



1. Over the last 2-weeks, how often have you been bothered by any of the following problems?

a. Little interest or pleasure in doing things

Not at all	Several days	More than half the days	Nearly everyday

b. Feeling down, depressed or hopeless;

Not at all	Several days	More than half the days	Nearly everyday

c. Poor appetite or overeating;

Not at all	Several days	More than half the days	Nearly everyday

d. Feeling tired or having little energy;

Not at all	Several days	More than half the days	Nearly everyday

e. Trouble falling or staying asleep; sleeping too much;

Not at all	Several days	More than half the days	Nearly everyday

f. A drop in self-confidence;

Not at all	Several days	More than half the days	Nearly everyday

g. Trouble concentrating on things, even on simple activities;

Not at all	Several days	More than half the days	Nearly everyday

h. Hyper or hypo-activity states;

Not at all	Several days	More than half the days	Nearly everyday

i. Suicidal or self-mutilation thoughts

Not at all	Several days	More than half the days	Nearly everyday

Science, Movement and Health, Vol. XIII, ISSUE 2 supplement, 2013
September 2013, 13 (2), 649-655

EXCESS IN SPORT AND ITS CONSEQUENCES – TRAUMAS KNEE INJURIES

MIRCIOAGĂ ALEXANDRA¹, BARZUCA DORIAN¹, MIRCIOAGĂ ELENA-DOINA¹

Abstract

Purpose. The starting point of the present study is the idea that the high trauma incidence among the studied competitive sportsmen is caused by factors that can be controlled at least partially through primary prevention methods.

Material and methods: The study was performed on a batch of 155 sportsmen who practised athletics, basketball, handball, football and volleyball. The sportsmen were between 13- 42 years old and had been practising sports for 4-20 years. The study covered three years of competitions: (August 2006 – July 2009).

Purpose: To reduce the number of traumas in the studied sportsmen through the identification of risk factors and the introduction of prevention exercises and stretching techniques exercises in the training programme, both during warm-up and in post-effort rehabilitation, in order to prevent injuries and increase performance

This article deals only with data regarding knee injuries.

Results. The statistical comparison of the results revealed that in the second period (August 2008 – July 2009), when the exercise programme was followed in a systematic, organised and dynamic manner both during warm-up and post-effort rehabilitation, the incidence of locomotor traumas affecting whole batch of sportsmen decreased significantly (**with 25.18%**) as compared with the first period. The number of knee traumas decreased significantly within the 23-26, 13-18 and 19-22 age groups ($p = 0.0011$; $\alpha = 0.001$).

The number of knee traumas decreased significantly in the second period as compared to the first, in all years of practice groups, except for the > 20 group, which showed only minor differences. Two sportsmen were included in this longevity category.

¹Department Of Physical Education End Sport , Victor Babes"University Of Medicine And Pharmacy Timisoara, ROMANIA

E-mail: doina_mircioaga@yahoo.com



Conclusions

- High incidence of medium severity macrotraumas – 1st and 2nd degree sprains and muscular elongations, compared with severe macrotraumas – 3rd degree sprains, which corresponds to the data in the sports-related literature.
- The utility, necessity and beneficial effects of the prevention exercises included in the training programme have been proved.
- The performance level and the number of training sessions influence the high number of traumas that occurred.
- The extrinsic factors have a stronger influence.

Key words: sportsmen, traumas, knee, prevention, rehabilitation.

Introduction

An injury, irrespective of its cause, may be of critical consequence in a sportsman's life.

Overstress imposed by high performance and the imbalance between the mechanic overstress and the functional resistance of the tissues are the causes of the high incidence of joint traumas in the studied batches.

Research objectives

- To determine musculo-skeletal trauma incidence, frequency and location by the affected segment in the studied sportsmen;
- to identify and reduce the internal and external factors that cause traumas in sportsmen;
- to develop and apply prevention exercises;
- to detect musculo-skeletal traumas early, using modern investigation methods: musculo-skeletal ultrasound scan, MRI, CT.

Material and methods

The study batch included 155 sportsmen (52 (33.5%) female and 103 (66.5%) male) who practised athletics, basketball, handball, football and volleyball. The sportsmen were between 13 and 42 years old and had been practising sports for 4-20 years. The study covered three competition years (August 2006 – July 2009).

