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ASPECTS ON MUSCULO-SKELETAL TRAUMA INCIDENCE IN COMPETITIVE SPORTSMEN. A COMPARATIVE STUDY OF ATHLETES AND FOOTBALL PLAYERS – PART II

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Abstract
Traumas occur frequently in the competitive sportsman's life. The causes and the mechanisms of musculo-skeletal traumas vary with every sport.
The aim of this study is to compare the frequency and location of musculo-skeletal traumas in competitive athletes and football players between period I August 2006 -July 2008 and period II August 2008- July 2009 within the same sport branch and between branches;
The comparison was based the track and field event and the player's position on the football ground.
Material and method
The study was performed on 27 football players from League A1 and A2 and 12 athletes (sprint and hurdles) aged between 13 and 26 and with 4-17 years time spent in training. The sportsmen were monitored both while training and during competitions through video recordings, questionnaires, observation and conversation conducted by coaches, medical sportsmen and kinetic therapy experts.
The injured sportsmen were examined clinically and imagistically (radiology, ultrasound scan and in severe traumas also MRI).
Results
Two batches were studied: batch one consisted of 12 male athletes and batch two consisted of 27 male football players.
The musculo-skeletal traumas occurred in 11 body segments: forearm, thigh, elbow, spine, face, calf, knee, ankle, hand (palm, fist), foot and shoulder.
The comparison of the trauma percentages in the two batches was based on the affected body segment, the player's position on the ground and the track and field event .
The results of the comparison between the injuries occurring in each body segment separately in the two periods are significant (the Z-test was used and the significance threshold was $\alpha = 0.05$).
The comparison between trauma percentages in athletes and football players had the following significant results:

- **elbow ($p = 0.016$; $\alpha = 0.05$)**
- **spine ($p = 0.032$; $\alpha = 0.05$)**
- **calf ($p = 0{,}011^{s}$; $\alpha = 0.05$)**
- **knee ($p < 0.001$; $\alpha = 0.001$)**
- **foot ($p = 0.027$; $\alpha = 0.05$)**
- **shoulder ($p = 0.002$; $\alpha = 0.01$)**

Trauma incidence was considerably reduced in football players than in athletes.
Conclusions
The results of our study, validated in sports-related literature, indicate that trauma incidence is higher in athletes, especially those participating in more events such as hurdling.
Key words: traumas, competitive sportsmen, track and field events, football

Introduction

This study deals with specific traumas in athletes and football players. *Compared with the data found in sports-related literature*, trauma incidence is very high in these sportsmen. For this reason, the authors of the study have tried to identify trauma causes and to establish methods meant to prevents injuries in sportsmen.

Hypothesis

Trauma incidence in sports varies with sex, age, time spent in training and affected body segments. The authors have assumed that following a comparative study on trauma incidence in training and competitions, specific means can be selected and applied as injury prevention methods and rehabilitation therapy.

Objectives

1. To determine the main musculo-skeletal

height, weight, BMI, the maximum number of traumas per segment and the total number of traumas in the studied periods;

2. to determine the main musculo-skeletal traumas based on the position of the football player on the ground and the track and field event;

3. to develop and use preventive training protocols;

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4. to evaluate and compare the results obtained within the same batch and between the two batches in the two periods

Material and method

The study was performed in order to obtain information on 12 athletes from the Banatul Sports High School and 27 football players from Timisoara playing in League A1 and period A2, all aged between 13 and 27 and with 4-17 years time spent in training. The study extended over three years: Period I August 2006-July 2008 and period II August 2008-July 2009.

Starting with august 2008, the sportsmen followed a complex and coherent programme of exercises focused on muscle groups and joints that are usually overstressed while training or during competitions. The exercises were chosen so as to increase muscular balance and joint mobility and to improve muscle and ligament flexibility (major factors in trauma prevention)(C. Baciu, 1972; D.V. Poenaru, P.L. Matusz, 1994; E.T. Rinderu, I. Ilinca, L. Rusu, A.M. Kesse, 2004; E.T. Rinderu, I. Ilinca, 2005).

The following research methods were used: scientific documentation, observation, experiments, conversations, questionnaires, MRI, CT, statistic and graphic methods (Z. Pasztai, 2001, I. Borza, et al., 2009).

The sportsmen were monitored both while training and during competitions through video recordings, questionnaires, 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).

