.

Conclusions: Skiers who don't had physical fitness preparation before the winter season, had a greater percentage of accidents and injuries. Polish skiers usually had limb injuries lower extremities (sprains) due to the reckless of the skiers.

Keywords: Alpine skiing, skier, accident, injury, prevention.

Introduction

The risk of a skiing accident grows as a skier has lower level of skill, which is dependent on inhibitory factors such as soil conditions, snow, as well as his equipment. Erdmann and Giovanis [1] classify the causes of accidents in alpine skiing and grouping the causes and factors causing the accident as follows: personal, coaching, equipment and clothing, weather, ground land and racing. In Polish, alpine skiing is the most popular sport. This is due to its natural terrain with mountains of medium and high altitude (South Poland), low temperature, long tradition of skiing with approximately 77 ski resorts [2], many clubs, with a good national skiing team and the greatly expanded winter tourism. This present study is based on registration of ski injuries in alpine skiing in some ski resorts in Poland. The above methodology was used as an epidemiological survey in the following countries: in Poland Chojnacki [3, 4] was concerned with the accident prevention system in Alpine skiing and injuries of the racing Polish skiers [5-7], while Horczyński [8] he studied the multiple epidemiological analysis of skiing accidents in the Beskydy region of Poland. In the Holland, Bouter [9] was concerned with the risk and causes of injury to the Dutch skiers of Alpine skiing. In Austria, Neumayr et al. [10] they studied the natural and physiological factors associated with the success of professional Alpine skiing. Chojnacki & Giovanis [11] have compared the incidence of injuries in Greece, Poland and the Holland. In Greece Amoutzas & Giovanis [12] concerned with factors contributing to the reduction of accidents of skiers of alpine ski. In Greece Giovanis was concerned with the kinematic analysis of racing alpine skiing in relation to injuries [13], assessing the safety of Alpine skiing races [14] and the characteristics of 1165 skiers related to the

frequency of accidents [15], while Giovanis and Erdmann [16] concerned with the problem of slalom's outer poles.

Zacharopoulos et al. they studied the types of ski injuries and snowboarding and the incidence of injuries in Greece [17, 18]. In the USA Hunter [19] and Jaffin [20] concerned with the epidemiological study of ski injuries. In Switzerland, Franz et al. [21] they studied the serious spine injuries of skiers in alpine skiing and snowboarding in the ski resorts of Bern, while Giovanis & Gompakis [22] concerned with the characteristics of skiers related to the frequency of accidents in the ski resorts of Adelboden, Lenk and San Bernardino. In Australia, Korbel & Zelcer [23] have made a controlled study of ski injuries.

The recording of the factors and characteristics that increase accidents in skiers, can determine a future preventive model of organization of the System Safety in Skiing ("SSS") [3, 4].

Hypothesis

The formulation of the hypothesis was based on the following questions: skiers' physical preparation before the season and the warm-ups done before skiing have the chances of an accident or injuries? The result of this research is to create a future model of prevention which can protect skiers from this adverse phenomenon?

Purpose

The purpose of this research was to record the characteristics of Poland's alpine skier's (students) in relation to the frequency of accidents.

Material and methods

Participants

In the research the participants were N = 66 skiers (50 men and 16 women) who were selected by random. The sample came from recreational skiers (beginners - advanced) in the ski resort in Passo Tonale (Italy).

Means of data collection

The research material came from analyzing the completed questionnaires of 66 Polish skiers (students). They have recorded four categories of factors: a) individual factors (age and sex, height and body mass of skiers), b) factors of preparation in the snow in relation to injuries (the existence of accident and injury in skiing in the past, involvement of skiers: ski equipment, wear a helmet?, level of technical training, period of ski training in years and days, preferred method of learning of skiing: individual, group or racing, with or without instructor, participation in the warm up), c) factors regarding preparation in dry ground in relation to the injury (physical fitness preparation), d) factors of injury (presence of the type of injury, the site of injury, causes and the number of days to recover from injury).

Procedure

The collection of the data was done in the winter season of 2013 - 2014, in the month of December during the scheduled winter vacation of the ski resort in Italy (Passo Tonale). The questionnaire was given to each individual skier, after briefing on the purpose of research and how to complete the questionnaire. Eighty questionnaires were handed out and 66 were returned completed (82.5% return rate).

Statistical analysis

In every characteristic group of skiers corresponds

three categories of statistical monitoring: the participants, the people with injuries, and the rate of injuries by using the Excel program 2007. The statistical analysis of the results of epidemiological research has helped to illustrate the causes and factors (such as the level of preparation of skiers) to reduce accidents of skiers.

