

INJURIES OF THE KNEE JOINT IN CHOSEN WINTER SPORTS DISCIPLINES

Katarzyna Ogrodzka^{1(A,B,C,D,E,F)}, Tomasz Ridan^{2(E,F)}, Jacek Krużel^{3(A,B,C,D,F)}

¹Department of Clinical Rehabilitation, Section of Rehabilitation in Traumatology, University School of Physical Education, Krakow, Poland

²Department of Physiotherapy, Section of Kinesiotherapy, University School of Physical Education, Krakow, Poland

³The Tatra Highlands Specialistic Hospital in Nowy Targ, Poland

Abstract

Aim: The purpose of the study was to assess the occurrence of knee joint injuries in sportsmen practicing the following three winter sports: ice hockey, ski jumping, downhill skiing and the impact of rehabilitation on return to active sport practice.

Methods: The research material was a group of 100 people (86 men and 14 women) aged 16 to 39. All those persons practiced selected sport disciplines professionally or semi-professionally. From the original group of 100 persons, 76 persons who have previously suffered knee injury while practicing sport were selected for the purpose of final analysis. A questionnaire was constructed for the purposes of the research in order to assess the frequency of knee joint injuries in winter sport disciplines and for the purpose of assessment of the post-injury treatment. The questionnaire included closed questions and TSK scales (Tampa Scale of Kinesiophobia).

Results: Following the analysis of the research carried out among sportsmen practicing winter sports one may conclude that downhill skiing and ice hockey were characterized by the highest rate of knee injuries (skiers - 75% of the respondents, hockey players - 82%). In the case of ski jumping, the rate of injuries was slightly lower (53% of respondents). The research results show that in most cases the sportsmen suffered a knee joint injury during competitions but also show that the most frequent cause of injury in all of the discussed disciplines is the lack of warm-up or inappropriate warm-up.

Conclusions: The knee joint injury results in damage of anatomic structures of the joint. The main type of knee injury suffered by the sportsmen representing all three sport disciplines was the joint sprain.

Key words: winter sports disciplines, injuries of knee joint, physiotherapy

Introduction

The popularity of physical activity has become one of the elements of what is referred to as a healthy life style. The global dynamic increase of interest in physical exercise in the form of exercise and various recreational and professional training forms should be seen as very positive. However, it creates a threat of injury and damage to the organs of locomotion, as well as internal organs. Those injuries may result from unfortunate accidents, though more often they are caused by insufficient preparation, especially in the case of professional sport [1].

A majority of bodily injuries in sport are to the lower limbs – usually to the knees. Of all the joints in a human body, this joint is the most exposed to injuries. In some sport disciplines, such as football, skiing or contact sports, knee injuries account for as much as 33-70% of all bodily injuries [2].

The reason for the high frequency of knee injuries is its location on the extension of two long levers of the kinetic chain of a lower limb, the lack of muscle protection, as well as undertaking activities and effort which exceed the general physical bodily capacity [3]. Unfortunately, professional sports and the growing fashion of “improvement of sport results” significantly

increase the existing threats to the knee joint. Contemporary professional sport is not friendly for human locomotion organs. The on-going pursuit of records forces athletes to undertake extreme effort both during training and during competitions. The consequence are changes to knee joint caused by overload, which are the reason for breaks in training for sportsmen representing various disciplines [4]. In professional sport where the organs of locomotion are excessively exploited, we observe syndromes of tissue and tissue structure wear, which was previously only diagnosed in ill and elderly people [5].

Recent medical literature concerning sport disciplines devotes a lot of attention to the issue of epidemiology of locomotion organ injuries suffered while practicing winter sports (skiing, snowboarding, skating and hockey) [6].

The rate of injury in downhill skiing is very high. The area which is particularly prone to injury in skiing is the knee joint, which may be damaged by straining or tearing the anterior cruciate or lateral ligaments, articular capsule, damaging the meniscus or damaging those structures in combination with fracture of the osseous parts of the joint [7]. Typical injuries in the case of downhill skiing include: head injuries, up-

per and lower limb injuries, trunk and bone injuries, muscle contusion and joint dislocation.

Ski jumping is a very spectacular winter discipline which has been practiced from the middle of the 19th century. As an elitist sport (some experts even classify it as an extreme sport), it is practically unavailable to amateurs. However, in many countries, e.g. in Finland, Norway, Austria, Germany, Japan, and recently also in Poland, ski jumping has become a discipline attracting a lot of media attention [8]. In ski jumping, we frequently come across serious bodily injuries: head injuries, lower limb injuries (knees – especially the anterior cruciate ligament, fracture of the femoral and shank bones, damage to the ligament elements of the hip joint), clavicle fractures and spinal injuries [9].

