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**PHYSICAL ACTIVITY AND INJURIES AND OVERSTRAINING SYNDROMES  
IN SITTING VOLLEYBALL PLAYERS**

**Key words:** physical activity, injuries and overstraining syndromes, sport for the disabled, sitting volleyball.

ABSTRACT

Sport is a part of active rehabilitation the aim of which is to restore self-reliance in the disabled. Sitting volleyball is one of sports, which apart from their sports advantages have also integrative properties. The level of physical activity and incidence of injuries and overstraining syndromes in top disabled volleyball players in Poland who play sitting volleyball was tested using a questionnaire. Significant involvement in physical activity through various additional forms, not only volleyball, was noted. Injuries occurring in players are related mainly to sprains and dislocations of joints. Overstraining syndromes of muscles and joints affect mainly upper and lower limbs. People with a dysfunction of one limb using the other limb for play are often additionally exposed to the overstraining of the healthy limb.

INTRODUCTION

Volleyball is one of the most attractive sports and it attracts great interest all over the world. Apart from the generally known volleyball of able-bodied athletes there are also two varieties of the sport for the disabled. They are standing volleyball for people with dysfunction of the motor system and sitting volleyball for persons with a greater degree of motor disability. Such people cannot take part in the play standing up due to limitations resulting from their disability. The players are allowed to play according to an appropriate medical classification which enables both people with a significant and minimal disability to play sitting volleyball. The issue is to make up the teams so that the general degree of disability in each team is balanced.

Sport for the disabled has developed rapidly in recent years. This is related to the disabled coming out of social isolation. There are more and more such people, as they include not only people born with disabilities, but also many victims of traffic accidents and war conflicts (e.g. in Serbia, Afghanistan, Iraq). Sport facilities without architectonic barriers are constructed, so the disabled can use them. It is getting easier for teams to find sponsors to finance the activities of clubs due to a constant increase in the popularity of sport performed by disabled people. This contributes to an increase in the sports level of the teams. Physical activity of the disabled is not limited to active spending of leisure time or forms of rehabilitation improving their physical fitness. Sport is a part of active rehabilitation the aim of which is returning self-reliance to the disabled. Sport is an important means to this end. Competitive sport is also a way

of satisfying ambitions, presentation of high abilities and even competing with able-bodied people [1, 2].

The research in the area of volleyball for the disabled aims to obtain a picture of the specificity of sport activity of disabled people. The research included, among other things, the structure of abilities which affect the sports performance in the game [8]. It focuses on searching for a specific sports model of athletes [10]. Within the framework of this research values characteristic for elite disabled athletes have been established and presented hierarchically, separately for men and women. They do not vary significantly from the values established in sport for the able-bodied. They include a feeling of self-value, team spirit or feelings of friendship among the players [10]. A separate problem in research is establishing predispositions necessary to work as a coach in disabled sport [3]. Many authors indicate directly the coach's special role [3, 9, 12]. Data from the studies carried out on coaches of national sitting volleyball teams lead to the conclusion that the most important qualities of a coach, which determine sports success, include motivation, responsibility and self-confidence [9]. These qualities seem to coincide with those which determine sports success of athletes. Disabled volleyball is not limited only to physical disabilities, although there are interesting scientific and methodological studies in this respect [5, 11]. Also, experimental studies are published, which are still rare, the aim of which is to teach volleyball to people with intellectual disabilities [12]. Attempts have been also made to develop measurement tools for the assessment of skills in disabled volleyball. One of the more important attempts of this kind is the study of Downs and Wood [4]. The authors present sets of tests which are highly accurate and have high reliability indicators [4].

Players with dysfunction of the motor system when striving to achieve a higher sports level train more often and more intensely and become competitive athletes in the full sense of the word. Motivated by coaches to hard training work and a great involvement in direct confrontation with the opponent, they suffer injuries and so-called overstraining syndromes. Disabled sports and related injuries have become a subject of discussions in professional literature in traumatology and sports medicine [1, 2, 6]. In this respect this sport is treated equally with sport for the able-bodied. It should be emphasised, however, that at

the moment few studies have been published related to incidence of injuries in volleyball for the disabled. The study of Reeser [7] is exceptional, but it is concerned with standing volleyball.

The aim of this study is to present the physical activity of top Polish sitting volleyball players and specify the type and intensity of incidence of various injuries resulting from the game.

