

Serbian Journal of Sports Sciences
2007, 1(4): 122-128, www.sjss-sportsacademy.edu.yu
UDC 796: 616-001; 796.42.015 ISSN 1452-8827

Original article

Received: 02 Sept 2007
Accepted: 13 Nov 2007



FREQUENCY OF SPORTS INJURIES DEPENDING ON GENDER, AGE, SPORTS EXPERIENCE, NATURE OF SPORTS AND TRAINING PROCESS

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Abstract The intention of this research was to determine whether the frequency of sports injuries could be related to gender, age, sports experience, nature of sport, and volume and intensity of training. The sample of 520 athletes divided in two sub-samples of young talented athletes was investigated, of both genders for 17 various sports events (N = 409), besides the sub-sample for the elite male athletes, members of the national team of Serbia and Montenegro (N = 111). Young athletes aged 12 to 18 ($\bar{X} = 15.18 \pm 1.62$) who had been involved in sport for at least two years ($\bar{X} = 5.07 \pm 3.23$) were surveyed during the summer camp in 2004. The sub-sample of elite athletes included soccer, volleyball, basketball and water polo players, of the average age of 22.35 ± 3.53 years and of sports experience of 11.42 ± 4.05 years, who within the regular check-up of functional abilities and psychological status were tested in the Republic Institution for Sport in Belgrade between 2000 and 2005. By analyzing the frequency of serious sports injuries with young athletes with regard to gender, sports experience, type of sport they play, we can conclude that: 1) More than 19% young athletes of both genders aged 12 to 18, and significantly greater percentage of adult elite athletes (34%) had a serious sports injury; 2) among young athletes with serious sports injuries it was the males who dominated, so they represented a group at a significantly greater risk from injury than the girls (22.4% : 14.7%); 3) tae kwon do, athletics and triathlon were the sports with the greatest percentage of injuries with men, while judo, shooting and handball were the sports in which girls were exposed to the greatest risk of experiencing serious sports injury. In the same way, in some sports such as synchronous swimming, fencing and weight lifting the risk of serious sports injuries was minimum or almost negligible; 4) there was no statistically significant correlation between the number and volume of daily and weekly training sessions with the frequency of sports injuries; 5) when we consider sports injuries with regard to the length of sports experience, we can see that susceptibility to sports injuries reduced with the increase of sports experience; 6) finally it should be stated that young athletes of Serbia spent a significant part of their free time in sports activities, training daily an average of 2.29 hours, and 5.77 times or 10.89 hours a week.

Key words: sports injuries, young athletes, training

INTRODUCTION

When we talk about the consequences of participation in organized sports, we usually underline the benefits of sports to physical, social and psychological development of young people. Far too rarely do we speak about possible negative consequences and experience regarding athletic environment: competitors' stress, demanding training programs and overtraining, bad communication and organization, rough game, injuries, the lack of expected accomplishment, the sense of incompetence, the decrease in self-respect, disappointment and eventual abandonment of sport [1, 2, 3, 6].

Although we encounter different aspects of the problem of sports-related injuries every day and at all ages and competitive levels (from recreation to the top competitive level), our knowledge

of their frequency and consequences (psychological, health, social, economic) are incomplete and non-systematized.

Pursuant to the data of the American survey (www.Safekids-knoarea.org) approximately 30% of the parents report that their child has been injured while playing a team sport, with over half of these being injured more than once, and with a quarter of them the injuries were serious. The highest percentage of sports injuries occurs during practices (62%). When we observe the nature of sports activity and frequency of sports injuries, the data show that baseball is the sport in which children get injured most [4, 5].

One should take into account that children are at great risk of sports injuries due to the development-conditioned lower abilities to estimate risk, inadequate coordination, slower time of reaction and lower accuracy. On the other hand, athletes of elite categories (members of national teams) continuously endure high training and competition burdens. In order to meet the demands of the national team as well as of their main clubs, they are often forced to train and compete when not recovered enough.

