Medical and Biological Sciences, 2012, 26/4, 85-89

Andrzej Lewandowski[1], Aleksandra Siedlaczek[1], Marcin Siedlaczek[2], Ryszard Grucza[3]

CHANGES IN THE PHYSICAL FITNESS OF VOLLEYBALL PLAYERS

ZMIANY SPRAWNOŚCI FIZYCZNEJ MĘŻCZYZN UPRAWIAJĄCYCH PIŁKĘ SIATKOWĄ

[1]Department of Basis of Physical Education Faculty of Health Sciences Collegium Medicum in Bydgoszcz,
Nicolaus Copernicus University in Toruń
Head: dr Andrzej Lewandowski
[2]Chair and Deparment of Kinezytherapy and Medical Massage Collegium Medicum in Bydgoszcz,
Nicolaus Copernicus University in Toruń
Head: dr Irena Bułatowicz
[3] Department of Physical Exercises Collegium Medicum in Bydgoszcz,
Nicolaus Copernicus University in Toruń
Head: prof. dr hab. Ryszard Grucza

Summary

Objective: Volleyball is one of the most popular team sports in the world. As this is a non-contact sport, it is also regarded as a pleasant and safe form of recreation. However, there are commonly known reports about serious injuries which players who represent the highest level of sport performance suffer from. Attempts have been undertaken to define the scale of changes of health-related physical fitness components of the players participating in the starting season of the extra league of Polish Volleyball League.

Method. Using the selected attempts of Eurofit test, health-related fitness features of the 12 players were examined at the beginning and at the end of the starting season in the following scope: flexibility, static arm strength, abdominal strength and endurance. In addition, explosive leg power as the most characteristic part of special volleyball skills was measured as well as the basic values of morphological features.

Results. With the exception of flexibility, the test results showed a negative effect of starting season on the level of the physical fitness components examined. Not only did the components relate to performance-related fitness deteriorated, but also the health-related ones did. Thereby, the research results demonstrate negative effects of intensive performance of physical activity which is widely considered as beneficial for health.

Conclusions were made about the necessity of selecting the intensity level of exercise which matches one's individual abilities. In case of professional sport, conclusions suggest paying attention to maintaining appropriate configuration of health-related physical components.

.

Streszczenie

Wstęp. Piłka siatkowa jest jedną z najbardziej popularnych i lubianych gier zespołowych na świecie. Jako, że jest to sport bezkontaktowy, uważany za przyjemną i bezpieczną formę rekreacji ruchowej. Powszechnie znane są jednak doniesienia o poważnych kontuzjach zawodników najwyższego poziomu. Podjęto więc próbę określenia wielkości zmian komponentów sprawności fizycznej sprzyjających zdrowiu w okresie startowym zawodników ekstraklasy Polskiej Ligi Siatkówki.

Metoda. Na początku i pod koniec okresu startowego, wykorzystując próby testu Eurofit, zbadano komponenty sprawności fizycznej sprzyjające zdrowiu 12 zawodników w zakresie: gibkości, siły statycznej, siły mięśni brzucha oraz wytrzymałości. Dodatkowo zmierzono siłę eksplozywną kończyn dolnych, jako najbardziej charakterystyczny przejaw sprawności specjalnej siatkarzy, a także podstawowe cechy morfologiczne.

W y n i k i . Z wyjątkiem wyników próby gibkość wykazano negatywny wpływ okresu startowego na poziom badanych komponentów sprawności fizycznej zawodników. Pogorszeniu uległy zarówno komponenty powiązane z osiągnięciami motorycznymi jak i ukierunkowane na zdrowie. Tym samym więc wyniki badań ukazują negatywne skutki intensywnej realizacji aktywności fizycznej powszechnie uznanej za sprzyjającą zdrowiu.

W n i o s k i . Sformułowano wnioski o konieczności dobieranie poziomu intensywności ćwiczeń do indywidualnych możliwości, a w przypadku sportu wyczynowego zwracanie uwagi na utrzymanie odpowiedniego ukształtowania komponentów sprawności fizycznej powiązanych ze zdrowiem.

Key words: men's volleyball, health-related fitness components, professional sport, starting season, regress
Słowa kluczowe: sport wyczynowy, okres startowy, zdrowie, kontuzje, regres

INTRODUCTION

Volleyball is one of the most popular team sport in the world. As it is a non-contact sport, it is also regarded as a pleasant and safe form of recreation. However, there are commonly known reports about serious injuries which players who represent the highest level of sport performance suffer from. The most often injuries occur during the starting season [1], as a result of load and game's dynamics . Moreover, injuries may significantly influence the physical fitness components. Many authors raise the issue of a type of examination which controls volleyball male and female players' motor skills and which also compares structural and motor determinants for playing effectiveness [2, 3, 4, 5, 6, 7]. However, all the information aims only at displaying the control of motor skills, taking into consideration achieved practice effects.