## METHODS

The study was carried out in 2006 by a team of staff of the Department of Sports Team Games of the University School of Physical Education in Poznań during a sitting volleyball tournament. Seven top Polish teams took part in the championships: IKS Atak Elbląg, Start-Simet Jelenia Góra, Start Kielce, UKS Poznań, Start Wrocław, KSI Start Szczecin and Start Katowice. The method used in the study was the questionnaire-based diagnostic survey. The questionnaire included 29 closed or semi-open questions relating to physical activity of the athletes and injuries and overstraining syndromes related to this sports discipline.

70 people took part in the tournament in Poznań. 48 people agreed to fill in the questionnaire, including five able-bodied people (the regulations allow two able-bodied players to be in the team). The able-bodied players were excluded from the analyses related to the motor system dysfunction, but they were taken into account in analyses of the effect of this type of volleyball on injuries and overstraining syndromes of participating athletes. Some questions were not answered by all players. The participants' age was varied: the youngest one was 17 years old and the oldest one was 53 years old. The mean age was 30.9 years. The players' training history was also varied. A 17-year-old player from Poznań had played for the shortest time – one year, a 48-year-old player from Elbląg had played for the longest time – 25 years. The mean time of involvement with this sport of all studied players was 7.1 years.

## RESULTS

Table 1 shows a numerical summary of answers to questions on the frequency of playing sitting volleyball and additional sports. The

numerical data indicate that most players train two to three times a week. It is characteristic that none of the participants trains more than three times per week. Players in all teams feature a similar duration of each training, which is from 1.5 to 2 hours.

before their accidents or illnesses 18 people played standing volleyball at least at the recreational level. It can be assumed then that technical abilities and general preparation of these people is better than that of those who only play sitting volleyball. Other

**Table 1.** Percentage characteristics of involvement in sports training of sitting volleyball players in Poland

No.	Frequency of training per week												
	once		2-3 times		more than 3 times		total						
1	n	%	n	%	n	%	n (100%)						
	13	27.1	35	72.9	0	0	48						
	Duration of sports training												
2	1 hour		1-1.5 hours		more than 2 hours		total						
	n	%	n	%	n	%	n (100%)						
	0	0	48	100	0	0	48						
	Doing other sports												
3	yes				no				total				
	n	%	n	%	n	%	n (100%)						
	27	56.2	21	43.7			48						
	Frequency per week of training other sports												
4	once		2-3 times		more than 3 times		total						
	n	%	n	%	n	%	n (100%)						
	9	33.3	17	62.9	1	3.7	27						
	A list of additional sports												
5	PN*	LA*	P*	TS*	PR*	K*	KL*	PS(s)*	B*	Ž*	TZ*	I*	R*
	n	n	n	n	n	n	n	n	n	n	n	n	n
	7	6	5	2	2	2	1	1	1	1	1	10	39

\* PN – football, LA – track and field, P – swimming, TS – table tennis, PR – handball, K – basketball, KL – cycling, PS(s) – standing volleyball, B – billiards, Ž – sailing, TZ – lawn tennis, I – other sports, T – total

For over a half of the participants sitting volleyball is not the only sport they practice. A great majority of them (62.9%) are engaged in other disciplines as often as two to three times a week, 33.3% – once a week, and only 3.7% – more than three times a week. Out of sport disciplines suggested in the questionnaire, performed at least at the recreational level, a great majority of the participants practice football, athletics and swimming. Less popular are such sports as table tennis, handball, basketball, cycling, standing volleyball, billiards, sailing, lawn tennis. Most of the questioned (as much as 25.6%) chose the answer “other”, that is disciplines not suggested in the questionnaire. An additional interview which had not been presented in the table indicates that

players only became interested in volleyball as disabled.