From the perspective of the complexity of the aforesaid problems, the research on frequency of sports injuries with young and elite athletes was done with a hypothesis that no significant differences would exist in the frequency of injuries of these two categories of athletes. The intention was to determine whether the frequency of sports injuries could be related to gender, age, sports experience, nature of sport, and volume and intensity of training. The description of the obtained data can serve as a guideline for further research and new insight in related interdisciplinary problems.

MATERIAL AND METHODS

SUBJECTS

The sample of 520 athletes divided in two sub-samples of young talented athletes was investigated, of both genders for 17 various sports events (N = 409), besides the sub-sample for the elite male athletes, members of the national team of Serbia and Montenegro (N = 111). Young athletes aged 12 to 18 ($\bar{X} = 15.18 \pm 1.62$) who had been involved in sport for at least two years ($\bar{X} = 5.07 \pm 3.23$) were surveyed during the summer camp in 2004. The sub-sample of elite athletes included soccer, volleyball, basketball and water polo players, of the average age of 22.35 ± 3.53 years and of sports experience of 11.42 ± 4.05 years, who within the regular check - up of functional abilities and psychological status were tested in the Republic Institution for Sport in Belgrade between 2000 and 2005.

PROCEDURE AND MEASUREMENTS

INSTRUMENTS AND PROCEDURE

All athletes answered the question "Have you had any serious sports injury?" which was intended for evaluation of the average social status of athletes (SSMS/97 and SSVS/2000) in standard questionnaires. In the course of conducting the poll it was stressed that "serious sports-related injuries" meant those which caused them to be at least a month absent from practices and games. The data were obtained for all athletes on gender, age, the type of sport they play, the length of participation, along with daily and weekly number and duration of training sessions.

STATISTICAL ANALYSIS

The methods of descriptive and comparative statistics were used for data processing. All analyses were made by PC using statistic software program SPSS for Win, release 7.5.1 – Standard Version (Copyright © SPSS Inc., 1989-1996).

RESULTS AND DISCUSSION

SPORTS-RELATED INJURIES, GENDER AND AGE OF THE ATHLETES

The results presented in Figure 1 as well as the values of X^2 - square test show that the percentage of sports injuries among adult athletes of elite level was significantly greater than with young athletes. ($X^2 = 11.44$, $df = 1$, $p = 0.001$). Identically, in comparison between juniors and seniors the percentage of serious sports injuries with young athletes of different gender shows that they were

significantly more present with men than with women ($\chi^2 = 3.67$, $df = 1$, $p < 0.05$), which is contrary to the findings of the American Institute for Health given in the booklet "Sports injuries". According to those data female athletes have far too higher percentage of injuries than male, especially in basketball, soccer, alpine skiing, volleyball and gymnastics. The study that involved 11780 college athletes discovered that female basketball players suffered a tear of the knee's anterior cruciate ligament 6 times more often than the male players. Although for the moment they have no adequate scientific explanation, the American scientists try to attribute greater susceptibility of women to injuries to their generally lower basic level of conditioning; differences of the knee and thigh muscles; fluctuating estrogen levels caused by menstruation; the fit of athletic shoes; and the way they jump, land and twist.

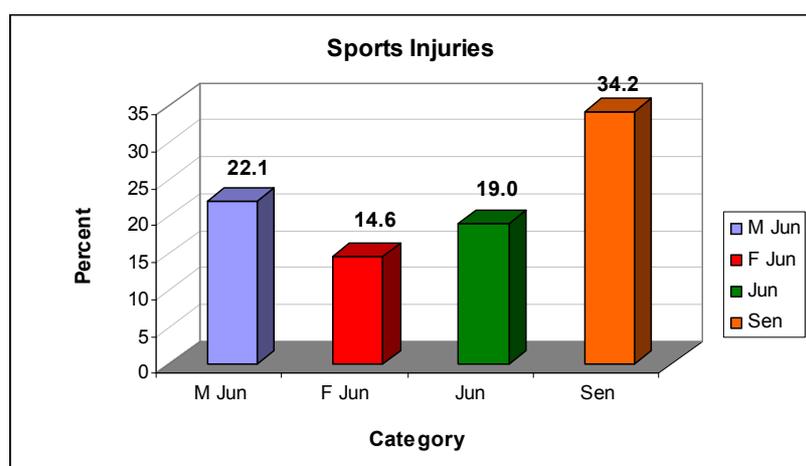


Figure 1. Comparative data on the percentage of injuries with young athletes of different age and gender