Methods for preventing traumas in sportsmen

The following research methods were used: scientific documentation, observation, experiments, conversations, questionnaires, MRI, CT, statistic and graphic methods (Rinderu, 2005; Kontonopoulou, Xidea-Kkemeni, 2004; Mircioaga, 2009). The sportsmen were monitored both while training and during competitions through video recordings, questionnaires, and observation and conversation conducted by medical sportsmen and kinetic therapy experts. The injured sportsmen were examined

clinically and imagistically (radiology, ultrasound scan and in severe traumas also MRI). Starting with **August 2008**, the sportsmen followed a complex and coherent programme of exercises focused on muscle groups and joints that are usually involved in the specific movements of sport games and athletics. (Mircioaga, 2009).

(The statistical processing included:

- the comparison of the average values: the "t" (Student) test was used for pairs of independent batches and a significance (risk) level of 0.05 (5%); the "F" test was used to compare more than two batches (the ANOVA model) (8) Mihalas, Lungeanu, 1998; Baron, Anghelache, Titan, 1995;
- regression and statistic correlation: linear regression and the Pearson coefficient;
- the Z test

Results

❖ The musculo-skeletal traumas that occurred in 11 body segments (forearm, thigh, elbow, spine, face, calf, **knee**, ankle, hand (palm, fist), foot and shoulder) both before and after introducing the prevention programme were all registered.

❖ In order to reveal the importance of the prevention programme, the shares of the type of injuries affecting the whole batch between the two periods were compared.

This article deals only with data regarding knee injuries.

Comparisons by age groups and affected body segments

In order to compare the percentage values in each age group between the two periods, the Z test was applied. The following table shows the p values and the significance of the comparisons:

Table 1. Comparison of trauma shares by age groups and body segment

Age group	p value and significance					p value and significance		
	Thigh	Spine	Knee	Ankle	Shoulder	Forearm	Face	Foot
13-18 years	0.475 ^{ns}	0.08 ^{ns}	<0.001 ^s	0.033 ^s	0.138 ^{ns}	0.99 ^{ns}	0.607 ^{ns}	0.99 ^{ns}
19-22 years	0.063 ^{ns}	0.49 ^{ns}	<0.001 ^s	0.0014 ^s	0.99 ^{ns}	0.995 ^{ns}	0.499 ^{ns}	0.717 ^{ns}
23-26 years	0.34 ^{ns}	0.99 ^{ns}	0.0011 ^s	0.08 ^{ns}	0.916 ^{ns}	0.617 ^{ns}	0.99 ^{ns}	0.558 ^{ns}
27-30	0.194 ^{ns}	0.99 ^{ns}	0.214	0.99 ^{ns}	0.99 ^{ns}	0.934 ^{ns}	0.99	0.908

years				ns				ns	ns
> 30	0.386 ^{ns}	0.99 ^{ns}	0.99 ^{ns}	0.99 ^{ns}	0.386 ^{ns}	0.951 ^{ns}	0.99 ^{ns}	0.99 ^{ns}	
years									

In **Period 2**, the number of traumas decreased in all segments and age groups, **except for** the ankle traumas, which **increased** a little within the **27-30 age group** ($p = 0.99, \alpha = 0.05$).

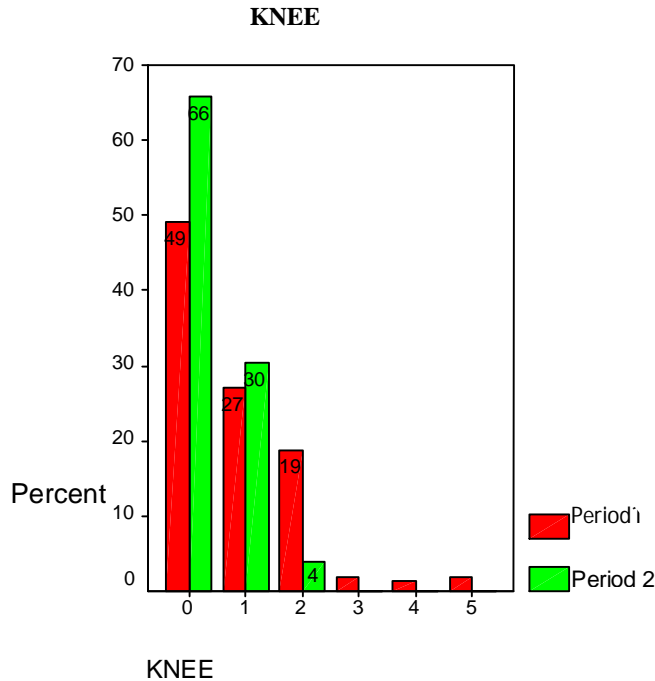
The table shows that the incidence of **thigh, spine and shoulder** traumas decreased slightly in the second period as compared to the first.