Ice hockey enjoys constant popularity in many countries. This is a team contact discipline which, apart from confrontations with other players, contains other elements which additionally increase the injury factor: the stick and the puck [6]. The number of bodily injuries in players is very high. Ice hockey is one of the fastest team games. Sharp skates, high speed, the hard ice rink surface, the puck and sticks which instantly change positions create a potential for unfortunate accidents. According to the research carried out by Daly et al. and quoted in Polish literature [6]:

- due to the obligatory use of facial protection, the number of facial bone injuries has significantly decreased. However, frequently encountered injuries include spinal injuries, while the most common ones are upper limb injuries (dislocation of the clavicle-shoulder joint, subluxation of the thumb phalangeal joint).
- lower limb injuries most frequently include injuries to knee joint ligaments (especially the lateral tibial ligament) and contusions.

One should also note that injuries in the case of ice hockey usually result from excessively brutal play, which does not comply with the rules.

There are a lot of reports concerning injuries in winter sports; nevertheless, comparison of injuries to the knee joint in three of the most popular disciplines presented in the example of high-qualified sport is rare.

Limited reports from the scope of injuries to the knee among ski jumpers are also pointing at the purpose of undertaken study.

A purpose of this research was the evaluation and comparison of knee joint injuries occurring in athletes of three winter disciplines (hockey, ski jumping, alpine skiing) and the influence of rehabilitation proceedings on return to active practice of the sport.

From the point of view of contact with an opponent and brutality of the game, it is possible to pull out the hypothesis that the most traumatic discipline is ice hockey; nevertheless, high overload of the knee

joint, resulting from operating forces in skiing or ski jumping, mean that one should treat these disciplines equally in terms of injuries to the knee.

Material and methods

Research material

The research material was a group of 100 people (86 men and 14 women) aged 16 to 39. All these persons practiced their selected sport disciplines professionally or semi-professionally. Due to the nature of the sport disciplines, women were only represented in downhill skiing. The age structure is shown in table 1.

Table 1. *Aged structure researched group*

Disciplines	Age researched group		
	>25	25-35	35-40
ice hockey	24	17	4
downhill skiing	14	18	8
ski jumping	9	6	–

All the participants were divided into the sport classes they represent – table 2.

Table 2. *Sports classes researched group*

Disciplines	Sports classes		
	Masterly class	First sports class	Second sports class
ice hockey	42	3	–
downhill skiing	7	13	20
ski jumping	6	9	–

Most sportsmen started practicing professional sport before or slightly after they were 10 years old.

From the primary group of 100 persons, selected randomly from the given disciplines, 76 persons, which in the past, during their sports career, sustained injury to the knee joint, were chosen for the final analysis. Selection to the initial group was based on filling out a voluntary questionnaire form by the athletes, so the final conclusions are related only to the research group, not to the population.

Table 3 demonstrates the details.

Table 3. *Frequency of occurrence of injury of knee joint in researched group*

Disciplines	Without injury	With injury
ice hockey	7	38
downhill skiing	10	30
ski jumping	7	8

The length of time from when a person sustained an injury varied from person to person. A clear majority declared that they suffered an injury more than a year ago – as many as 51 of the respondents; 21 persons stated that they suffered from an injury 6 months before the day of completing the questionnaire. In the case of 4 people, an injury took place 1 year ago.

Methods

A questionnaire was constructed for the purposes of the research in order to assess the frequency of knee joint injuries in winter sport disciplines (ice hockey, ski jumping, downhill skiing) and for the purpose of assessment of post-injury treatment. The questionnaire included closed questions (single and multiple choice) and TSK scales (Tampa Scale of Kinesiophobia). The questions concerned the occurrence of knee joint injuries during their sport career. The questionnaire also comprised questions concerning conservative and surgical treatment, including pharmacological treatment, as well as diagnostic methods used after injury and preventive and operational treatment methods. The subsequent part of the questionnaire referred to the sensations felt after injury and the influence of the injury on relationships with the sport environment, family and friends. The respondents were also asked to provide a subjective assessment of their level of efficiency with respect to the general function of the injured knee joint, to specify whether they returned to training at the same or a decreased level in comparison to their situation before the injury (sport results were taken into account).

