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Incidence of injuries in the opinion of young volleyball players and ways to prevent them

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- A Study Design
- B Data Collection
- C Statistical Analysis
- D Data Interpretation
- E Manuscript Preparation
- F Literature Search
- G Funds Collection

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abstract

- Background** The aim of the research was to establish the types and incidence of motor organ injuries in young volleyball players and to indicate methods of preventing them.
- Material/Methods** The research was carried out in a population of 70 volleyball players aged 16-19, students of the Sports Championships Schools No. 2 and 3 in Gdansk, players of the Lotos Trefl Gdansk sports club. The employed method was a diagnostic survey based on an original questionnaire entitled "The Characteristics of Motor Organ Injuries in Young People Aged 16-19 Who Train Volleyball."
- Results** 85.7% adolescent players experienced different motor organ injuries, the main cause being overtraining and fatigue. It was found the majority of injuries were localised to upper and lower limbs. It was also found that joint dislocations were the most frequent type of trauma experienced by study participants (93.3%).
- Conclusions** The most frequent cause of sport injuries, in the opinion of adolescent volleyball players, were overtraining and fatigue, which may suggest the injuries could result from training errors and incorrect performance of technical tasks.
- Key words** Motor organ injury, sport injury, volleyball, young people, sports training

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INTRODUCTION

Physical activity at all stages of human development relies on rationally applied physical effort, aiming towards strengthening body health and extending its biological capacity as far as its potential will allow. Both physical exercise and motor activity with sport, understood as increased physical activity rather than competition, are by definition meant to improve health; therefore, they should boost a person's physical and mental potential [1].

In reality, however, contemporary sport can lead to health deterioration. On the other hand, the role of contemporary sports medicine should be preventing sports-related overstraining which exceeds the health-beneficial norm. Since training a sport is intrinsically connected with an increased risk of injury, particularly of the motor organ, it should be preventive medicine rather than just corrective [2]. A continuation of a preventive program after retaking sports training should also be considered, so as to reduce the risk of recurrent injuries [3]. Even though complete elimination of injuries in sports is hardly realistic, respecting rules of conduct, such as a properly designed training process with conscious supervision over it, as well as dynamic warm-ups, functional eccentric training of active joint stabilisers, stretching, can all lead to a decrease in the overall number of injuries [4, 5, 6, 7]. In Polish sports clubs in the case of tissue damage doctors generally limit their actions to treatment procedures and apply preventive measures on rare occasions [8].

Discussions widely undertaken not only by sports theorists and practitioners but also experts in the field of physical strain physiology or sports training, particularly among young sports people, draw our attention to the following, very significant, fact: in order to enable the process of full health protection in sporty children and youth, apart from a properly designed training, a priority concern is the ability to diagnose the level of biological development in this population, knowledge of the dynamics of the growth and maturation processes, and evaluation of the impact of sports training on these processes in the context of preventing motor organ injury [9].

The burden of physical strain, at times up to the limits of adaptive capacity potential, especially in a young person, may result in microtrauma, repetitive strain injury, direct trauma (e.g. contusion) or indirect trauma (e.g. sprain), and other physiological disorders. Those health hazards and their undesirable consequences for health cannot be avoided during a sports activity for objective (materials and technical conditions necessary to perform the activity) and subjective, inherent to a person, reasons. Thus, there are limits which cannot be broken. No wonder nature has equipped humans with numerous defence mechanisms, such as pain, exhaustion, fatigue. Even if the motor organ is the weakest link in an athlete's body, and as emphasised by Dziak and Tayara [10, p. 17]: "Until today no way to prevent premature 'wear' of the motor organ as a result of overexploitation has been found. It is true that in the case of a young person, huge regenerative reserves of tissues enable nearly perfect 'self-healing' and as a result, serious damage to the body can be avoided. However, things are different when strain and microtrauma accumulates in adults or ageing persons." Therefore, the right selection of candidates for a sport and proper planning of the training process may play a vital role in motor organ injury prevention and affect their nature.

The aim of the research was to establish the types and incidence of motor organ injuries in young volleyball players and to indicate methods of preventing them.

MATERIALS AND METHOD

The studies were carried out in the school years 2014/2015 and 2015/2016, in a group of 70 students of the Sports Championship Schools No. 2 and No. 3 in Gdansk aged 16-19 who trained volleyball. The age bracket of the players studied was from 15.69 to 19.45 years ($\bar{x} = 17.25 \pm 1.7$).

All study participants represented the Lotos Trefl Gdansk sports club. But due to their age, the 16-17-year-old players took part in cadet competitions while the others (18-19-year-olds) played in the Young League and Young League Plus. The cadets trained 5-6 times a week with a training session lasting 120 minutes and played between 25 and 40 matches in a season. The Young League and Young League Plus competitors trained 7 times a week. In their case one training session lasted 120 minutes too, and the number of matches played in one season was from 45 to 50. The players' training experience was between 3 and 11 years ($\bar{x} = 5.76 \pm 2.4$).