In the analysis of the disease entities (Table 2) determining the disability it should be emphasised that the largest group of the participants were amputees – 16 of them, including five after an amputation of the lower limb at the level of the lower leg, four at the level of the thigh, one at the level of lower leg of two lower limbs, one at the level of thighs of two lower limbs (a player in the wheelchair), two after an amputation of the upper limb at the level of the hand, two at the level of the forearm, one after an amputation of the lower right limb at the level of the thigh and a deformation of the left lower limb (the person moves on a bicycle playing a role of a wheelchair). A further analysis

of Table 2 shows that in this group there are three people with paresis of lower limbs due to poliomyelitis. Other two people suffer from infantile cerebral palsy (one hemiplegia, the other spasticity of lower limbs). Other disease entities are represented in small numbers. One person has contracture of the hip joint, two people have paraplegia, one has hypoplasia of one lower limb, one has hypoplasia of fingers, one has paresis of the right leg, one has a chronic inflammation of the hip joint, two suffer from talipes equinovarus, one has paralysis of shoulder plexus and one has paralysis of the lower leg as a result of crushing. Apart from this, two people suffer from diseases not related to the motor system, therefore they were qualified for the game as healthy. One of them suffers from

epilepsy, and the other one from loss of eyesight – 20% in the right eye and 80% in the left eye.

Table 3 shows that the injuries the players sustained during training and matches are quite common. In total 50 various injuries were noted in 34 people. The most frequent injuries were sprains and dislocations of joints and bruising of various body parts. The problem of overstraining syndromes of muscles and joints is also significant as it is related to 35 people (Table 4). In eleven of them the complaints were so serious that they were forced to abandon sport temporarily. Most complaints concern overstraining syndromes of upper limb muscles and lower limb joints.

**Table 2.** Types of players' disabilities

Type of disability	number	%	total	
			n	%
<b>Amputations:</b>				
amputation of the lower limb at the shank level				
amputation of the lower limb at the thigh level	5	14.7		
amputation of both lower limbs at the shank level	4	11.0		
amputation of both lower limbs at the lower thigh level	1	2.9		
amputation of the right lower limb and deformation of the left lower limb	1	2.9		
amputation of the upper limb at the hand level	1	2.9		
amputation of the upper limb at the forearm level	2	5.9		
	2	5.9		
<b>Poliomyelitis</b>				
lower limb paresis	3	8.8		
<b>Infantile cerebral palsy</b>				
hemiplegia	1	2.9	34	100
spasticity of lower limbs	1	2.9		
<b>Other diseases</b>				
hip joint contracture	1	2.9		
paraplegia	2	5.9		
hypoplasia of one lower limb	1	2.9		
hypoplasia of fingers	1	2.9		
leg paresis	1	2.9		
chronic inflammation of hip joint	1	2.9		
talipes equinovarus	2	5.9		
paralysis of the shoulder plexus	1	2.9		
paralysis of the lower leg as a result of crushing	1	2.9		
<b>Qualified to the game as healthy</b>				
epilepsy	1	2.9		
loss of eyesight in the right eye 20% in the left eye 80%	1	2.9		

**Table 3.** Injuries of players sustained during training and matches

No.	types of injures	n	%	total	
				n	%
1	sprained joints	15	30		
2	dislocated joints	8	16		
3	brushing of various body parts	24	48		
4	tearing off shoulder ligaments and spraining of two fingers of the upper limb	1	2	50	100
5	dislocation of ankle joints, spraining of the right knee, spraining of the left shoulder	1	2		
6	spraining of the left shoulder, spraining of the fingers	1	2		

**Table 4.** Numerical and percentage list of overstraining syndromes of muscles and joints occurring during matches and training

No.	General incidence of overstraining syndromes of muscles						total n (100%)		
	yes			no					
1	n	%	n	%	n	%	n (100%)		
	23	51.1	22	48.9			45		
Overstraining syndromes of muscles in relation to individual body parts									
2	Upper limb muscles		Back muscles		Lower limb muscles		Neck muscles	total	
	n	%	n	%	n	%	n	%	
	10	43.9	6	26.1	5	21.7	2	8.7	
General incidence of overstraining syndromes of joints									
3	yes			no			total		
	n	%	n	%	n	%	n (100%)		
	18	43.9	23	56.1			41		
Detailed list of overstraining syndromes of joints									
4	Upper limb joints			Lower limb joints			Spine joints		total
	n	%	n	%	n	%	n	%	
	5		8						
	Shoulder joint	Finger joints	27.8	Ankle joint	Knee joint	Hip joint	44.4	5	27.8
	2	3		2	5	1			18
Abandoning training as a result of overstraining syndromes and the need of treatment									
5	yes			no			total		
	n	%	n	%	n	%	n (100%)		
	11	31.4	24	68.6			35		
Overstraining syndromes were caused by disability (according to the participants)									
6	yes		no		I don't know		total		
	n	%	n	%	n	%	n (100%)		
	3	9.7	18	58.1	10	32.3	31		