The statistical processing included:

- the comparison of the average values: the "t" (Student's) 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) (A. Gagea, 1996; A. Gagea, 1999)

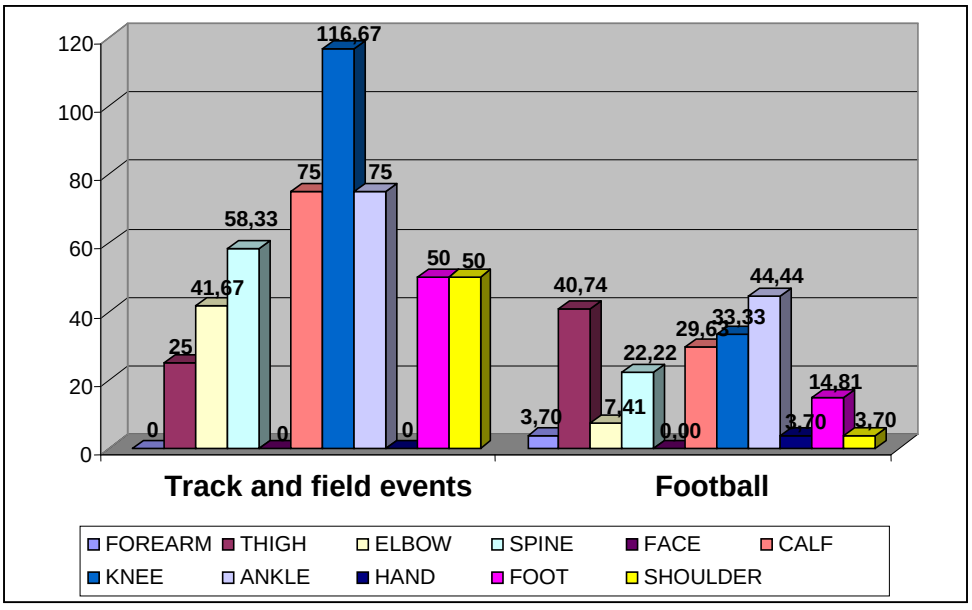
- regression and statistic correlation: linear regression and the Pearson coefficient;

- the Z test (T. Baron, C. Anghelache, E. Titan, 1995; A.C. Rettig, 2002).

The mean, the standard deviation and the standard error of the mean were calculated for all numerical parameters: age, time spent in training, height, weight, BMI, maximum number of traumas per body segment and total number of traumas. the comparison was based on the track and field event and the football player's position on the ground (T. Baron, C. Anghelache, E. Titan, 1995; A.C. Rettig, 2002).

(See Part I of this study, **Aspects on Musculo-Skeletal Trauma Incidence in Competitive Sportsmen. A Comparative Study of Athletes and Football Players.)**

Data presentation and analysisComparison of trauma distribution on the 11 body segments in athletes and football ayers



Graphic 1

Table 1

BODY SEGMENTS	Track and field 12 athletes	Football 27 players

FOREARM	0	3.70
THIGH	25	40.74
ELBOW	41.67	7.41
SPINE	58.33	22.22
FACE	0	0.0
CALF	75	29.63
KNEE	116.67	33.33
ANKLE	75	44.44
HAND	0	3.70
FOOR	50	14.81
SHOULDER	50	3.70

The values in the table represent the total number of segment injuries per the number of athletes and football players.

The Z test was used to compare the percentages and the results (p values and significance) are shown in.

Table 2

BODY SEGMENTS	Athletes vs. football players
FOREARM	0.336^{ns}
THIGH	0.279^{ns}
ELBOW	0.016^{s}
SPINE	0.032^{s}
FACE	0.99^{ns}
CALF	0.011^{s}
KNEE	$< 0.001^{s}$
ANKLE	0.078^{ns}
HAND	0.336^{ns}
FOOR	0.027^{s}
SHOULDER	0.002^{s}

The comparison between trauma percentages in **athletes** and **football players** had the following significant results:

- elbow – significantly reduced traumas in football players ($p = 0.016$; $\alpha = 0.05$)
- spine – significantly reduced traumas in football players ($p = 0.032$; $\alpha = 0.05$)
- calf – significantly reduced traumas in football players ($p = 0.011$; $\alpha = 0.05$)
- knee – significantly reduced traumas in football players ($p < 0.001$; $\alpha = 0.001$)
- foot – significantly reduced traumas in football players ($p = 0.027$; $\alpha=0.05$)
- shoulder – significantly reduced traumas in football players ($p = 0.002$; $\alpha = 0.01$)

Trauma incidence was considerably reduced in football players than in athletes.