Results

A) Individual factors in the sample in relation to injuries

The 66 respondents were aged from 20 to 28 years ($21,24 \pm 1,59$). The average height for men was $1,80 \pm 0,06$, while for women it was $1,66 \pm 0,06$. Also the weight of men was $75,08 \pm 7,99$, and women $58,38 \pm 6,17$. Finally, the values of Body Mass Index (BMI) of males was $23,19 \pm 1,59$, while that of women $21,02 \pm 0,86$, where the degree of obesity for both sexes were normal (Table 1). From Figure 1 it is concluded that women had injury rate (13%) to men (4%).

B) Factors preparation in the snow in relation to injuries

From Figure 2 it is concluded that depending on the level of technical training the highest rates of injuries were the following skiers: advanced (17%) and beginners (5%).

The largest percentage of injury rate depending

Table 1. The anthropometric characteristics of the skiers in Poland (students)

SKIERS (N)	MEN (N=50)		WOMEN (N=16)		TOTAL (N=66)			
	M	SD	M	SD	M	SD	MIN	MAX
AGE (years)	21,36	1,66	20,88	1,31	21,24	1,59	20	28
HEIGHT (m)	1,80	0,06	1,66	0,06	1,76	0,08	1,55	1,94
WEIGHT (kg)	75,08	7,99	58,38	6,17	71,03	10,44	50	90
BMI (kg/m ²)	23,19	1,59	21,02	0,86	22,66	1,72	18,42	26,26

N - number of questions M – average SD - standard deviation

Figure 1. The comparison of injury rate by gender

Figure 2. The injury rate depending on the level of technical skills

Figure 3. The injury rate depending on years of experience in skiing

Figure 4. The injury rate depending on the experience of skiing day

on years of experience in skiing were people who had experience 6 < 10 years (33%) and the lowest percentage of injury rate was that of people with experience of 0 < 0,5 years (6%, Figure 3).

The major injury rates according to experience skiing days were experienced skiers 15 < 20 days (20%) and 0 < 3 days (8%), while those with experience of 4 < 14 days

had no injuries (Figure 4). From Figure 5 it is concluded that the skiers, who are taught to ski without an instructor had a higher injury rate (50%).

C) Factors in training in dry soil in relation to injuries

Table 2 show the highest percentage of injuries compared with the use of their ski equipment (8%) and

Figure 5. The injury rate depending on how skiing is taught, with instructor or without instructor

Table 2. Involvement of skiers: ski equipment, wear a helmet? and method of learning

Participation of skiers in :	Participants		People with injuries		Percentage of injuries %
	N	%	N	%	
Ski Equipment					
Rent	42	64	2	50	5
Yours	24	36	2	50	8
Wear a helmet?					
Never	40	61	2	50	5
Occasionally	16	24	0	0	0
Always	10	15	2	50	20
Method of Learning					
Personal	46	70	4	100	9
Group	12	18	0	0	0
Racing	8	12	0	0	0
Total	66	100,0	4	100,0	6

Table 3. Involvement of skiers: the physical condition before the season, in warming up and corrective exercises

Participation of skiers in :	Participants		People with injuries		Percentage of injuries %
	N	%	N	%	
Physical Condition					
Yes	59	89	2	50	3
No	7	11	2	50	29
Warm Up					
Yes	66	100	4	100	6
No	0	0	0	0	0
Corrective exercises					
Yes	26	39	2	50	8
No	40	61	2	50	5
Total	66	100,0	4	100,0	6

skiers who always had a helmet (20%), while the highest percentages of injuries compared with the type of training was personal training (9%). A remarkable phenomenon is that people (students of skiing), who did warm-up and corrective exercises had more injuries 6% and 8% respectively (Table 3). While on the other hand, as expected, skiers who their physical training in dry soil did not had more injuries (3%) than non-participants in the physical training (29%).

D) Factors of injuries

Figure 6 shows the percentage of injuries in relation to the cause of the reckless (50%), fall (25%) and speed (25%), but Figure 7 shows that skiers of Poland had the following injuries: sprains (50%), wounds (25%) and bruises (25%).

The most common area of injury is the legs (50%), the rarest was the torso (25%) and head (25% - Figure 8). The largest percentage 75% of Polish skiers needed a recovery time of injuries until 7 days, while the least percentage 25% needed recovery time from 8 to 21 days (Figure 9).