There is not much information in available literature about health effects of playing volleyball professionally and the only publication which was found and which deals with changes of physical fitness features during the playing season was written by W. Stasiak [1998], where physical fitness changes of female volleyball players from a second-league team are shown. Therefore, it is interesting whether people playing volleyball professionally gain benefits for health or lose its components.

The aim of the research was to attempt to determine the scale of changes in physical fitness components of volleyball players. It was assumed that the starting season will deteriorate the scale of physical fitness components, which is connected with fatigue w occuring after participating in the games. It was also assumed that sport injuries have a significant influence on the decrease of physical fitness level during the games.

SUBJECTS AND METHOD

Twelve male players of the 'BKSch Delecta' club were involved in the research. The club belongs to extra league of Polish Volleyball League. The men were aged 18 - 34 years old and the volleyball experience of the majority of the players exceeded 10 years.

The basic values of morphological features were measured: height and body weight [8]. Using the Eurofit test, physical fitness was measured in the scope of: flexibility, strength of abdominal muscles, static arm strength, explosive leg power and cardiorespiratory endurance. Flexibility was defined by the depth of the front sit-and-reach test (cm), strength of the abdominal muscles by the maximum number of correctly performed sit ups (n), static arm strength by clamping hands on a dynamometer (kG), explosive leg power by the distance of standing long jump (cm), cardiorespiratory endurance by the level and number of shuttle run (20m) reached (n) [9].

Both fitness attempts and morphological features examined were conducted twice a main season: at the beginning and at the end of the starting season.

The results obtained are presented in tables and with the help of graphs. The scale of changes of the examined features was defined with the help of Mollison indicator and t-Student test [8,10].

RESULTS

Comparative characteristics of average values of the players' morphological features are presented in table I.

It is concluded from the table data that basic morphological features of the examined players did not change their values during the starting season.

Table II presents the characteristics of physical fitness components of the team examined at the beginning and at the end of the starting season.

Tabela I. *Charakterystyka porównawcza średnich wartości cech morfologicznych w obu okresach badań*
Table I. *Comparative characteristics of average values of morphological features in both periods of research*

Kategoria Category	Pomiar Measurement	$\overline{X}$	δ	D	t
N=12					
Wysokość ciała [cm] Height	I	197,17	6,15	0,38	0,15
	II	196,79	6,08		
Masa ciała [kg] Weight	I	90,88	8,14	2,96	0,9
	II	93,83	8,02		

Tabela II. *Charakterystyka porównawcza średnich wartości wyników prób sprawności fizycznej badanych zawodników*
Table II. *Comparative characteristics of average values of physical fitness attempt results in both periods of research*

Kategoria Category	Pomiar Measurement	$\overline{X}$	δ	D	t
N=12					
Siady z leżenia [n] sit ups [n]	I	30,42	2,47	2,83	3,08**
	II	27,58	2,02		
Głębokość skłonu w przód [cm] depth of the front sit-and-reach test [cm]	I	26,17	6,96	4,83	1,77*
	II	31,00	6,41		
Skok w dal z miejsca [cm] standing long jump (cm),	I	278,25	16,19	12,83	1,92*
	II	265,42	16,58		
Zaciskanie ręki lewej [kG] Clamping left hand [Kg]	I	53,58	7,86	5	1,58
	II	48,58	7,66		
Zaciskanie ręki prawej [kG] Clamping right hand [kG]	I	57,25	8,22	5,42	1,61
	II	51,83	8,28		
Bieg wahadłowy[etap] shuttle run [level]	I	8,17	1,34	1,33	2,51**
	II	6,83	1,27		

* różnica statystycznie istotna dla $p \leq 0,05$
* statistically significant difference for $p \leq 0,05$
** różnica statystycznie istotna dla $p \leq 0,01$
**statistically significant difference for $p \leq 0,01$

It is concluded from the data that, except for flexibility, all averages have decreased, which indicates the deterioration of the physical fitness features they represented. Statistically significant differences were noticed in the following measurements: abdominal strength, explosive leg power and endurance. The material analysis, which takes into consideration the differentiation of respondents by the injury occurrence and no injury, indicated lower averages of injured players' characteristics researched. Significant differences of averages with characteristics of the other players were achieved in case of endurance.

Thereby, the following result was acquired: injured players are characterized by lower level of endurance.

The assessment of the scale of physical fitness components changes are presented in Fig. 1.