Average sportsmen's age:
athletes 17.25; ---- football players 20.11
Height: athletes 179.42; --- football players 182.15
Weight: athletes 71.75 kg; --- football players 74.81 kg
BMI: athletes 22.6; --- football players 22.48

Time spent in sport practising:
athletes 8 years; --- football players 11.3 years

The average age of the athletes is considerably smaller than that of the football players ($p = 0.006$; $\alpha = 0.01$).

The **time spent in sport practising** is shorter in the case of the athletes ($p = 0.039$; $\alpha = 0.05$)

Height: no significant differences

BMI values are optimal and indicate no major differences.

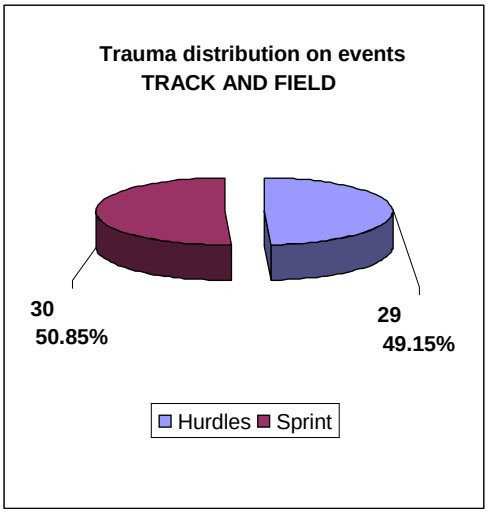
The average of the maximum trauma number per sportsman on one body segment: no significant differences between athletes (1.42%) and football players (1.15%).

The average of the maximum trauma number per sportsman on all body segments is higher in athletes than (4.33%) than in football players (2.07%) ($p < 0.001$; $\alpha = 0.001$)

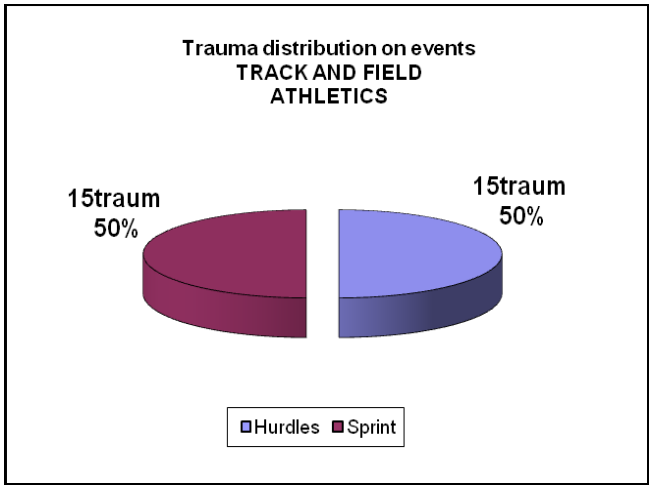
Trauma distribution in relation to the track and field event and the player's position on the ground

Track and field events - 12 athletes, 6 sprinters (100 -200 m) and 6 hurdlers (110 m)