Discussion

Summarizing this research, the greatest injury rate depending on years of experience in skiing were people with 6<10 years experience (33%), while relatively according to experience by counting skiing days, experienced skiers with 15 < 20 days had a percentage of (20%). Women had the largest percentage of injuries (13%), while skiers who learned without an instructor had a larger percentage of injuries (50%). The factor of training skill, the highest accident rate in Poland was observed in the group of advanced skiers (17%). Greater frequency of accidents were those skiers who prefer the individual skiing (9%), the use of their ski equipment (8%) and skiers who always had a helmet (20%), while the percentage of injuries in relation to the cause of the reckless (50%). The typical injuries of skiers from Poland was 50% sprain, while the largest percentage of Polish skiers 75%, need a recovery time from injuries of until 7 days.

By studying the epidemiology of accidents, injuries in skiing have been studied by scientists in such countries

Figure 6. Causes of injuries

Figure 7. The percentage of injury depending on the type of injury

Figure 8. The percentage of injuries depending on the location of the injury

Figure 9. Time required (days) of rehabilitation of injuries

as: USA [20, 24], Norway [25], Austria [10, 26], Germany [27, 28], Canada [29, 30], Switzerland [2, 21], Poland [31, 32], Russia [33], Australia [23], Netherlands [9] and Greece [12, 15]. Chojnacki, & Kusion [7] have done an epidemiological study of 100 athletes of Poland in period 1987 -2000, where 67% of participants had lesions, while the common place of injury were the lower extremities (80%). The most common injuries were to "Slalom" (42%), where the cause was a technical error. Giovanis [13] in his analysis, investigates the relationship between accidents and thus the injuries at the rates and indices of industrial path of giant slalom as: track geometry, speed, acceleration, frequency (tempo), endurance and tactics of the athlete. Chojnacki [3, 4] dealt with the organizational model of ski traffic and the algorithms presented in connection with the Skiing Safety Skiing (SSS). He compares the underlying causes of accidents (ex. by training - resulting in injuries) in athletes of different countries as: Poland 71% Austria 38% and Greece 37% [11, 13]. Shealy, et al. [34, 35] concluded that the use of a helmet was associated with a reduction in the number of

minor head injuries, but no such reduction was observed for the more serious forms of head trauma. Tuli, et al. [28] and Young [36] dealt with the dangerous and likelihood of injury in relation to the practice of skiing.

For recreational skiers the percentages of injury in relation to their physical condition were as follows: Poland 19%, 71% in the Netherlands and Greece 26% [13]. The corresponding values for recreational skiers who participated in warm-ups before skiing, the percentage of injuries were: 16% for Poland, the Netherlands 44% and Greece 20% [13]. In this investigation the above percentages of injuries to athletes and recreational skiers of Poland in relation to fitness, warm-up and corrective exercises, totalled 3%, 6% and 8% respectively. The high values of the factors for fitness training and warm-ups were the consequence of poor preparation of training before winter and poor warm ups before skiing. Giovanis [15] concludes that the Greeks skiers have lower percentage of injuries compared to other countries that have a tradition in winter sports. In a total of 1165 Greek participants the percentage of injuries was 16% [15], for 2000 Polish

skiers the percentage of injuries was 19%, 572 injured Dutch constituted 49% of participants skiers [6, 9] and for 49 Swiss skiers the percentage of injuries was 33% [22]. In the study of Amoutzas & Giovanis [12], we observe that Greek student skiers (136 participants) of the Department of Physical Education and Sports, University of Athens and the corresponding University of Komotini (Northern Greece) had high percentage of injuries (3% and 16% respectively) than those of recreational skiers (control group - 36%), while in the present study of 66 Polish student skiers the percentage of injuries was 6,3%.

Conclusions

Based on the above results about 6,3% Polish respondents' skiers had earlier accidents in Alpine skiing. The Polish population mostly consists of advanced skiers, with a few years training in skiing, with abundant days training by using a skiing instructor, warming up and

personal form of training. Skiers who don't had physical fitness preparation before the winter season, had a greater percentage of accidents and injuries. Polish skiers usually had limb injuries lower extremities (sprains) due to the reckless of the skiers. The duration of treatment and rehabilitation of injured skiers in Poland lasted until 7 days. The answer to the case and questions of this research is: skiers who are physically training to be prepared before the season and warm-up before skiing have the chances escape of accidents and injuries. It is recommended to make investigations not only by the factors of choosing the right equipment, but investigations with choice factors of the best methodology, preparation and adaptation of physical capability in the difficult environment of skiing in relation to accidents and injuries.

Conflict of interests

The authors state that there is no conflict of interest.

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