The questionnaire was checked in a pilot study on a group of 15 competitors of ice hockey. This questionnaire was aimed at determining the intelligibility of questions and checking whether the questions asked are being properly interpreted by the respondents.

In order to determine whether the mental trauma connected with the injury suffered and fear of it hap-

pening again have an impact on a return to sport, the respondents were asked to complete a questionnaire regarding the Tampa Scale of Kinesiophobia. The scale, which is used in order to assess the fear of repeat injury due to age or physical activity, was originally intended for patients with spinal pain. In her research, Kvist et al. adjusted the TSK scales to the assessment of patients with knee joint problems [10]. It contains 17 statements concerning a subjective approach to pain and physical activity. In the case of each statement, the respondents had to specify if they agree or not according to a 0-3 scale ("0" - definitely no, "1" - no, "2" - yes, "3" - definitely yes). The results could range from 0 to 51 points. A higher result meant a higher level of fear of repeat injury.

The respondents' answers were subjected to a descriptive statistical analysis, and the numeric and percentage data was summarised in tables and presented in the form of diagrams.

Questions with the possibility of multiple choice are presented in the form of numerical analysis; however, questions with the possibility of a single choice are presented in the form of percentage analysis.

Results

All 76 persons who met the criteria of inclusion into the research suffered a knee joint injury while practicing sport – Tab. 4.

Table 4. *Circumstances of injuries*

Place of injury	Number of person		
	ice hockey	downhill skiing	ski jumping
training	14	23	6
competition	24	7	2

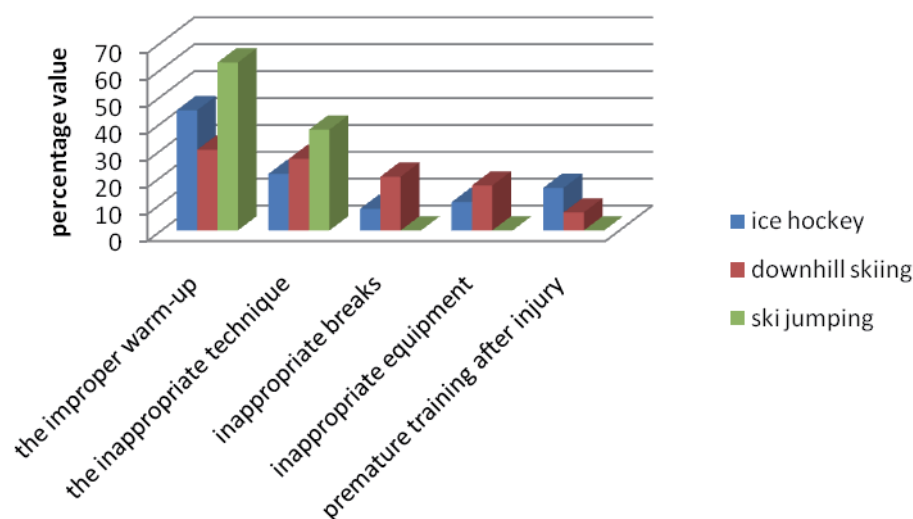


Fig. 1. *Causes of the injury*

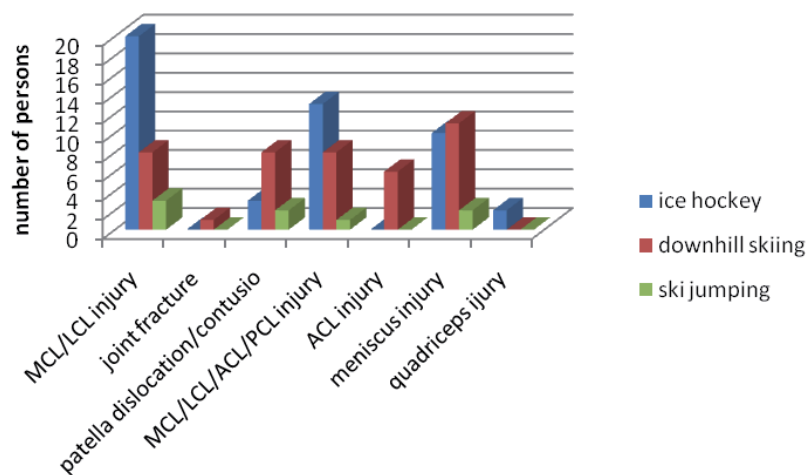


Fig. 2. Kinds of injuries of the knee joint. Amount does not equal 100%, as respondents could give more than one answer.