## DISCUSSION

The questionnaire consisted of items examining the players' sport activity, their interest in other sports and frequency of performance. This was one of the themes of the study. It shows that disabled volleyball players are involved in performing a few sports disciplines and are not limited to playing sitting volleyball only. Their average physical activity takes place around three times a week, from 1 to 1.5 hours. The study took place at the end of the tournament and each team played twelve championship matches and a various number of friendly matches. Teams from Poznań, Kielce and Szczecin did not play any friendly matches. Start Katowice played three friendlies, Start Wrocław – four, Start Simet Jelenia Góra – twelve, and JKS Atak Elbląg – twenty. Differences in the number of friendly matches played by the players and their different physical strains had to affect the incidence of a number of injuries and overstraining affecting players so frequently. Training load and match load were probably related to sport injuries accumulated at the time. In the assessment of injuries in sitting volleyball attention was paid mainly to their number and type in terms of overstraining syndromes of muscle and joints. The object of the analysis is not, however, to specify the injuries and overstraining depending on the sports performance and the place in the tournament.

In each team there were players of various ages, therefore, it may be assumed that older players were in a much worse situation and more exposed to injuries. An additional strain for them were various types of disabilities (e.g. a missing limb) as a result of which limbs were involved in the play asymmetrically. Healthy limbs were forced to an excessive activity during the play in order to compensate for the lack or disability of function of the other limb, often were overstrained and injured in consequence.

It is worth looking closely at individual cases which show a true picture of problems the disabled players encounter in sitting volleyball. Characteristic injuries affecting e.g. a player after an amputation at the forearm level who complained of tearing off of ligaments of the left shoulder and spraining of two fingers. Moreover, the player after an amputation at the level of the right wrist suffered from dislocation of ankle joints, a sprained right knee and a sprained left shoulder. In these two players with amputations within upper limbs forced

to play using one arm, the overstrained healthy limb was injured. Another player suffering from poliomyelitis sustained a sprained left shoulder and sprained two fingers. A player with hypoplasia of fingers suffered from a sprained ankle and bruising of a knee. This indicates occurrence of injuries related to the specific type of disability. Usually they were complaints related to excessively intensive training or involvement in the game exceeding physical capabilities of a body in a direct confrontation with an opponent but not lasting very long. On the other hand, it has to be emphasised that almost 32% of the participants were forced to abandon training for some time as a result of overstraining within muscles or joints. The majority of players asked for their subjective opinion on the relation of the overstraining syndromes with their disability did not perceive such a relation. Almost one third of the participants did not have an opinion on the subject, and only 10% of respondents thought the overstraining resulted from their disability.

In literature there have been no reports on sports injuries of disabled sitting volleyball players. Out of necessity, let us look at sports injuries reported by Reeser [7] and related to standing volleyball players. Top Paralympians from Atlanta (1996) were examined in terms of injuries which caused at least one-day long break in playing the games. Out of 41 participants, 22 did not sustain any significant injuries. Nineteen had 30 injuries in total. The most frequent injuries were within the lower limb, defined as an overstraining, muscle stretching or joint dislocation. They were related to various actions related to spiking the ball or blocking it. More often injuries were found in players after amputation of one leg than in players without amputations. Injuries were noted less often in people who had undergone earlier a special programme of strengthening exercises. The author suggests also that injuries of disabled people in standing volleyball are similar to those occurring in able-bodied players [7]. Taking into account the number and type of injuries in the studied volleyball players one can see the similarity to other variations of volleyball.

It should be stated that sports activity of disabled volleyball players for whom sitting volleyball is the main sport is relatively high, but not only limited to this discipline. Injuries and overstraining syndromes of muscles and joints are inseparably related to performance of this sport. They occur with a similar intensity as in other

sports, performed by both able-bodied and disabled athletes. They are, however, characterised by a certain specificity in terms of the degree of intensity of their occurrence. The results of the current study show that players have many disease entities which are certainly obstacles in playing volleyball by this group of the disabled. Overcoming these obstacles is an important means of active rehabilitation and sitting volleyball is an appropriate, interesting sport for the disabled and at the same time, through the participation of the healthy in it, it is an important factor of social integration. Hence, disability is not a decisive obstacle in undertaking sitting volleyball training. This sport discipline has important health and integrative advantages and should find wide application in active rehabilitation.

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