Although a generally lower percentage of serious sports injuries was characteristic of our young female athletes rather than of young male athletes (14.7% : 22.4%), this fact was not applicable to all sports. A careful analysis of Table 1. shows that in shooting and in judo women were exposed to a greater risk of sports injuries. These data must be taken into consideration with great reserve since they were obtained by interviewing a relatively small number of athletes (12 male and 12 female shooters; 7 male and 5 female judoists)

Just because of insufficient sample representation of the tested athletes in fencing, tae kwon do, badminton, triathlon, sports dance and ice hockey, the data must not be generalized or considered reliable enough. Until we check them at greater representative samples we shall consider them as noticed tendencies that require affirmation and appropriate explanation. It seems to us that it is the experts who know profoundly the nature of training and competitive activities in judo as a sport on the one hand, as well as the nature, structure, limits and specificities of the female body on the other hand that can give proper scientific explanations for a dramatically high percentage of serious judo-related injuries with girl judoists. However, at this moment, we cannot explain the data showing that one quarter of the young female shooters interviewed had already had serious sports injuries. It is necessary to know the kind of injury, when they appear most frequently, what causes them and how they can be reduced or completely eliminated.

SPORTS INJURIES AND TYPES OF SPORT

If we observe the occurrence of serious sports injuries in certain sports events, we can conclude that young male athletes who practiced tae kwon do, athletics, triathlon, volleyball and table tennis got hurt more often than their peers who did shooting, weight lifting, fencing and judo. It is interesting that among the interviewed young soccer players not a single serious injury was registered.

Sports injuries of serious character were not present with girls who were in synchronous swimming, fencing, badminton and triathlon. Among the girls the most injured were judoists, shooters, handball players, followed by the girls doing tae kwon do and athletics.

The data presented in Table 1 show that the percentage of injuries was not the same for all sports events, i.e. that there were riskier and less risky sports, which was also confirmed by the data obtained with adult athletes of elite level. Although all of them were in team sports, the major part of serious sports injuries occurred with basketball and volleyball players, while with soccer and water polo players the risk was somewhat lower (Figure 2).

Table 1. Frequency of sports injuries with young athletes with regard to the sport they play

SPORT	MALE		FEMALE	
	N	%	N	%
Tae kwon do	13	38.5%	10	20.0%
Athletics	29	33.3%	22	18.2%
Triathlon	10	30.0%	3	0.0%
Volleyball	24	29.2%	14	14.3%
Table tennis	14	28.6%	18	10.5%
Badminton	4	25.0%	4	0.0%
Handball	34	23.5%	23	21.7%
Rugby	21	19.0%		-
Karate	37	18.4%	22	13.6%
Fencing	7	14.3%	9	0.0%
Judo	7	14.3%	5	40.0%
Weight lifting	8	12.5%		-
Shooting	12	8.3%	12	25.0%
Soccer	21	0.0%		-
Synchron. swimming		-	17	0.0%

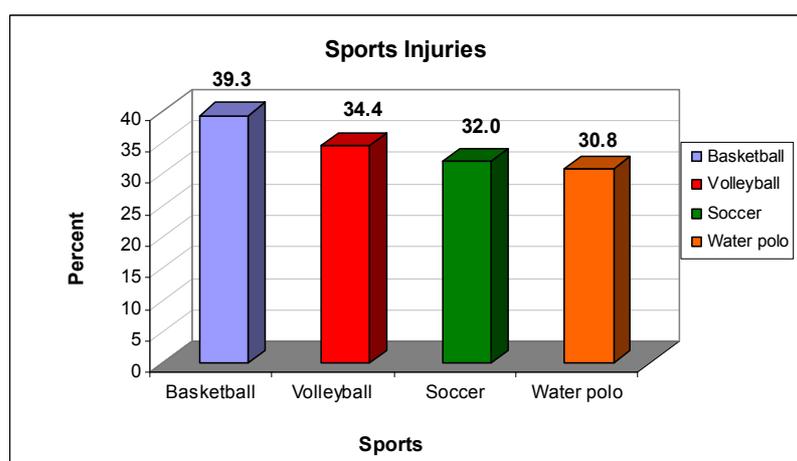


Figure 2. Distribution of sports-related injuries with senior male elite athletes in 4 different sports.

