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OVERUSE INJURIES IN YOUNG ATHLETES

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Summary: In overuse injuries, there is no clear single event that can be associated with the injury. They are thought to arise as a result of repeated submaximal loading of the musculoskeletal system that is not followed by adequate rest. The aim of the study is to determine the incidence of overuse injuries in young athletes, their gender structure and anatomical localization, as well as their impact on the level of training and competition in the previous season. The study is based on the analysis of questionnaires completed by athletes at the end of the 2018/2019 season. The Oslo Sports Trauma Research Center Overuse Injury Questioner questionnaire was translated into Serbian and modified to reflect the previous season. A total of 171 athletes participated, of which 99 (58.1%) were men and 72 (41.9%) were women. The research involved athletes aged 15 to 30 who competed in 5 sports disciplines: basketball, football, volleyball, handball and karate. Of the 171 athletes who participated in the trial, 48.5% registered at least one in the group of overweight injuries. Of the 99 male athletes, 44.4% reported injuries. In women, 54.8% of the total were registered in 72. According to anatomical localization, in men, knee injuries were registered in 40.9%, back injuries in 31.8%, injuries in multiple anatomic locations in 15.9% and shoulder injuries in 11.4%. In women, knee injuries were reported in 47.1%, shoulder injuries in 23%, back injuries 17.6% and more localization 11.8%. Of the men who reported a knee injury, 61.1% reported having had a lot of involvement but with knee problems, as well as reduced training. A little more than half reported that they did not affect performance during the last season and reported mild knee pain. In the majority of respondents, they reported full participation without knee problems and did not reduce the amount of training and that their knee problems did not affect performance. The highest percentage reported mild pain. In male subjects with lower back injury, the highest percentage, 64.3%, reported full participation, but with problems, half reduced training. In the largest percentage, 64.4% had no effect on performance during the previous season and all subjects reported mild pain. All the respondents answered that they had full participation but with problems in the lower back. The largest 71.4% reduced training volume to a lesser extent, while 42.8% said the lower back problem did not affect performance during the previous season and all reported mild pain. Questions about shoulder problems the majority of male respondents, 60%, said they had reduced participation due to shoulder problems. An equal percentage of 40% reported that they had reduced their training volume to a lesser extent and generally decreased it. More than half, 60% reported having a shoulder problem that affected performance, and all respondents reported some level of shoulder pain. Also, the largest number of female respondents, 77.8%, reported full participation but with shoulder problems, decreased training and affected performance during last season. The highest percentage reported some level of pain.

In our research, some of the injuries caused by overstress were registered in almost half of the respondents, 48.5%. Injuries are more commonly reported in female subjects. In both groups of subjects, knee was the most common anatomical localization

Keywords: sport's overuse, sport's injuries, young athletes

INTRODUCTION:

The participation of young people in sports and regular physical activity offers many benefits: improving general health, socializing with peers, increasing self-esteem. Regular physical activity and sports have been widely promoted due to its many positive effects. Contributes to improving

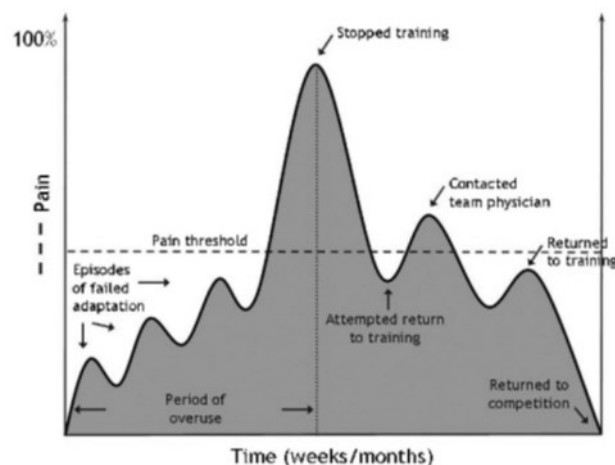
the function of the cardiovascular system, has a positive effect on the development of the nervous and muscular systems, reduces anxiety [1,2,3,4,5]. Although children and young people should be encouraged to participate in a number of different sports activities and develop different skills, it is increasingly common today

for young athletes to participate in only one sport and the so-called "early specialization" in sports, which often ends before the end of primary school. Young people, like their parents, start with high intensity training from the desire to participate in elite leagues, get scholarships and the like. All this leads to more frequent injuries in sports. A large number of participants in sports activities have led to sports being the primary cause of injury in young people [1,6,7].