Graphic 2 a **2 b**



period I

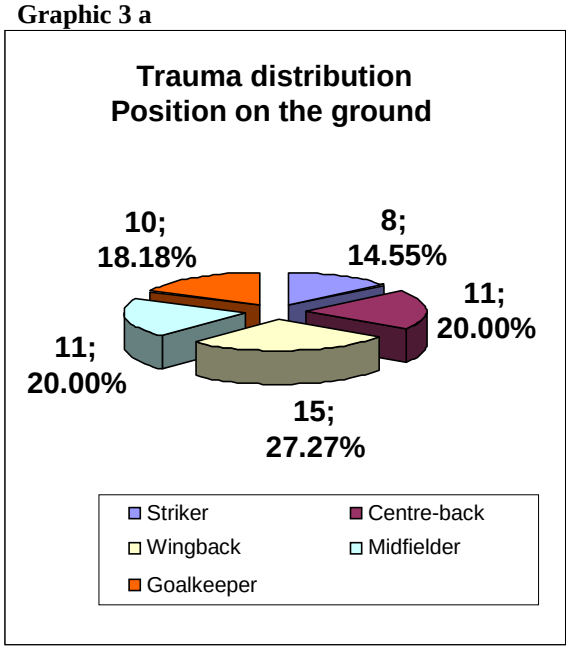


period II

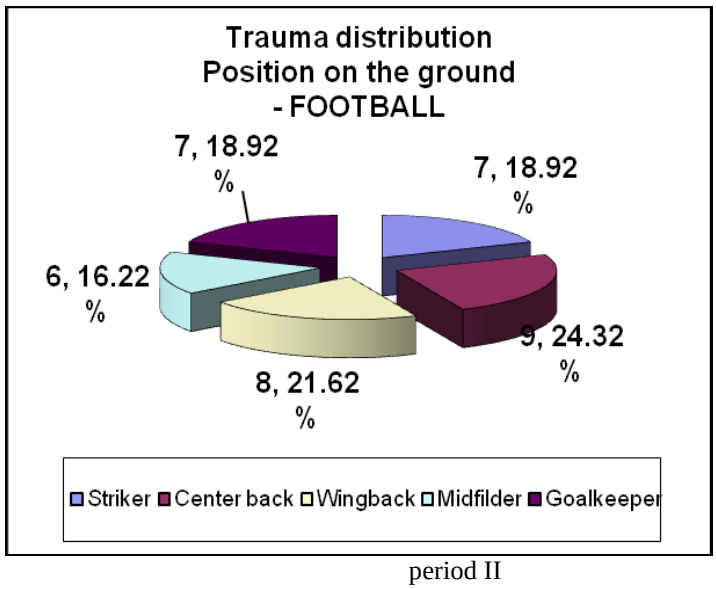
No major differences were found in trauma distribution between sprinters and hurdlers. The number of traumas was close or the same in both periods. The comparison of the two periods showed that the total number of injuries was reduced with 50%.

Football 27 male players

Graphic 3 a **3 b**



period I



period II

As indicated in the graphics above, in the second period, the number of traumas was smaller, but not significantly smaller. Also there is no considerable difference between the numbers of traumas per players in relation to their positions. In the first period, **august 2006 – july 2008**, the number of traumas varied between 15 (27.27%) in wingbacks and 8 (14.55%) in strikers.

In august 2008-july 2009, the number of injured players decreased from 55 to 37. The number of traumas varied from 9 (24.32%) in centre-backs to 6 (16.22%) in goalkeepers.

Discussions

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 joint traumas in the studied batches.

Each track and field event is typical in nature and affects certain body segments.

Accident incidence is higher in athletics than in football, as shown in our study and confirmed in the athletics-related literature, according to which most lesions occur in athletes, especially in hurdlers (S. Roy, R. Irvin, 1983)

The comparison between trauma percentages in athletes and football players had the following significant results:

- **elbow – ($p = 0.016$; $\alpha = 0.05$)**
- **spine – ($p = 0.032$; $\alpha = 0.05$)**
- **calf – ($p = 0{,}011^{s}$; $\alpha = 0.05$)**
- **knee ($p < 0.001$; $\alpha = 0.001$)**
- **foot – ($p = 0.027$; $\alpha = 0.05$)**
- **shoulder ($p = 0.002$; $\alpha = 0.01$)**

Trauma incidence was considerably reduced in football players than in athletes

- **Track and field events**: tendon and muscle lesions and joint injury
  - Sprains, strains, tendon and muscle lesions: at ankle and knee joint caused by overstress;
  - muscle lesions: contraction, strains and partial or total ruptures that affect leg muscle groups, thigh and calf.
- **Football:** most traumas affected the lower limbs: knee and ankle sprains, meniscus ruptures; shoulder separations
  - Muscle injuries: contraction, strains and partial or total ruptures that affect leg muscle groups, thigh and calf

The most affected segment is the **ankle**: 40.74% in the first period and 44.44% in the second. Football-related literature also indicates 31% ankle injuries.

Ankle sprain is the most frequent sports injury, accounting for 40% of all injuries. In the USA, 23,000 (28,29%) ankle sprains occur every day (10).

Conclusions

Knowledge of trauma and the identification of its causes, prevention and rehabilitation is the key to future competitiveness.

Overstress accidents in the studied batches were reduced as a result of the trauma prevention programme that included joint exercises, massage, stretching, and exercises to increase muscle strength .

As far as the number of traumas and affected body segments is concerned, in both periods the athletes suffered from more injuries and affected body segments than the football players. This is a result of overstress, bad running track and the technical difficulties of the sprint races, especially the hurdle races that overstress the osteoarticular system and require returning to training before the complete rehabilitation of injures athletes .

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