SPORTS INJURIES AND THE TRAINING PROCESS

It is logical to suppose that young people who participate in sports for a longer time are more at risk to experience serious sports injury than those who are new to a sport. This is because beginners are mostly directed towards learning and practice of the sports technique, their trainings are of smaller volume and intensity, and competitive burden is minimal. Figure 3 shows the percentage of sports injuries depending on the length of sports practice and the gender of young athletes.

The obtained data slightly denied our expectations, especially when it comes to young male athletes. With them, the percentage of injuries was the greatest at the very beginning of sports practice, and later upon gaining some sports experience it got progressively reduced. However, the value of χ^2 - test shows that this trend did not reach the level of statistic significance ($\chi^2 = 1.71$; $df = 1$; $p < 0.426$). It is probable that inexperience of the beginners was connected to the higher risk of injuries, because of the lack of conditioning, warm up or stretching, or due to improper equipment. They were more susceptible to physical fatigue, overtraining, fast clashes, risky actions, muscular imbalance, attention distraction, and anxious reactions. Upon adopting specific sports knowledge and general sports culture, the risk of injuries diminished with young athletes.

However, female athletes showed a different trend. With them in the first three years of sports practice the percentage of injuries was significantly lower than with the men, then with an increase of sports experience it additionally reduced, only to grow with the beginning of serious sports practice (over 6 years). It seems that young female athletes were more cautious, less prone to rushing into risky situations, tended to have more thorough warm up, to overburden themselves less and to have better physical conditioning. However, the results of testing the significance of differences in frequency of sports injuries with the girls of three different categories of sports experience ($\chi^2 = 2.99$; $df = 1$; $p < 0.224$) do not confirm the trend of injury reduction with the growth of sports experience in the first 6 years of sports practice, followed by sudden growth with further serious participation in sports activity.

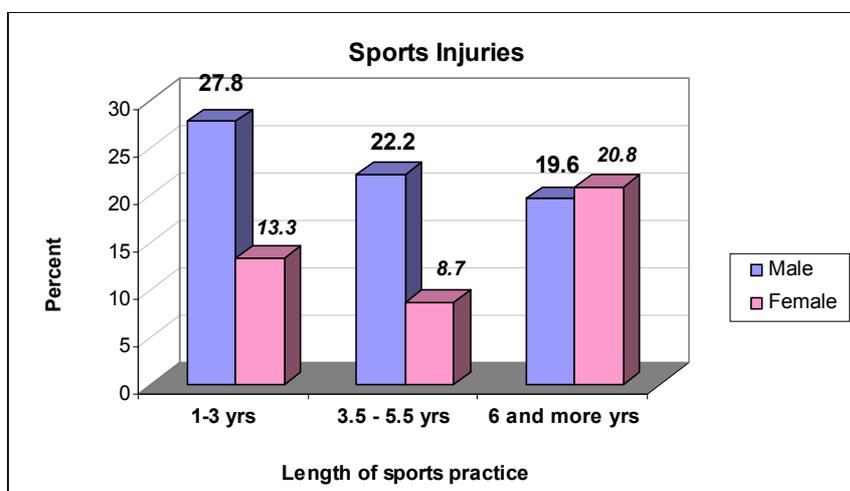


Figure 3. Percentage of sports injuries and the length of sports practice

Interestingly, in the attempt to link the occurrence of serious sports injuries with the number and duration of daily and weekly training sessions we reached the following data (Table 2):

- The greatest percentage of young athletes of both genders trained once a day (70.2% male and 75.8% female).