Today, sports injuries are most often divided into acute (traumatic) and overuse injuries. Traumatic injuries are the result of a specific

event, which can be identified. In overuse injuries, there is no single individual event that can be associated with the injury. Overuse injuries are thought to result from repeated submaximal loading of the musculoskeletal system that is not followed by adequate rest. These are repetitive microtrauma resulting from repeated exposure to force or a large number of repetitions. In most cases, the tissue recovers at the beginning of the process without visible signs and symptoms, however as the process continues the possibility of adaptation is depleted and results in clinically clear symptoms [1,4,8,9,10,11,12,13]. Figure 1

Figure 1. Hypothetical overview of the onset of tissue injury and pain in a typical overuse injury. Adopted from R. Bahra. No injuries, but plenty of pain? On the methodology for recording overuse symptoms in sports. *Br J Sports Med* 2009;43:966-972. doi:10.1136/bjsm.2009.066936



Overuse injuries are considered to be one of the most common etiological factors leading to injuries in young athletes, and that almost half of sports injuries in children and young people belong to overuse injuries. Overuse injuries can affect: bones, muscles, tendons, ligament. There are several risk factors for the occurrence of an overuse injuries as: previous injury, adolescent age, higher training intensity, etc. Overuse injuries are considered to be underestimated in the literature because the majority of studies define injuries based on time off from competition. While more recent studies have cited the term "presence of any physical discomfort", and above all pain, which has led to a significantly higher number of reported overuse injuries [1,8,9,12,13]. However, there are also works that indicate that the term overuse injuries is used too often and advise that

it should be avoided until there is definitive evidence of a cause of injury. Overuse injuries most commonly affect the knee, shoulder, and lower back [10,11,13,14,15,16]. The importance of regular monitoring and protection of the health of athletes is increasingly recognized. For this reason, several systems for reporting and monitoring illnesses and injuries in athletes have been developed. Since 2008, the International Olympic Committee has also developed an injury monitoring system. The first official guidelines were for reporting and monitoring injuries in football, and later they formed the basis for other sports. Nowadays, a questionnaire developed in 2013 to register overuse injuries is increasingly used. The Oslo Sports Trauma Research Center Overuse Injury Questioner has 4 key questions and a response and scoring system. The questionnaire collected

data based on whether the athletes experienced / felt pain, limited participation in training or competition, and reduced training or competition volume [2,8,10,15,16,17,].

The goal. The aim of the study is to determine the frequency of overuse injuries in young athletes, their gender structure and anatomical localization, as well as their impact on the level of training and competition in the previous season.

METHOD

The research is based on the analysis of questionnaires completed by athletes at the end of the 2018/2019 season. The study involved 171 athletes, ages 15 to 30. The tested athletes competed in 5 sports disciplines: basketball, football, handball, volleyball and karate. We used the Oslo Sports Trauma Research Center questionnaire Overuse Injury Questioner translated into Serbian and modified so that the questions relate to the past season.

RESULTS

A total of 171 athletes participated, of which 99 (58.1%) were men and 72 (41.9%) were women. The study involved athletes aged 15 to 30 years competing in 5 sports disciplines: basketball, football, volleyball, handball and karate. Athletes aged 15 years were 29.7% (51), 16 years 18.8% (32), 17 years 5.45 (9), 18 years 10.8% (19), 19 years 2.8% (5), 20 years 5.45 (9), 21 years 2.8% (5), 22 years 5.4% (9), 23 years 5.4% (9), 24 years 4% (7), 25 years 2.8% (5), 27 years 1.3% (2), 28 years 2.8% (5), 29 years 1.3% (2) And 30 years 1.35 (2). Of the 171 athletes who participated in the test, 48.5% (83) registered at least one overuse injuries. Of the 99 male athletes, 44.4% registered overuse injury (44). In women, overuse injury were registered in 54.8% (39) of the total 72. According to anatomical localization, in men, knee injuries were registered in 40,9% (18), back injuries in 31.8% (14), injuries at multiple anatomical locations at 15.9% (7) and shoulder injury at 11.4% (5). In women, knee injuries were reported in 47.1% (18), shoulder injuries in 23% (9), back injuries 17.6% (7) and multiple localizations 11.8% (5).