Knee injuries decreased **significantly** within the 23-26, 13-18 and 19-22 age groups ($p = 0.0011, \alpha = 0.001$)

Ankle injuries decreased **significantly** ($p = 0.033, \alpha = 0.05$) within the 13-18 ($p = 0.0014, \alpha = 0.01$) and the 19-22 age groups.

The incidence of **forearm, face and foot** traumas decreased only a little; as a rule, the general number of traumas decreased, **except for** the 19-22 and 23-26 age groups, where the number of **foot** injuries increased slightly in **period 2**.

Distribution of musculo-skeletal traumas by affected segment and maximum number of traumas (1-5 traumas/sportsmen/segment) against the whole batch (= 155) a comparison of the two studied periods



Graphic 1. KNEE trauma distribution (%) (0 -5 traumas) on the two studied time periods

Period 1

42 sportsmen (27.1%) suffered **1** knee trauma in August 2006 – July 2008.

29 sportsmen (18.71%) suffered **2** knee traumas in August 2006 – July 2008.

3 sportsmen (1.94%) suffered **3** knee traumas in August 2006 – July 2008.

2 sportsmen (1.29%) suffered **4** knee traumas in August 2006 – July 2008.

3 sportsmen (1.94%) suffered **5** knee traumas in August 2006 – July 2008.

Period 2

47 sportsmen (30.32%) suffered **1** knee trauma in August 2008 - July 2009.

6 sportsmen (3.87%) suffered **2** knee traumas in August 2008 - July 2009.

It should be noticed that in the second period the number of knee traumas was smaller among the sportsmen with relapses (2-5 traumas), while the number of injured sportsmen decreased from 79 to 53 (-26) in the same period.

**Table 2. Percentage distribution of knee trauma
COMPARISONS BY AGE GROUPS AND AFFECTED SEGMENTS - KNEE**

		KNEE		
		Number of traumas	Trauma %	Total sportsmen
Period 1	Age group			
	13-18 years	22	61.11	36
	19-22 years	70	100.00	70
	23-26 years	28	82.35	34
	27-30 years	9	75.00	12
	> 30 years	3	100.00	3
		132	85.16	155
Period 2	13-18 years	5	13.89	36
	19-22 years	33	47.14	70
	23-26 years	14	41.18	34
	27-30 years	5	41.67	12
	> 30 years	2	66.67	3
			59	38.06

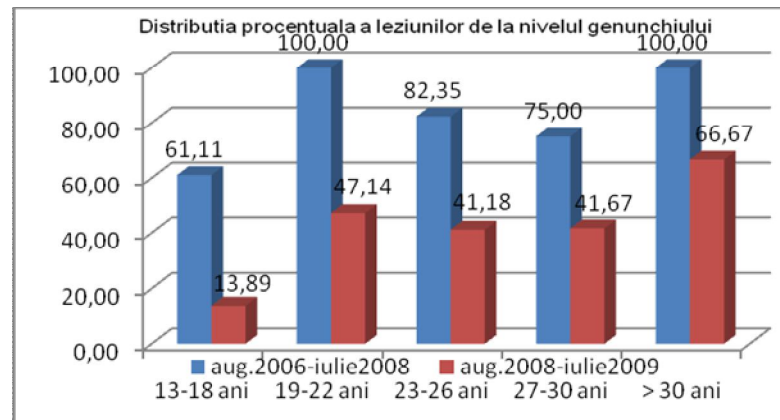
Percentage distribution of musculo-skeletal traumas by affected segment and age groups, against the whole batch, irrespective of sex or sport; a comparison of the two studied periods

As there are significant differences in knee lesions by age groups, it is necessary to compare the age groups to determine which of them shows the most important differences.