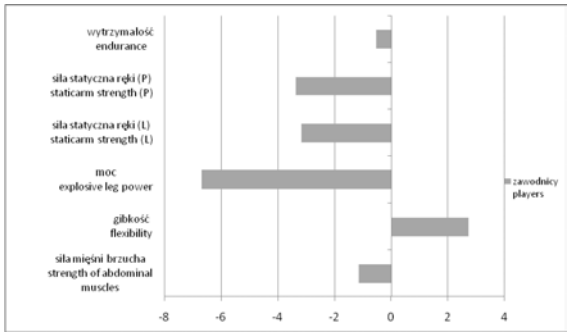

Fig. 1. *Graphical characteristics of the scale of physical fitness components changes*
Ryc. 1. *Graficzna charakterystyka wielkości zmian badanych komponentów sprawności fizycznej*

The assessment indicates that the level of explosive leg power conveyed by the distance of standing long jump has changed the most, whereas cardiorespiratory endurance characterized by the level and number of shuttle run reached has changed the least.

The following figure demonstrates the results related to the changes which characterize the groups of injured players and non-injured players during the playing season.

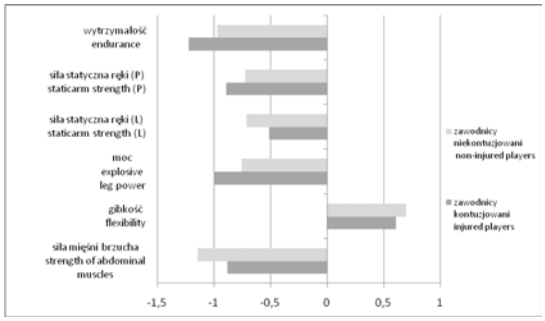

Fig. *2. Graphical comparative characteristics of the scale of changes of injured and non-injured players*
Ryc. 2. *Graficzna charakterystyka porównawcza wielkości zmian u zawodników kontuzjowanych i niekontuzjowanych*

As it may be concluded from figure 2, greater changes in the examined characteristics of the injured players occurred in the scope of cardiorespiratory endurance, explosive leg power and static strength of right hand. Other changes of components were similar in both groups.

DISCUSSION

The conducted research on men playing volleyball demonstrated the deterioration of the majority of physical fitness components during the starting period. Among other features examined, only flexibility has improved which was conveyed by a higher average of the depth of the front sit-and-reach test in the second period of the research. However, the component depends on several factors, such as: environmental temperature or circadian rhythm. These factors might have influenced the obtained research results. Nonetheless, beneficial changes occurred in all the players, which may indicate that the starting season consisted of many practice elements developing the feature. The deterioration of the strength level is of significance for the changes of this motor skill as well. As it is widely known, its level is negatively correlated with flexibility [11, 12].

The deterioration of the other components, e. g. static muscle strength, explosive leg power, abdominal muscles strength and cardiorespiratory endurance may be explained by influence of the starting season which greatly loads the players' organisms. To develop physical fitness components to the greatest possible extent during relatively short preparation period and subsequently to maintain their high level during the entire starting season turns out to be extremely difficult.

The high level of the players' strength, both explosive and static, as well as abdominal muscle strength, has significantly decreased in the staring season. The reason for this regression seems to be caused by the tiredness which results from participating in playing season. The following aspects depend on the strength level: jumps height, the speed of performing particular elements connected with the playing technique, the speed of moving on the playing field as well as the efficiency both in the forwards and in the defence. During one match, a player often performs over 200 jumps [13]. That is why it is not surprising that explosive leg power changes during playing season, which was also indicated by the research demonstrating its level decrease in all men examined.

The conducted research also indicated a significant decrease of static muscle strength value of both hands. In volleyball, elements such as moving in defence position during the block and the attack, as well as other actions on the playing field, require a significant static tension of muscles. This type of strength influences health condition to a greater extent than others mentioned as it protects and relieves the spine and other joints, reducing the risk of musculo-skeletal injuries [14].

The conducted research also indicates that maintaining a high level of cardiorespiratory endurance during the entire starting season is difficult. Similar results in this scope were obtained by W. Stasiak (1998). A high level of endurance is necessary for a versatile physical performance preparation, particularly due to the fact that it is the main factor which influences a young volleyball player's organism development. A player has to be prepared to undertake high intensity and significant capacity effort. This is explained by the fact that five-set matches often lasts for even two hours and the effort performed by a player on the field during every action is close to maximal [15].