Among men who reported knee injury, 61.1% (11) reported having had full participation in training and competition but with knee

problems, 27.8% (5) had full participation without knee problems, 11.1% (2) decreased participation due to knee problems And no one reported being unable to participate. 72.2% (13) did not reduce the amount of training due to knee problems, 11.1% (2) reported that they decreased the volume of training due to knee problems, 11.1% (2) moderately decreased, 5.6% (1) decreased to a greater extent. When asked how much your knee problem affected your performance over the past season, 55.5% (10) said they had no influence, 16.7% (3) responded to a lesser extent, 5.6 % (1) they were moderately influenced, while 22.2% (4) responded that they were mostly influenced. Mild sports-related knee pain reported 55.5% (10), 33.4% (6) reported moderate pain, and 11.1% (2) reported severe pain. Of women, 55.5% (10) reported full participation without knee problems, 44.5% (8) reported full participation but with knee problems, no cases of reduced participation were reported. A total of 83.3% (15) did not reduce training volume, 16.7% (3) reported that they reduced training volume to a lesser extent, none reported a larger reduction volume. A total of 61.1% (11) reported that knee problems did not affect performance during the past season, while 38.9% (7) reported that they had less impact on performance, there was no response that they were moderately or mainly affected. 22.2% (4) did not report knee pain, 38.9% (7) reported mild pain, 27.8% (5) moderate pain, and 11.1% (2) severe sports-related knee pain. (Table 1.)

In men with lower back injury, 35.7% (5) reported full participation in training or competition with no problems in the lower back, 64.3% (9) reported full participation but with problems in the lower back. until reduced participation was reported. 50% (7) did not reduce the volume of training due to lower back problems, 50% (7) reduced it to a lesser extent, no moderate or major response. Respondents in 64.4% (9) answered that lower back problems did not affect performance during the last season, 35.7% (5) responded that they were less affected while there was no response that they were more affected. Subjects who had a problem in the lower back reported mild pain. In women, all respondents said that they had full participation in training or competition but with problems in the lower back. Of these, 14.3% (1) replied that the problem in the lower back did

not affect the decrease in training volume, 71.4% (5) reduced it to a lesser extent, 14.3% (1) moderately decreased until it was more extensive. When asked about the extent to which lower back problems affected their performance, over the past season, 42.8% (3) answered that it was unaffected, 28.6% (2) to a lesser extent and 28.6% (2) to a moderate extent while there was no greater response. All respondents answered that they experienced mild lower back pain related to sports. (Table 2.)

To questions about shoulder problems, during last season, of the total number of male respondents, 20% (1) answered that they had a full participation in training or competition without shoulder problems, 20% (1) a full participation but with problems with shoulder and 60% (3) responded that he had reduced involvement due to shoulder problems. None of the respondents answered that they did not reduce the volume of training due to shoulder problems. 40% (2) of the respondents reported that they reduced the training volume to a lesser extent, 20% (1) moderately and 40% (2) mostly reduced the training volume. 40% (2) of the respondents answered that the shoulder

problem did not affect the performance during the last season, there was no answer to a lesser extent, 20% (1) and mostly 40% (2) answered moderately. None of the respondents answered that they did not have shoulder pain, 20% (1) reported mild pain, while moderate sport-related shoulder pain was reported in 60% (3) of the subjects and 20% (1) severe pain.

Of the total number of femal respondents who had a shoulder problem, 22.2% (2) had full participation without shoulder problems and 77.8 (7) full participation but with shoulder problems. The volume of training due to shoulder problems did not decrease 33.3% (3) of the examinee, to a lesser extent reduced 55.6% (5) of the respondents 11.1% (1) moderately. In 22.2% (2) the shoulder problem did not affect performance during the previous season, 55.6% (5) responded that it had less impact on performance and 22.2 (2) moderately. 55.6% (5) women had mild shoulder pain related to sports during the last season, while 22.2% (2) women had moderate pain and the same percentage 22.2% (2) did not report pain in the last season. (Table 3.)