Period 1: significantly less knee lesions in the 13-18 age group than in the 19-22 group ($p = 0.001$, $\alpha = 0.001$)

Period 2: significantly less knee lesions in the 13-18 age group than in the 19-22 group ($p = 0.0011$, $\alpha = 0.01$)

Period 2: significantly less knee lesions in the 13-18 age group than in the 23-26 group ($p = 0.022$, $\alpha = 0.05$)



Graphic 2. A comparison of the percentage distribution of knee traumas by age groups in the two studied periods

COMPARISONS ON YEARS OF PRACTICE GROUPS AND AFFECTED SEGMENTS – KNEE –

Percentage distribution of musculo-skeletal traumas by affected segment and years of practice groups, against the whole batch, irrespective of sex or sport; a comparison of the two studied periods.

Table 3. Percentage distribution of knee traumas by years of practice groups in the two studied periods

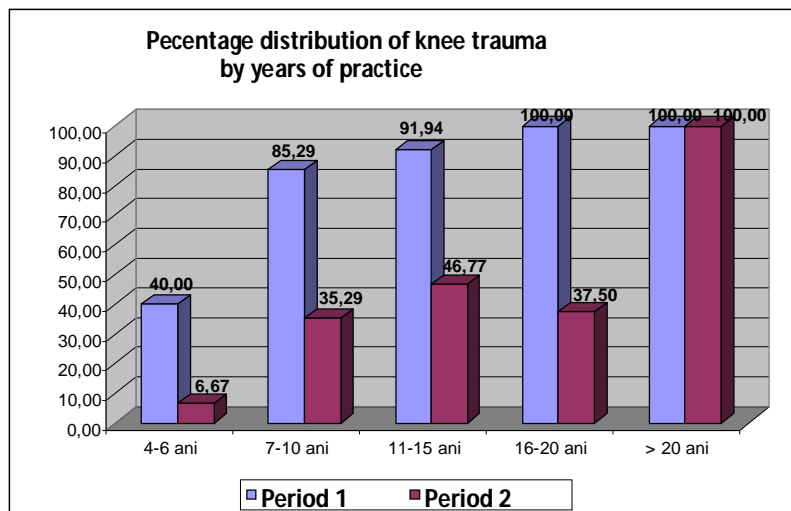
		KNEE		
		Number		
	Years of practice	of traumas	Trauma %	Total sportsmen
Period 1	4-6	6	40.00	15
	7-10	58	85.29	68
	11-15	58	91.94	62
	16-20	8	100	8
	> 20	2	100	2
	Total	132	84.52	155
Period 2	4-6	1	6.67	15
	7-10	24	35.29	68
	11-15	29	46.77	62
	16-20	3	37.5	8
	> 20	2	100	2
	Total	59	38.06	155

For the first studied period, the knee trauma comparisons between the years of practice groups were made with the χ^2 test; the results were $p < 0.001$, with a significance threshold of $\alpha = 0.001$, which indicates **significant differences** between these groups. The comparison between the numbers of traumas by years of practice groups led to the following results:

- there are significantly less traumas in the 4-6 years of practice group than in the 7-10 group ($p < 0.001$, $\alpha = 0.001$)
- there are significantly less traumas in the 4-6 years of practice group than in the 11-15 group ($p < 0.001$, $\alpha = 0.001$)
- there are significantly less traumas in the 4-6 years of practice group than in the 16-20 group ($p = 0.018$, $\alpha = 0.05$). The rest of the differences are not important.