The method employed was a diagnostic survey based on an original questionnaire entitled "The Characteristics of Motor Organ Injuries in Young People Aged 16-19 Who Train Volleyball." The obtained data were then processed in a statistical analysis based on a Microsoft Excel spreadsheet. Before the study, consent of the school headteacher and the coach as well as the players was obtained.

RESULTS

Data obtained from an analysis of all the players' feedback indicate that during a competitive volleyball career 60 of them (85.7%) experienced a motor organ injury while the remaining 10 players (14.3%) never had a sports trauma which would prevent them from training or playing matches.

Own research shows that in the opinion of 70.0% of the respondents, motor organ injuries occurred most frequently in the main part of the training, less frequently (23.3%) during game matches and in 6.7% players, during training warm-ups. At the same time, none of the players experienced an injury during a warm-up before a game match (Tab. 1).

Table 1. Circumstances in which an injury occurred

Circumstances in which an injury occurred	n = 60	%
Training warm-up	4	6.7
Training (main part)	42	70.0
Warm-up before game match	0	0.0
Competition (match)	14	23.3

Considering the training cycle, the information that the highest number of sports injuries in players occurred in the transition period (40.0%), with fewer

injuries in the preparation period (30.0%) and start (30.0%), proved to be significant.

Statistical analysis also showed that half of the young volleyball players (n = 30) were at the highest risk of injury when performing a jump to the ball and spiking it. Another injury-promoting technical element was landing (23.3%) and running and blocking (10.0% each). Moreover, 6.7% of young players experienced motor organ injuries at the point of clashing with another player but never while playing (Tab. 2).

Table 2. Type of technical exercise at the time of injury

Type of technical exercise	n = 60	%
Jump and spike	30	50.0
Landing	14	23.3
Running	6	10.0
Play	0	0.0
Blocking	6	10.0
Clash with another player	4	6.7
Other	0	0.0

In the analysis, the following circumstances of the most frequent sports injuries were also considered: overtraining (33.4%), fatigue (23.3%), clash with an opponent or partner (16.7%), getting hit with a ball (13.3%). It was also shown that the drive for success (6.7%), previous, not fully treated consequences of motor organ injuries, and - in the young players' opinion - insufficient warm-ups (3.3%) were causes of injuries (Tab. 3).

Table 3. Direct causes of sports injuries

Causes of sports injuries	n = 60	%
Overtraining	20	33.4
Fatigue	14	23.3
Clash with opponent/partner	10	16.7
Hit by a ball	8	13.3
Excessive drive for success	4	6.7
Previous, not fully treated motor organ damage	2	3.3
Insufficient warm-up	2	3.3
Sports overuse syndrome resulting from participation in competitions	0	0.0
Slipping	0	0.0
Personal problems	0	0.0
Lack of discipline in trainings and competitions	0	0.0
Other	0	0.0

An analysis of the feedback of the respondents who experienced motor organ injuries (n = 60) allows defining the following localisation of the injuries, typical of the discussed team game: upper limbs (71.4%) and lower limbs (62.9%), with the torso being a less frequent localisation (20.0%).

The study also showed that the highest incidence was for dislocations (93.3%), followed by sprains and repetitive strain injury respectively (70.0% each). It was less common for the players to experience muscle and ligament strains (33.3%), contusion and muscle or ligament tear (30.0% each), with fractures being the least common (6.7%). The incidence of injuries in different body parts with detailed localisation is presented in Table 4.

Table 4. Incidence of injuries in different body parts with localisation

Type of injury	n = 60		Location	%
	n	%		
Contusion	18	30.0	Hand (palm)	33.3
			Hand (wrist)	11.2
			Elbow	33.2
			Knee	22.2
Sprain	42	70.0	Hand (wrist)	4.8
			Ankle	95.2
Dislocation	56	93.3	Hand (finger dislocation)	71.4
			Hand (wrist)	10.7
			Ankle	17.9
Fracture	4	6.7	Forearm	50.0
			Elbow	50.0
Repetitive strain injury	42	70.0	Torso	28.6
			Shoulder	9.5
			Knee	61.9
Muscle/ligament strain	20	33.3	Torso	20.0
			Shoulder	30.0
			Hip	40.0
			Ankle	10.0
Muscle/ligament tear	18	30.0	Torso	22.2
			Shoulder	22.2
			Hip	22.2
			Ankle	22.2
			Lower leg	11.1

In the course of the analysis, treatment methods applied in the case of post-traumatic tissue damage in young players were also established. The majority of players indicated rehabilitation (36.7%) and limb immobilisation (26.7%), followed by pharmacological treatment (16.6%). Among the respondents who had experienced a sports injury, one fifth (n = 12) were not given any therapeutic procedures which might suggest that the sustained injuries were not serious.

As a result of the motor organ injuries, the treatment and rehabilitation period in 62.5% of the volleyball players took up to 2 weeks, while 46.2% of the study participants indicated inability to undergo sports trainings of up to 1 week (Tab. 5).