Table 1. Replies regarding overuse knee injuries

Answers	Have you had any difficulties participating in normal training and competition due to knee problems during the past season?				To what extent have you reduced you training volume due to knee problems during the past season?				
	Full participation without knee problems	Reduced participation due to knee problems	Full participation but with knee problems	Cannot participate due to knee problem	No reduction	To a minor extent	To a moderate extent	To a major extent	Cannot participate at all
Men	27.8%	11.1%	61.1%	0%	72.2%	11.1%	11.1%	5.6%	0%
Women	55.6%	0%	44.4%	0%	83.3%	16.7%	0%	0%	0%
Answers	To what extent have knee problems affected your performance during the past season?					To what extent have you experienced knee pain related to your sport during the past season?			
	No effect	To a minor extent	To a moderate extent	To a major extent	Cannot participate at all	No pain	Mild pain	Moderate pain	Severe pain
Men	55.5%	16.7%	5.6%	22.2%	0%	0%	55.5%	33.4%	11.1%
Women	61.1%	38.9%	0%	0%	0%	22.2%	38.9%	27.8%	11.1%

Table 2. Replies regarding overuse lower back overuse injuries

Have you had any difficulties participating in normal training and competition due to lower back problems during the past season?					To what extent have you reduced you training volume due to lower back problems during the past season?				
Answers	Full participation without lower back problems	Reduced participation due to lower back problems	Full participation but with lower back problems	Cannot participate due to lower back problem	No reduction	To a minor extent	To a moderate extent	To a major extent	Cannot participate at all
Men	35.7%	0%	64.3%	0%	50%	50%	0%	0%	0%
Women	0%	0%	100%	0%	14.3%	71.4%	14.5%	0%	0%
To what extent have lower back problems affected your performance during the past season?					To what extent have you experienced lower back pain related to your sport during the past season?				
Answers	No effect	To a minor extent	To a moderate extent	To a major extent	Cannot participate at all	No pain	Mild pain	Moderate pain	Severe pain
Men	64.3%	35.7%	0%	0%	0%	0%	100%	0%	0%
Women	42.8%	28.6%	28.6%	0%	0%	0%	100%	0%	0%

Table 3. Replies regarding overuse shoulder overuse injuries

Have you had any difficulties participating in normal training and competition due to shoulder problems during the past season?					To what extent have you reduced you training volume due to shoulder problems during the past season?				
Answers	Full participation without shoulders problems	Reduced participation due to shoulders problems	Full participation but with shoulders problems	Cannot participate due to shoulders problem	No reduction	To a minor extent	To a moderate extent	To a major extent	Cannot participate at all
Men	20%	60%	20%	0%	0%	40%	20%	40%	0%
Women	22.2%	0%	77.8%	0%	33.3%	55.6%	11.1%	0%	0%
To what extent have shoulder problems affected your performance during the past season?					To what extent have you experienced shoulder pain related to your sport during the past season?				
Answers	No effect	To a minor extent	To a moderate extent	To a major extent	Cannot participate at all	No pain	Mild pain	Moderate pain	Severe pain
Men	40%	0%	20%	40%	0%	0%	20%	60%	20%
Women	22.2%	55.6%	22.2%	0%	0%	22.2%	55.6%	22.2%	0%

Discussion. It is estimated that 50% of sports injuries in children and young people are related to overuse injuries. However, detailed analysis and data on overuse injuries in children and young athletes are lacking, but in the opinion of athletes and coaches overuse injuries are very common. Young athletes are more at risk of developing overuse injuries than older athletes. There are several reasons for this: bone mineralization, cartilage development, immaturity of the musculoskeletal system, a sudden increase in training efforts, but also a lack of awareness of overuse injuries in young athletes [1,4,11,13,16]. In our study, 171

subjects participated, most of them men. Respondents are of different age groups, including sports experience, and have participated in 5 sports disciplines. This is important since it is known that overuse injuries may differ depending on the age and type of sport [1]. Of the total number of respondents, 48.5% reported at least one in the overuse injuries group. The literature data differ in part from the fact that the average prevalence of all overuse injuries is 39% to 46.2% of those who reported an injury [7,16]. A higher number of overuse injuries was registered in women than in men, 54.8% compared to 44.4%. This is

consistent with literature data that overuse injuries are more common in female than male. It is also stated that not only are overuse injuries more common but also occur earlier [11,13]. In men and women, the most common overuse injuries were knee injuries, which, like the total number of overuse injuries, were more common in women with 47.1%. This corresponds to literature data that indicate that the lower extremities are more commonly injured. Most overuse injuries are considered to include the knee, and this percentage ranges from 35% to 52%. It is also stated that overuse injuries knees are common in many different sports [3,10,13].