For the second studied period, the knee trauma comparisons between the years of practice groups were made with the χ^2 test; the results were $p = 0.019$, with a significance threshold of $\alpha = 0.05$, which indicates **significant differences** between these groups. The comparison between the number of traumas by years of practice groups led to the following results:

- there are significantly less traumas in the 4-6 years of practice group than in the 7-10 group ($p = 0.03$, $\alpha = 0.05$)
- there are significantly less traumas in the 4-6 years of practice group than in the 11-15 group ($p = 0.01$, $\alpha = 0.05$)
- there are significantly less traumas in the 4-6 years of practice group than in the > 20 group ($p = 0.023$, $\alpha = 0.05$)
- there are significantly less traumas in the 11-15 years of practice group than in the > 20 group ($p = 0.013$, $\alpha = 0.05$). The remaining differences are unimportant.



Graphic 3 Percentage distribution of knee traum by years of practice

In order to compare the percentage values for each years of practice group in the two periods, the Z test

was applied and the following results were obtained:

Table 4

Years of practice	p value and significance	α significance threshold
4-6	0,042 ^s	0.05
7-10	<0,001 ^s	0.001
11-15	<0,001 ^s	0.001
16-20	0,03 ^s	0.05
> 20	0,99 ^{ns}	0.05

Discussions

The number of **knee traumas decreased significantly in the second period** as compared to the first, in all years of practice groups, except for the > 20 group, which showed only minor differences. Two sportsmen were included in this longevity category.

Distribution of joint traumas in the studied batches:

- In the **handball** and **volleyball** batches, the **knee joint** lesions are far more common than in the **basketball** batch.

- In **basketball** and **handball**, the most frequent lesions are knee and ankle sprains that cause meniscus and muscle injuries in most cases.

- **Track and field events:** the number of knee traumas ($p = 0.001$; $\alpha = 0.01$) decreased considerably in 2008-2009 compared with 2006-2008.

- **Football:** the number of knee traumas ($p = 0.007$; $\alpha = 0.01$) decreased significantly.

The comparison between trauma percentages in athletes and football players had the following significant results: knee ($p < 0.001$; $\alpha = 0.001$). Trauma incidence was considerably reduced in football players than in athletes.

The overtraining imposed by competitiveness and the imbalance between the mechanic overstress and the functional resistance of the tissues are the causes of the high incidence of knee trauma in the studied batches.

The literature of the field indicates that as far as volleyball injuries are concerned, 90% of the sportsmen treated in a metropolitan clinic had injuries of the lower extremities, while 59% of them suffered from knee traumas (Gerberich et al., 1987). Avramescu et al. (2006) which confirms the results of our study, that points us an average injuries at the knee and ankle, on both time periods, of 68%. Knee traumas are significantly more frequent in the volleyball batch than in the basketball one. Practically, one cannot play volleyball without jumping which points us to the knee and ankle injury average on both time periods of 68%.

In a study conducted at the team U. PRO VOLLEYBALL CRAIOVA, on a batch of 12 athletes there have been recorded a number of 50 injuries, from which 40% were represented by macrotraumatism (sprains 50%): hiperfunctionale disease 44% (of which tendinitis 36, 36%). (2)

A 2007 study performed on 116 trauma-suffering sportsmen (in the sportive medicine centre) concluded that over 63% of the injuries were caused by jumps.(INCS)(2) Ankle sprain may occur in any sport; however, it is commonly associated with contact and team sports that require jumping or sudden changes of direction. Ankle sprains account for about 35% of all accidents that occurred during basketball, volleyball, football and handball games and training sessions. Once a sportsman has sprained his ankle, he is at high risk of spraining it a second time. In basketball, ankle sprains account for 45% of all traumas. In volleyball, they represent only 25% of the total number of injuries. In 20-40% of cases, ankle sprains cause residual functional sequelae and chronic ankle instability (Kontonopoulou, Xidea-Kkemeni, 2004; Lian et al., 1996).

The overtraining imposed by competitiveness and the imbalance between the mechanic overstress and the functional resistance of the tissues are the causes of the high incidence of knee trauma in the studied batches.