Among hockey players, 36.6% suffered a knee injury during training, while 63.2% during a hockey match. Of all skiers, 76.6% suffered injury during training, while 23.4% during competition. The situation was similar in the case of ski jumpers – most of the respondents (75%) suffered injury during training, while 25% during competition.

Respondents were also asked to determine the kind of injuries of the knee joint. Fig. 2 shows the results.

Of 30 downhill skiers, 18 stated that the injury was related to high overload in a specific preparatory season, while 12 found no such connection.

In the case of hockey, 18 of 38 respondents stated that the injury was related to increased overload. 5 ski jumpers did not find any connection between overload and the injury, while 3 persons thought overload before competition was the reason.

The respondents were also asked to indicate the cause of injury. According to the respondents, the cause of injury in the case of ice hockey was incorrect warm-up exercise. (44.7% of respondents). The wrong training technique and method was mentioned as the second cause (21% of respondents), and premature return to physical activity after a previous injury was listed as third (15.8% of respondents). Consequently, there is no unanimous consensus as to the cause of injury. A number of factors contributed to it, including inappropriate sport equipment and inappropriate breaks between exercises.

A similar situation was observed in the case of downhill skiing. The respondents claimed that the key reason for injury was incorrect warm-up exercise (30% of respondents), wrong training method (26.6%) and premature return to physical activity following a previous injury (6.7% of respondents). However, in response to the question: what the warm-up exercise preceding the injury was like, 13 respondents declared that it was correct, while 12 found it too short.

In ski jumping, 62% of respondents considered incorrect warm-up exercise or the lack of such warm-up exercise as the cause of the injury or they found the warm-up exercise too short.

The respondents were also asked to specify the type of injuries of the knee joint. In the case of ice hockey, the main injuries suffered by players included knee joint sprain (26 respondents) and contusion (9 respondents). In 3 cases, the joint was dislocated. Knee joint sprain resulted in extensive damage to anatomic structures. Usually it involved damage to the lateral ligaments (20 respondents) and damage to the lateral and cruciate ligaments, mostly the anterior cruciate ligament (13 respondents). Injuries to meniscus ranked third (10 respondents). Knee cap contusion and damage of the extensory apparatus were in the minority.

In downhill skiing, the main type of knee joint injury was sprain (18 respondents). Contusion and hematoma ranked second (6 respondents). In the case of two respondents, intra-articular fractures were diagnosed. Of injuries to anatomic structures, the most common ones were meniscus injury (11 respondents) and damage to the lateral (8 respondents) and anterior cruciate (8 respondents) ligaments. There was a significant group of persons with joint contusion – 8 persons. In two cases, articular fractures were diagnosed.

In ski jumping, the most common injuries were joint sprains (5 respondents) and contusion (4 respondents). Of anatomic injuries, damage to the lateral ligaments was declared by 3 jumpers, knee cap contusion – 2, meniscus injury – 2.

One may conclude that in the three discussed winter disciplines, the most frequently injured elements were the lateral ligaments (31 respondents) and meniscus (23 respondents). Anterior cruciate ligament injuries were listed as third. There were also numerous cases of knee cap contusions and sprains

Table 5. *Procedures among individual groups of athletes applicable**

Procedures	ice hockey	downhill skiing	ski jumping	Summary
light therapy	5	5	1	11
kriotherapy	8	10	1	19
laser therapy	6	10	0	16
electrotherapy	10	8	0	18
magnetic field	4	7	1	12
ultrasounds	9	5	1	15
massage	8	7	0	15
kinesiotherapy	10	11	2	23

* Amount does not equal 100%, as respondents could give more than one answer

(16 respondents). The remaining injuries, such as epiphysic fractures, quadriceps injuries or damaging the dermal continuity took place less frequently.

Following diagnosis, the respondents were subjected to treatment, both conservative and surgical.

In the case of ice hockey, of 38 players who suffered from knee injury, 23 underwent conservative treatment, while 14 underwent surgical treatment. In downhill skiing, 16 persons took advantage of conservative treatment while 14 underwent surgical treatment. 6 ski jumpers underwent conservative treatment, while 2 underwent surgical treatment.

Of all the sportsmen representing the three disciplines who underwent conservative treatment, 42 took advantage of physical therapy, while 15 persons had their joint immobilized.