Lower back pain in young athletes is of particular concern because the developing skeletal system is particularly sensitive. Athletes who have had a lower back problem earlier are 3-6x more likely to have a lower back problem again [13]. The percentage of athletes who report a problem in the lower back varies between men and women. Among men out of the total who reported overuse injuries, 31.8% reported a problem in the lower back. This is slightly higher than the percentage reported in the literature of 21%, although there is data that even 40% [10,13]. In women, this percentage is lower and is 17.6%. In contrast, the proportion of athletes who reported having a shoulder problem was higher in women by 23% compared to men by 11.4%. An even higher percentage reported by the respondents is far less than some of the data that can be found in the literature I, citing 43%. [10]. The percentage of subjects who reported a problem at two or more anatomical sites was slightly higher in males 15.9% compared to females 11.8%. In our study, no anatomical localization of the injury was registered in relation to the type of sport so additional testing is needed to determine if the difference in the percentage of reported injuries, by anatomical localization, is directly related to sports discipline

The impact of overuse injuries on the level of training and competition differed in part depending on the anatomical localization of overuse injuries. In both men and women, the knee was most commonly affected. If we consider the knee as an anatomic localization of overuse injuries a higher percentage of men reported having had a full participation in training and competition but with knee

problems, 61.1% of them compared to 44.4% of women. The impact on participation in training and competition was reported by respondents of both sexes. In men, an equal number, 11.1%, reported a smaller and moderate decrease in participation. Among women, 16.7% had a smaller decrease in participation rates, while there were no women who reported a moderate decrease. In both cases, this percentage is close to that found in the literature, and they state that 14% of athletes reported that overuse injuries influenced their current participation [16]. Respondents registered 16.7% of those who had a lesser impact on performance in the competition, 6.7% had a moderate effect on performance, and as many as 22.2% reported that it mainly affected performance during the competitions. The percentage of respondents who reported that their knee problem had a lesser impact on performance in the competition was slightly higher and amounted to 38.9%, but no cases were reported that had a moderate or major impact on performance. Respondents reported mild pain due to knee problems in 55.6%, moderate pain in 33.3%, and severe pain in 11.1% of cases. The subjects had mild pain in 38.9%, moderate pain 27.8% and severe pain in 11.1% of cases. Given the above percentages, it could be concluded that knee injuries had a slightly greater impact on male subjects than in female subjects

If we consider the lower back as an anatomic localization of the overuse injuries, they had a somewhat greater impact in the female subjects. While 64.3% of men reported full participation in training or competition but with problems in the lower back, 100% reported having a problem in the lower back. 71.4% reported that they had reduced training to a lesser extent, while in men it was 50%. Among respondents, 35.7% reported that lower back problems had less impact on performance in the competition, while in respondents, this percentage was 28.6%. However, the same number of 28.6% reported that it moderately influenced the performance in the competition, whereas in the male subjects this response was not registered. In men, 20% reported full participation but with shoulder problems, while as many as 60% reported reduced participation. In women, 77.8% reported full participation but with shoulder problems. The volume of training due to shoulder problems was reduced to a lesser

extent by 40% of respondents and 55.6% of respondents, while 20% of respondents moderately reduced the volume of training. Overuse injuries in the shoulder area also had quite a big impact on performance in the competition. Thus, 40% of respondents reported that shoulder injuries mainly affected performance, while 55.6% of respondents reported that shoulder injuries had less impact on performance. In both sexes, the presence of pain was high.

Our testing has several limitations. First of all, retrospective data collection that requires the athlete to remember the injury. But prospective collection, while recommended, does not ? it must also be more complete. Some studies have also shown that these results are similar, explaining that athletes report injuries more easily at the end of the season [8,13]. Overuse injuries was registered on the basis of the

athlete's application and did not require clinical confirmation, which may have led to the fact that the "usual pain" associated with training was registered as overuse injuries.

Conclusion. In our study, some of the overuse injuries group was registered in almost half of the respondents, 48.5%. Injuries are more commonly reported in female subjects. In both groups of subjects, knee was the most common anatomic localization of overuse injuries. In comparison to the level of training and competition of the knee injury, the male respondents had a somewhat greater influence. Injuries localized in the lower back had a greater impact on the level of training and competitions, on the female subjects. The greatest impact on the level of training and competition in the subjects of both sexes had shoulder injuries.

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