- On average men trained 2.33 ± 1.04 hours (N = 236) and women did 2.25 ± 0.87 hours (N = 159) a day, but the greatest percentage of both males and females (35.3% : 37.7%) trained 2 hours a day.
- The average number of weekly trainings amounted to 6.03 ± 2.75 for men (N = 236) and 5.44 ± 2.45 for women (N = 158) and the greatest number of athletes of both genders trained 5 times a week (24.6% of males and 32.3% of females). The difference in the average number of weekly trainings between athletes of different gender was statistically significant at the level 0.031 ($t = 2.17$; $df = 392$).
- Weekly young male athletes spent an average of 11.22 ± 5.97 hours (N = 233) in their sports activity compared to 10.54 ± 5.69 hours (N = 155) for the females. This difference was not significantly important, but the data show that the greatest percentage of athletes trained from 14 - 16 hours (16.7%), followed by 7.5 - 8 hours (1.2%) and 10 hours (12.4%). However, the greatest percentage (16.8%) of the girls trained weekly from 7.5 - 8 hours, 10 hours (14.2%) and 6 hours (14.8%).
- When we compared young and adult elite athletes according to the frequency and duration of daily and weekly training sessions, the relation was 1:2 in almost all tested parameters. It is completely reasonable, since those were adult persons who were professionally involved in sport as their basic and primary activity. Although they trained twice more than young athletes, the percentage of sports injuries with seniors was not twice as great. This fact leads to the conclusion that the correlation of sports injuries with the training process is not simple. In any case, sports injuries are the result of poor training, either lack of conditioning or overtraining, insufficient warm up and stretching, improper equipment, accidents, carelessness, muscular tension and anxiety.

Table 2. Volume of daily and weekly training with young and adult elite athletes

Training Parameters	JUNIOR				X^2 M - F	SENIOR (M) N = 105		X^2 M jun- M sen
	Male N = 236		Female N = 159			1x	2x	
Times/day	1x 70.2%	2x 29.8%	1x 75.9%	2x 24.1%	n.s	4.8%	95.2%	139.2 p = 0.000
Training	Mean	SD	Mean	SD	t - test M - F	Mean	SD	t - test Jun - Sen
Hours/day	2.33	1.04	2.25	0.87	n.s	4.44	1.05	t = 20.36 p = 0.000
Times/week	6.03	2.75	5.44	2.45	t = 2.17 p = .03	10.14	1.85	t = 14.19 p = 0.000
Hours/week	11.22	5.97	10.54	5.69	n.s	22.42	5.75	t = 18.19 p = 0.000

CONCLUSION AND PRACTICAL APPLICATION

The research done with 409 young athletes of both genders and 11 seniors of elite level proved that injuries are natural accompaniment of sports activity of both genders, notwithstanding their age and length of sports practice. By analyzing the frequency of serious sports injuries with young athletes with regard to gender, sports experience, type of sport they play, we can conclude that:

- ❑ More than 19% young athletes of both genders aged 12 to 18, and significantly greater percentage of adult elite athletes (34%) had a serious sports injury.
- ❑ Among young athletes with serious sports injuries it was the males who dominated, so they represented a group at a significantly greater risk from injury than the girls (22.4% : 14.7%).

- ❑ Tae kwon do, athletics and triathlon were the sports with the greatest percentage of injuries with men, while judo, shooting and handball were the sports in which girls were exposed to the greatest risk of experiencing serious sports injury. In the same way, in some sports such as synchronous swimming, fencing and weight lifting the risk of serious sports injuries was minimum or almost negligible.
- ❑ There was no statistically significant correlation between the number and volume of daily and weekly training sessions with the frequency of sports injuries. Sports injuries can be rather more connected with poor and low quality trainings than with their volume and frequency.
- ❑ When we consider sports injuries with regard to the length of sports experience, we can see that susceptibility to sports injuries reduced with the increase of sports experience. This trend was present only with young male athletes while it was quite different with the girls. In the first three years of sport practice the percentage of injury with girls was significantly lower than with the males (13.3%), then with the increase of sport experience it was additionally reduced (8.8%), only until the beginning of serious sport practice (6 and more years) when it increased and reached the percentage of 20.8% .
- ❑ Finally it should be stated that young athletes of Serbia spent a significant part of their free time in sports activities, training daily an average of 2.29 hours, and 5.77 times or 10.89 hours a week.

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