The pathology included the following areas of the body:

- **Knee joint:** sprains, strains, collateral ligament injuries and meniscus tears. The most frequent lesions affected the meniscus (degenerations, fissures, ruptures) and the ligaments (sprains, partial or total ruptures of the cruciate ligament, mostly ACL injuries, ruptures of the collateral ligament). A common injury in volleyball players caused by repeated jumps is patellar tendinitis. The most frequent name of the quadriceps and patellar tendinitis is the **jumper's knee**;

MOST AFFECTED BODY SEGMENTS BY SPORTS

Table 5 Knee:

Period 1		Period 2	
SPORTS			
1. Handball	128.57 %	1. Volleyball	55%
2. Athletics	116.67 %	2. Basketball	43.75%
3. Volleyball	102.5%	3. Handball	39.29%
4. Basketball	66.67%	4. Athletics	33.33%
5. Football	33, 33%	5. Football	3.70%

Conclusions

- high incidence of medium severity macrotraumas – 1st and 2nd degree sprains and muscular elongations, compared with severe macrotraumas – 3rd degree sprains, which corresponds to the data in the sports-related literature.

- Injuries are hard to treat, especially if treatment is not started early. Their treatment can be a simple conservation method or surgery. The best strategy is to avoid injuries. In order to avoid accidents and meet the requirements of the daily training, a series of factors must be taken into account: **prevention exercises, diet, rest, proper warm-up.**

- The utility, necessity and beneficial effects of the prevention exercises included in the training programme have been proved.

- The performance level and the number of training sessions influence the high number of traumas that occurred.

- The extrinsic factors have a stronger influence.

- Research work has revealed the complexity of the physical and psychological changes occurring after traumas in sports. This study has proved the importance of prevention in reducing trauma incidence among the studied sportsmen.

References

- Avramescu E.T., Ilinca I., Zavaleanu M., Enescu-Bieru D., Abordarea metodologică a factorilor de risc în traumatologia sportivă din volei, Revista Societații Române de Medicină Sportivă, nr. 6, 2006
- Agenția Națională pentru Sport, INCS. seria: Sportul de înalta performanță SDIP nr. 7/2006 p 65-67.
- Baron, T., Anghelache C., Titan E., 1995, Compendiu de statistică, Editura 11 Plus S.A., București.
- GAGEA A., 1996, Informatică Și Statistică, Curs Master, Editura Anfs, București, p. 118-122
- Gavrilescu, G., Anton, M., Timnea, O., 2007, Noțiuni de Biomecanică cu Aplicație în Educație Fizică și Sport, Ed., Bren, p 175-185.
- Joseph, L.R., 2000, USA Rtaks & Fild Coaching Manual – Proiect Coordonator, Human

Kinetics, (Manualul antrenorului de atletism din SUA cap. 3, 100-200 mp Curtis Frye p.44-45), Ralph Lindeman John Millar Cap. 5, 100-110 mg p.63

Kontonopoulou, I., Xidea-Kkemeni, A., 2004, Musculoskeletal Injuries and the Parameters that Contribute to their Appearance in Professional Athlets or in Athlets of High Level, the 13 th Balkan Sports Medecine Congress, Drama

Lian, O., Engebresten, L., Ovrero, P.V., Bahr, R., 1996. Characteristics of the leg extensors in male volleyball players with jumper's knee. The American Journal of Sports Medicine.

Mihalas, G.I., Lungeanu, D., 1998, Curs de Informatică Medicală. Timișoara: Ed. Eurobit.

Mihailescu, L., 2005, Performanta sportiva si traumatismele specifice alergatorilor de garduri, articol Revista Stiinta Sportului.

Mircioaga, E.D., 2009, Prevention of Musculo-Skeletal Traumas in Competitive Sportsmen (Aspects regarding trauma incidence in volleyball and basketball teams), articol, Analele Universitatii — Ovidius — Seria Educatie Fizica si Sport / Vol IX, Issue 2 –supliment, septembrie.

Mircioaga, E.D., 2009, Effects of overstress in competitive sportsmen - Jumper's Knee Syndrome, Medicina Sportiva, supliment 2 octombrie 2009.

Poenaru, D.V., Matusz P.L., 1994, Traumatologie sportiva, Editura Mirton Timisoara, p. 42, 43, 44, 59 RINDERU E.T., 2005, Kinetoterapia În Activități Sportive, Ed. Universitaria, Craiova, pg 4, 6, 124-130.

Rochcongar, P. et al., 2004, Étude épidémiologique du risque traumatiques des footballeurs français de haut niveau / Science & Sports 19, 63–6.