Surgical treatment usually involved arthroscopy (28 respondents) and ligament reconstruction (12 respondents). In two cases, broken bones were connected with the injury. 31 sportsmen who underwent surgical treatment took advantage of physical therapy after surgery. Table 5 describes the physiotherapy treatment applied after the procedure.

Usually the respondents took advantage of kinesiotherapy exercises (23 persons), kriotherapy (19 persons) and electrotherapy (18 respondents). The respondents also took advantage of ultrasounds, magnetic field and laser therapy.

Among the sportsmen who underwent surgical treatment, the level of satisfaction from the procedures was high.

According to the respondents (58), no complications in the form of contractures or limited mobility appeared after injury of the knee joint. Of 11 respondents who declared that complications appeared, the majority complained of limited mobility (problems with bending or extension), joint pain and frequently perceived instability.

The sportsmen were also asked to describe their feelings at the moment of the injury (Fig. 3)

At the moment of injury, most sportsmen felt anger, depression and negated the consequences of injury. This is related to awareness of the seriousness of a knee joint injury for people involved in professional sport.

The return to training and competitions is a long and complex process. However, most of them returned

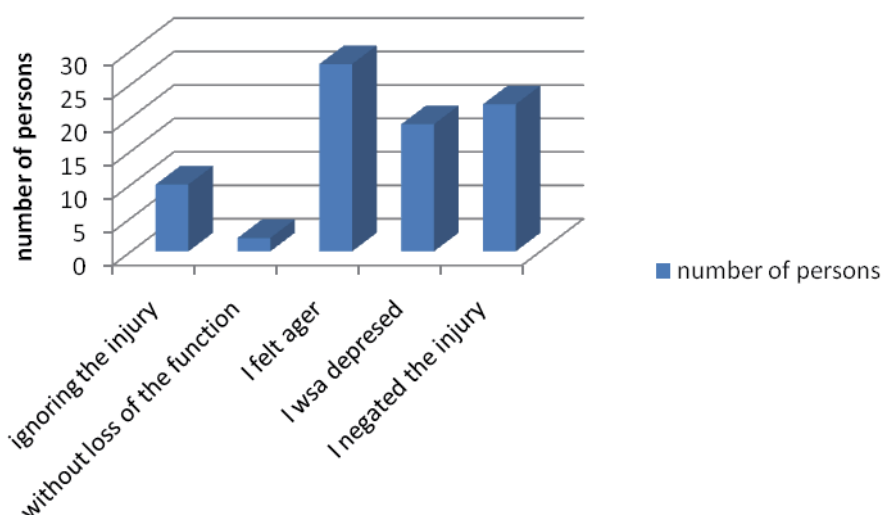


Fig 3. Reaction researched after carried injury. Amount does not equal 100%, as respondents could give more than one answer.

to the sport from the same as they were at the pre-injury period. 40 sportsmen who returned to their sport discipline declared that the injury caused slight deterioration of their sport results, while 11 found that it had a significant negative impact on sport results.

The respondents were also asked to assess the functions of their knee joint – most of them identified minor troubles (27 respondents), 35 sporadically experienced slight pain, while 10 persons suffered from persistent pain during or after training.

Nevertheless, most respondents assessed the function of their knee joint as good (40 respondents), 17 as very good and 4 respondents as weak.

According to the respondents (52 persons), the injury did not cause deterioration of their everyday life quality in terms of such activities as: walking, recreational cycling, driving, simple everyday activities. A significant majority of the respondents (73 persons) did not decide to change their sport activity to one which would be less burdensome for knee joints.

In order to verify whether the fear of repeat injury due to movement or physical activity influences the decision on returning to active sport practice in patients who have undergone a surgical procedure, the Tampa Scale of Kinesiophobia was used. The average number of points obtained by 31 respondents was 22.82.

In downhill skiing, the average result was 23.85 points (from 16 to 30), in ice hockey - 25.13 (from 12 to 33) and in ski jumping – 19.5 (from 19 to 20). The results show that in the examined group of sportsmen who have undergone a surgical procedure, a significant part of the respondents returned to sport, which suggests that their level of fear of repeat injury is low.

Discussion

The dynamic increase of persons doing sports observed in recent years and, consequently, the growing number of injury to organs of locomotion made the epidemiology of sport injuries one of the most important issues of sport medicine. This is why the determination of causes, treatment and rehabilitation methods applied in the case of injuries of organs of locomotion has been of interest to many scientists, especially in view of the fact that frequently those injuries are serious and eliminates many sportsmen from a future sport career.