In the scope of other features, we did not confirm the improvement of the results' level examined among female players of a second league team, as it was stated by W. Stasiak [1998]. On one hand, the differences may be explained by a sexual dimorphism, yet by the sport performance level accepted for the comparison of the teams on the other hand. It is possible that the female players, examined by the author, did not achieve maximal level of physical fitness in the preparation period because of a lower level of sport performance, which enabled them to increase it in the starting season by participating in the games. This statement is also justified by a positively verified hypothesis about the influence of injury on decrease of physical fitness level during the playing season. In comparison to non-injured players, injured players achieved worse attempt results. The majority of sport injuries were acquired during the starting season. The above explanation proved the observations of other authors [8] and the thesis researched in the present study. It also indicated that the starting season brings a great load even for professional players. We should be aware of the fact that physical activity serves health only when it is performed with an appropriate capacity,

intensity and the frequency of performance, e.g. with appropriate load [16]. It often does not occur in professional sport where only significant loads which often exceed the adaptive abilities of organism, guarantee achieving success in sport. The chase for a significant sport result may at the same time threaten sportspeople's health, as there are tendencies to cut the ways to success short or to minimise the level of training performance. As a result, control and caring of appropriate level of health-related physical components of the volleyball players is in the scope of coaches' duties.

The conducted research demonstrates the issue on the example of the players of one team. However, their results may also be related to consequences of taking up other forms of physical activity which are performed with an excessive intensity and capacity. Thereby, the research allowed forming the following general conclusions

.

CONCLUSIONS

1. A significant deterioration of physical fitness components in the starting season, concerning both performance-related fitness components and health-related fitness components, indicates that volleyball performed on a professional level loads the organism to a great extent and causes numerous injuries despite its non-contact characteristic feature.
2. A great involvement of dynamic strength, speed in technique and tactical aspects of playing volleyball justifies the necessity of controlling and caring of the appropriate development or maintaining the level of the other health-related fitness components which help maintain health to a great extent.

REFERENCES

1. Wnorowski K., Skrobecki J.: Teoretyczno- metodyczne podstawy kontroli motoryczności siatkarek i siatkarzy. Rocznik Naukowy AWF Gdańsk, 2000, t. IX, s. 53-78
2. Superlak E.: Piłka siatkowa. Techniczno-taktyczne przygotowanie do gry. Wrocław 1995, Wyd I
3. Kielak D., Kotulski M., Śledziewski D., Tyc Z.: Zmiany wskaźników mocy młodych siatkarzy a obciążenia treningowe okresu przygotowawczego. Trening 1997, t 1, nr 2, s. 85- 89
4. Kielak D.: Zmiany cech somatycznych i skoczności uczestników I.O. 1998-2000. Sport Wyczynowy 2002, nr 7-8, s. 41- 49
5. Klocek T., Żak S.: Kompensacja cech ujętych w modelu mistrza w piłce siatkowej. Sport Wyczynowy 1999, nr 9-10, s. 18- 26
6. Klocek T., Żak S.: Strukturalne i motoryczne determinanty skuteczności gry w piłce siatkowej kobiet. Antropomotoryka 2001, nr 22, s. 65-80
7. Taniewski M., Radtke A., Zaleski R.: Urazy sportowe wśród zawodników zespołowych gier sportowych. Rocznik Naukowy, AWF Gdańsk, 1996, t. 5, s. 113-133
8. Drozdowski Z.: Antropometria w wychowaniu fizycznym. Poznań 1987
9. Council of Europe, Committee for the development of sport,: Eurofit, Europian test of physical fitness. Rome 1988
10. Bobrowski D.: Probabilistyka w zastosowaniach technicznych. WNT, Warszawa 1986
11. Uzarowicz J., Zdebska H.: Piłka siatkowa. Warszawa 1998
12. Zaciorski W.:Kształtowanie cech motorycznych. Warszawa 1970
13. Skrobański H., Wieczorek A.: Tendencje rozwojowe w piłce siatkowej.
AWF Poznań Monografie, nr 300, 1993, s. 105-118
14. Haskell W., Montoye H., Orenstein D.: Psysical activity and exercise to achieve health-related fitness components. Public Health Reports, 100, 1985 s. 202-2012
15. Grządziel G., Ljach W.: Piłka siatkowa, podstawy treningu. Centralny Ośrodek Sportu, Warszawa 2000
16. Drabik J.: Aktywność fizyczna w kształtowaniu zdrowia człowieka- korzyści i zagrożenia. Wychowanie fizyczne i Sport, 2001, nr 4, s. 127
17. Stasiak W.: Zmiany sprawności fizycznej siatkarek AZS AWF Poznań w rocznym cyklu treningowym - badania wstępne. AWF Poznań Monografie nr 328, 1998, s. 61-67

Address for correspondence:
dr Andrzej Lewandowski
Uniwersytet Mikołaja Kopernika w Toruniu
Collegium Medicum im. Ludwika Rydygiera w Bydgoszczy
Katedra i Zakład Podstaw Kultury Fizycznej
tel./fax (52) 585-36-12 / 585-11-19
mail. kizpodskf @ cm.umk.pl

Received: 10.01.2012
Accepted for publication: 6.03.2012