Table 5. Duration of rehabilitation/treatment and duration of inability

Period of inability	Duration of rehabilitation/treatment		Duration of inability to train	
	n = 48	%	n = 52	%
Up to 1 week	6	12.5	24	46.2
Up to 2 weeks	30	62.5	10	19.3
Less than 1 month	12	25.0	14	26.9
Less than 3 months	0	0.0	2	3.8
Up to 6 months	0	0.0	2	3.8
Longer	0	0.0	0	0.0

An analysis of the information, however, indicated that the most frequent post-traumatic complaint was pain, which was reported by 46.7% players; it also acted as a warning signal from the not-yet-fully treated injuries. When it comes to players going back to volleyball practice, it might be seen as an optimistic sign that in 76.7% of previously injured players, new injuries to the motor organ did not occur. Also in 40.0% of them, lack of serious, undesirable consequences to health may result from relatively large regenerative reserves of tissues, as is the case with young people.

DISCUSSION

The problem of injuries in young people playing and practising various sports has been the focus of numerous publications [11, 12, 13, 14, 15, 16]. It is also one of the important questions considered with a player's success and the development of a sport in mind. Modern development of sports and its increasing level forces an early start of regular training and requires more and more talented youth. That is why reflections on e.g. age in this training process suggest such defining of its aims and objectives which, considering an individual's physical and psychomotor development, will be possible to achieve without posing a risk to health. Thus, practising a sport should be started at an optimal age for particular disciplines [17]. It is difficult to widely confront the results of own research with data found in sources on the topic of injury characteristics in young volleyball players. Those results do, however, confirm findings of other authors [18, 19, 20, 21] with regard to the causes, characteristics, incidence, localisation, and extent of injuries. Moreover, they

prove that in players undergoing specialist sports training, in their opinion, overtraining and fatigue can be one of the causes for sustained motor organ injuries. As stated by Donatelli [22], when players undergoing intense training while in the phase of intensive growth and skeletal development lack proper rest, they are particularly prone to repetitive strain injuries to the musculoskeletal system.

Statistical analysis of the collected material showed that performing a jump to the ball, spiking and landing are the key technical elements responsible for motor organ traumas in young players, which is consistent with research findings by Aagaard and Jørgensen [18].

Additionally, own research results concerning the localisation of injuries are not fully consistent with those obtained by experts in the field [20, 21, 23]. Both in own research and in the findings by the above-cited authors, traumas in the torso area were the least frequent. The discrepancy is that injuries appear more often in upper limbs in own research, while the mentioned authors indicate lower limbs.

Other data from own analyses showed that the most common type of injury was dislocation, followed by sprain and repetitive strain injury. Muscle or ligament strains, contusions and muscle or ligament tears were less common. Moreover, motor organ injuries occurring to sports people are characteristic of the sport they do or play: contusions and ligament strains prevail in boxing [24] and wrestling [25] while fractures are more common in karate [26].

Adolescent players are usually reluctant to cease their practice at the moment an injury occurs and they have their own, personally justified reasons for that. They realize that within a few days of stopping physical effort, physiological adaptation ability to practice strain decreases [27]. According to the participants of own research, excessive drive for success, not-fully-treated consequences of previous motor organ injuries, and insufficient warm-ups appeared as the causes of sustained injuries. This personal approach is most often connected with a disregard for rules on healing soft tissues of the motor organ (muscles, tendons, ligaments), an attitude which is rather common in the world of sport [28]. Resuming intensive sports practice too soon may lead to a deterioration of the existing physiopathological condition of body structures and significantly increase the risk of a recurrent injury in the same part of the body [10, 29, 30]. Therefore, as a result of their appearance, the treatment and rehabilitation period in 62.5% of the study volleyball players took up to 2 weeks whereas 46.2% of the study participants indicated inability to undergo sports trainings of up to 1 week.

Failure to follow the rules of rational training (the optimum selection of training means, methods and burdens) in reaction to physical strain can be a significant cause of a delayed renewal of the damaged tissue, persistence of inflammation, and deterioration of the overall condition of the motor organ. Therefore, potential capability of a body put under training stress should always be kept in mind. Thus body adaptation to the necessary volleyball strain in young people should be adjusted to each player's individual ability [31, 32].

Since the main aim of the research was to establish the types and incidence

of sports injuries in young volleyball players and to indicate ways to prevent them, actions aimed at reducing injury impact resulting from strain proved to be important, including ways to treat post-traumatic tissue damages experienced by young volleyball players. Here, the majority of players indicated rehabilitation and limb immobilisation, followed by pharmacological treatment.

Awareness of the growth process dynamics (adolescence) and maturation and the impact of sports practice on these processes, as well as the results obtained from own research can be seen as important factors in the realization of the health protection process in this population.

CONCLUSIONS

1. The most frequent cause of sport injuries, in the opinion of adolescent volleyball players, were overtraining and fatigue, which suggests that the injuries may have resulted from training errors and incorrect performance of technical tasks.
2. For young athletes the analysis and observation of fatigue levels as the main cause of overstrain changes in soft tissues is vital.
3. In view of the obtained results, the need for optimisation of rest in order to replenish energy reserves and regenerate strength seems to be justified.

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