Following the analysis of the research carried out among sportsmen practicing winter sports, one may conclude that downhill skiing and ice hockey were characterized by the highest rate of knee injuries (skiers - 75% of the respondents, hockey players – 82%). Literature does not provide a conclusive answer as to which of those two disciplines the knee joint injury rate is higher. In the case of ski jumping, the rate of injuries was slightly lower (53% of respondents). Nevertheless, the result of the questionnaire with respect to ski jumpers may not be representative, as the number

of jumpers covered by the study was much lower in comparison to the two remaining disciplines.

Flørenes et al. [11] claims that of all the bodily injuries in downhill skiers, the knee joint was the most prone to injury. The total number of bodily injuries was higher in the case of men than in the case of women, except for knee joint injuries. These observations are also confirmed by Vysata [12]. His research shows that, from the perspective of gender, women suffered twice as many knee joint injuries as men, probably due to weak thigh muscles, while the injuries of the upper limbs, trunk and head were five times as frequent in men as in women. According to Vysata [12], this may result from the very active and dynamic, or even risky, skiing of male skiers. A high rate of knee joint injuries was also observed by Papież et al. [13].

In the second of the disciplines discussed, ice hockey, where the knee joint injury rate is very high, a detailed study of the problem was carried out.

Radzioch et al. stated that 40% of injuries concerned knee joint injuries (frequently with ligament damage) [6]. Meanwhile, Rzepka et al. observed that 39.8% of injuries in hockey pertain to the lower limbs. According to the authors, knee joint injuries account for 22% of all lower limb injuries [14]. These conclusions are similar to the results of observations carried out by the Swedish authors Tegner and Lorentzon [15]. One of the latest research studies shows that of all lower limb injuries among hockey players, knee joint injuries dominate (lateral ligaments and meniscus damage) [16].

The third of the examined sport disciplines (ski jumping) also causes a high risk of overload and knee sprains, thus creating a threat of dangerous joint injuries. Since professional literature on the injury rate in this discipline is scarce, in the case of jumpers, it is not possible to present the percentage data on injury location as in the case of other disciplines.

Research results show that in most cases, the sportsmen suffered a knee joint injury during competitions. A high rate of injury during hockey matches is confirmed by Rzepka et al. [14]. According to them, as many as 72.8% of all injuries are suffered during matches, while 27.2% during training. Researchers from other countries reached the same conclusions [15, 17]. On the other hand, in the case of downhill skiers and ski jumpers, the majority of injuries took place during training. According to Flørenes et al. [11], in downhill skiing 45% of knee joint injuries took place during competitions, while 55% during training. No specific data is known with respect to ski jumpers.

The results show that the most frequent cause of injury in all of the discussed disciplines is lack of warm-up exercise or inappropriate warm-up exercise.

The reasons for a high injury rate, as the research shows, also include incorrect training techniques and methods.

In the case of hockey players, injuries frequently took place if physical activity was undertaken prematurely after a previous injury or resulted from inappropriate sport equipment; the least frequent cause of injuries were inappropriate breaks between training. Research carried out among players by Rzepka et al. proved that the most frequent reason for injuries in ice hockey is brutal and dangerous play, inappropriate protection measures or their lack, as well as premature return to sport after an injury, which means that the players pay relatively little attention to their health and are driven by the will to return to the game at all costs [14].

Meanwhile, in the case of downhill skiing, apart from the reasons already discussed above, injuries frequently resulted from an inappropriate break between training, the use of inappropriate sport equipment and, least frequently, premature return to physical activity after an injury. Bambach et al. [18] discusses the importance of appropriate preparation for the skiing season and selecting the right equipment for one's skills.

Those reasons (inappropriate break between training, inappropriate sport equipment, premature return to physical activity after a prior injury) did not occur among the examined jumpers.

A knee joint injury results in damage to the anatomic structures of the joint. The main type of knee injury suffered by sportsmen representing all three sport disciplines was joint sprain.

In ice hockey, a joint sprain was the most common. This is confirmed by the research of Rzepka et al. [14]. As the questionnaire study shows, the second discipline from the perspective of injury type was downhill skiing, while ski jumping came third. Widuchowski claims that knee joint sprain is the most common injury in sportsmen, irrespective of the discipline and level (professional, recreational, occasional sport) [3].

This is confirmed by Ziomkowski et al. [20] – according to their research, joint sprains account for as much as 70% of all sport injuries.

The consequences of a knee sprain include a number of extra- and inter-articular damages [3].

According to the respondents, the most frequent injury of anatomic structures in ice hockey was the damage to the ligaments (lateral and anterior cruciate) followed by meniscus damage. Fractures and damages of the knee extensor apparatus were in the minority. This is confirmed by the research of Rzepka et al. [14] who claims that in 22% of knee sprains, damage to the lateral ligaments accounts for 9.8%, damage to meniscus – 4.9%, while fractures and other – 4.8%. Similar data is quoted by Radzioch et al. [6].

In downhill skiing, the respondents declared that they suffered from meniscus damage most frequently. Paletta and Warren present similar conclusions [21].

The author's own research shows that in skiers, damage of the lateral and anterior cruciate ligaments is at a similar level.

The research results may suggest that the most frequent type of knee injury in ski jumpers is damage of the lateral ligaments. Joint contusions and meniscus damage follow, and the remaining injuries are not significant.

Treatment improving the condition of the joint is a very important element in treatment of knee injuries. Neglecting this treatment, or failure to perform it in an appropriate way, especially in the cases where the physical therapist is inexperienced, may cause even more damage and pose a serious threat to a future sport career [3].

Sportsmen undergo both conservative and surgical treatment. The questioned sportsmen underwent both conservative and surgical treatment. In both cases, they took advantage of physical therapy procedures. Of all the sportsmen representing the three disciplines (downhill skiing, ice hockey, ski jumping) who underwent conservative treatment, 42 respondents took advantage of physical therapy. According to them, the level of satisfaction from the procedures was high. Meanwhile, in the case of sportsmen who underwent surgical treatment (40 respondents), 31 persons took advantage of physical therapy after a surgical procedure. In the group of sportsmen who underwent surgical treatment, the level of satisfaction from the procedures was also high. This may suggest that the sportsmen felt that the persons taking care of them were competent, which resulted in a visible progress in treatment.

The respondents took advantage of various therapeutic procedures in order to return to their previous physical activity, including light therapy, krio-therapy, laser therapy, electrotherapy, magnetic field, ultrasound, massage and exercise.

Success of the therapy is confirmed by the respondents, who report few complications in the form of contractures, instability or joint pain. As the research shows, most of the respondents (58) do not complain of the symptoms described above.

Another finding is that at the moment of suffering an injury, most sportsmen felt anger, depression and refused to believe in their condition. Most of the respondents expressed fear as to the future of their sport career. However, as a result of a long and complicated therapy process, most of them returned to a pre-injury sport activity level. Those results may prove that the 10. rule of physical therapy according to Gawroński's classification [22] which provides that "physical therapy in all secondary post-traumatic injuries (complications) cannot result in deterioration of the damaged tissue, while the functions damaged as a result of the injury must be reconstructed and their functionality restored to the "normal" condition (starting point) has been implemented to a significant extent, though not completely.

What is more, Gawroński states that well-planned and carefully conducted physical therapy is a significant element of treatment, because it allows one to return to practicing sport safely and in a relatively short time, without the risk of another injury [22].

Because of the low number of examined ski jumpers, an objective analysis of the results of trauma in this discipline and a comparison of them with hockey players and skiers is impossible. Nevertheless, insignificant reports from literature concerning injuries to the motor organ among ski jumpers point to the necessity for continuation of research and carrying its very detailed analysis.

Kvist et al. [10] discovered a significant connection between the fear of repeat injury and resignation from sport. On the basis of the Tampa Scale of Kinesiophobia (TSK) results, one may state that the questioned persons were characterized by a low level of fear related to return to sport after an injury (most of them returned to sport). Of all the respondents, mostly the older ones (from the age group 35-40) felt more fear concerning the return to sport; they obtained a higher number of points, while the youngest age group (up to 25) returned to sport without any fear (they obtained a lower number of points). One may conclude that this is connected with a more optimistic approach to the future held by young people.

The conducted research on a small group of athletes, although providing valuable information about injuries of the knee joint amongst athletes practising winter sports professionally, does not constitute the actual image of given issues; therefore, generalizing results for the entire population is not possible, and we should treat this research as a descriptive study and a basis for examinations on the population at large.

Conclusions

Of all the examined disciplines, the rate of knee joint injury is highest in the case of ice hockey.

The most frequent cause of knee joint injury in all the examined disciplines is lack of warm-up exercises or inappropriate warm-up exercise.

In the examined group of hockey players, the most frequent injuries involved damage to the lateral and anterior cruciate ligaments, in downhill skiers – meniscus damage, while in the case of jumpers – lateral ligament damage.

In the case of a majority of the examined sportsmen, physical therapy allowed them to return to professional sport at a pre-injury level.

Knee joint injury did not have an impact on deterioration of the quality of life of the examined sportsmen.

References

1. Garlicki J, Kuś W. M. *Traumatologia sportowa*. Warszawa: PZWL, 1988.
2. Widuchowski J. *Kolano – urazy i obrażenia sportowe*. Katowice: G-kwadrat s.c., 1997.
3. Dziak A, Tayara S. *Urazy i uszkodzenia w sporcie*. Kraków: Kasper, 2000.
4. Chojnacki K, Ruchlewicz T. Przeciążenia stawów kolanowych w narciarstwie zjazdowym i ich profilaktyka. *Med Sport* 1998; 2(4): 307-12.
5. Dziak A. Etiopatogeneza uszkodzeń więzadeł krzyżowych kolana. *Med Sport* 2002; 6 (supl.2): 9-17
6. Radzioch W, Lewicki R. Epidemiologia obrażeń narządów ruchu w niektórych dyscyplinach sportów zimowych. *Medycyna Sportowa* 1997; 11: 6-11
7. Pasławska M. Przygotowanie kondycyjne i sprzętowe do sezonu narciarskiego jako czynniki warunkujące jakość jazdy i bezpieczeństwo na stoku narciarskim. *Kultura Fizyczna* 2007; 1-2: 27-30.
8. <http://www.skokinarciarskie.pl>
9. <http://www.skijumping.pl>
10. Kvist J, Ek A, Sporrstedt K, Good L. Fear of re-injury: a hindrance for returning to sports after anterior cruciate ligament reconstruction. *Knee Surg Sports Traumatol Arthrosc* 2005; 13: 393-7.
11. Flørenes TW, Bere T, Nordsletten L, et al. Injuries among male and female World Cup alpine skiers. *Br J Sports Med* 2009; 43: 973-8.
12. Vysata K. Problemy urazowości we współczesnym narciarstwie zjazdowym. *Kultura Fizyczna* 1992; 1-2: 28-9.
13. Papież M. Obrażenia narciarskie. *Medycyna Sportowa* 1998; 78: 11-2.
14. Rzepka J, Przybyła E, Imiołczyk E. Urazowość w hokeju na lodzie. *Wych Fiz i Sport* 1992; 3: 69-78.
15. Tegner Y, Lorentzon R. Ice hockey injuries: incidence, nature and causes. *Br J Sports Med* 1991; 25 (2): 87-9.
16. Moslener M, Wadsworth L. Ice hockey: a team physician's perspective. *Curr Sports Med Rep* 2010; 9(3): 134-8.
17. Kuzuhara K, Shimamoto H, Mase Y. Ice Hockey Injuries in a Japanese Elite Team: A 3-Year Prospective Study. *J Athl Train* 2009; 44 (2): 208-14.
18. Bambach S, Kelm J, Hopp S. Ski sport. Trend-pattern of injuries—prevention. *Sportverletz Sportschaden* 2008; 22(1): 25-30.
19. Vysata K. Sprzęt narciarski a bezpieczeństwo jazdy. *Kultura Fizyczna* 1989; 11/12: 24-6.
20. Ziomkowski R, Sosnowski W, Lechowicz J. Diagnostyka artroskopowa sportowych obrażeń stawu kolanowego. *Medycyna Sportowa* 1996, X/XII; 63: 2-3.
21. Paletta GA, Warren RF. Knee injuries and Alpine skiing. Treatment and rehabilitation. *Sports Med* 1998; 2(4): 313-29.
22. Gawroński W. Dziesięć zasad rehabilitacji w medycynie sportowej. *Med Sport* 2002; 6 (supl. 2): 91-3.

Received: November 17, 2010

Accepted: July 27, 2011

Published: August 05, 2011

Address for correspondence:

Katarzyna Ogrodzka

Zakład Rehabilitacji w Traumatologii AWF

Al. Jana Pawła II 78

31-571 Kraków, Poland

e-mail: katarzynaogrodzka@wp.pl

Tomasz Ridan: tomasz.ridan@gmail.com

Jacek Kruzel: jacek_kruzel@onet.pl