



The model characteristics of jump actions structure of high performance female volleyball players

Stech M., Skrobecki J., Wnorowski K.

Academy of Physical Education and Sport in Gdansk, Poland

Annotation:

The purpose of this study was to develop generalized and individual models of the jump actions of skilled female volleyball players. The main prerequisite for the development of the jump actions models were the results of our earlier studies of factor structure of jump actions of 10 sportswomen of the Polish volleyball team "Gedania" (Premier League) in the preparatory and competitive periods of the annual cycle of preparation. The athletes age was 22.0 ± 2.9 years, the sports experience – 8.1 ± 3.1 years, body height – 181.9 ± 8.4 years and body weight – 72.8 ± 10.8 kg. Mathematical and statistical processing of the data (the definition of $M \pm SD$ and significant differences between the samples) was performed using a standard computer program «STATISTICA 7, 0». Based on the analysis of the factor structure of 20 jump actions of skilled women volleyball players determined to within 5 of the most informative indexes and their tentative values recommended for the formation of a generalized model of this structure. Comparison of individual models of jump actions of skilled women volleyball players with their generalized models in different periods of preparation can be used for the rational choice of means and methods for the increasing of the training process efficiency.

Стех М., Скробески Я., Вноровски Л. Модельні характеристики стрибкових дій волейболісток високої кваліфікації. Мета дослідження полягала у визначенні узагальнених і індивідуальних моделей стрибкових дій кваліфікованих волейболісток. Головною передумовою для цього визначення були результати наших попередніх досліджень щодо вивчення факторної структури стрибкових дій 10 спортсменок польської команди «Геданія» («Прем'єр-ліга») у підготовчому і змагальному періодах річного циклу підготовки. Вік спортсменок складав 22.0 ± 2.9 років, спортивний стаж – 8.1 ± 3.1 років, висота тіла дорівнювала 181.9 ± 8.4 см, а маса тіла – 72.8 ± 10.8 кг. Математична обробка даних (визначення $M \pm SD$ і істотність відмінності між зразками) виконувалася за допомогою стандартної комп'ютерної програми «STATISTICA 7, 0». На підставі факторного аналізу 20 стрибкових дій волейболісток було виділено 5 найбільш інформативних показників, які були запропоновані для утворення узагальненої моделі досліджуваної структури. Зіставлення індивідуальних моделей стрибкових дій кваліфікованих волейболісток з їх узагальненими моделями в різні періоди підготовки може бути використане для раціонального підходу до вибору засобів і методів підвищення ефективності тренувального процесу спортсменок.

Стех М., Скробески Я., Вноровски Л. Модельные характеристики прыжковых действий волейболисток высокой квалификации. Цель исследования заключалась в определении обобщенных и индивидуальных моделей прыжковых действий квалифицированных волейболисток. Главной предпосылкой для этого определения были результаты наших предыдущих исследований относительно изучения факторной структуры прыжковых действий 10 спортсменок польской команды «Гедания» («Премьер-лига») в подготовительном и соревновательном периодах годичного цикла подготовки. Возраст спортсменок составил 22.0 ± 2.9 лет, спортивный стаж – 8.1 ± 3.1 лет, высота тела равнялась 181.9 ± 8.4 см, а масса тела – 72.8 ± 10.8 кг. Математическая и статистическая обработка данных (определение $M \pm SD$ и достоверность различия между выборками) осуществлялась с помощью стандартной компьютерной программы «STATISTICA 7, 0». На основании факторного анализа 20 прыжковых действий волейболисток были выделены 5 наиболее информативных показателей, которые были предложены для формирования обобщенной модели исследуемой структуры. Сопоставление индивидуальных моделей прыжковых действий квалифицированных волейболисток с их обобщенными моделями в разные периоды подготовки может быть использовано для рационального подхода к выбору средств и методов повышения эффективности тренировочного процесса спортсменок.

Keywords:

female volleyball players, jump actions, model characteristics.

волейболістки, стрибкові дії, модельні характеристики.

волейболистки, прыжковые действия, модельные характеристики.

Introduction

The effectiveness of management training and competitive activities can be greatly enhanced through the development and use of different models to clarify the characteristics of athletic training. Generalized and individual models of athlete's competitive activity and fitness are widely used for orientation and correction of the training process [1, 2, 3, 4, and 5].

In particular, models that characterize different aspects of fitness allow observing noticing the distinctive features of some outstanding athletes, evaluating their importance for achieving of high sport results, and following the dynamics of indexes reflecting the state of the physical qualities, which determine the success in a particular discipline as a whole, and of an individual athlete.

As noted by V. Platonov [6], the efficiency of use of such models is high in the preparation of young athletes, as well as adults who have not attained high sporting skills. Nevertheless, for the sportsmen of high qualification an analysis of individual model characteristics, in particular of qualitative characteristics and the structure of their motor actions, can be helpful.

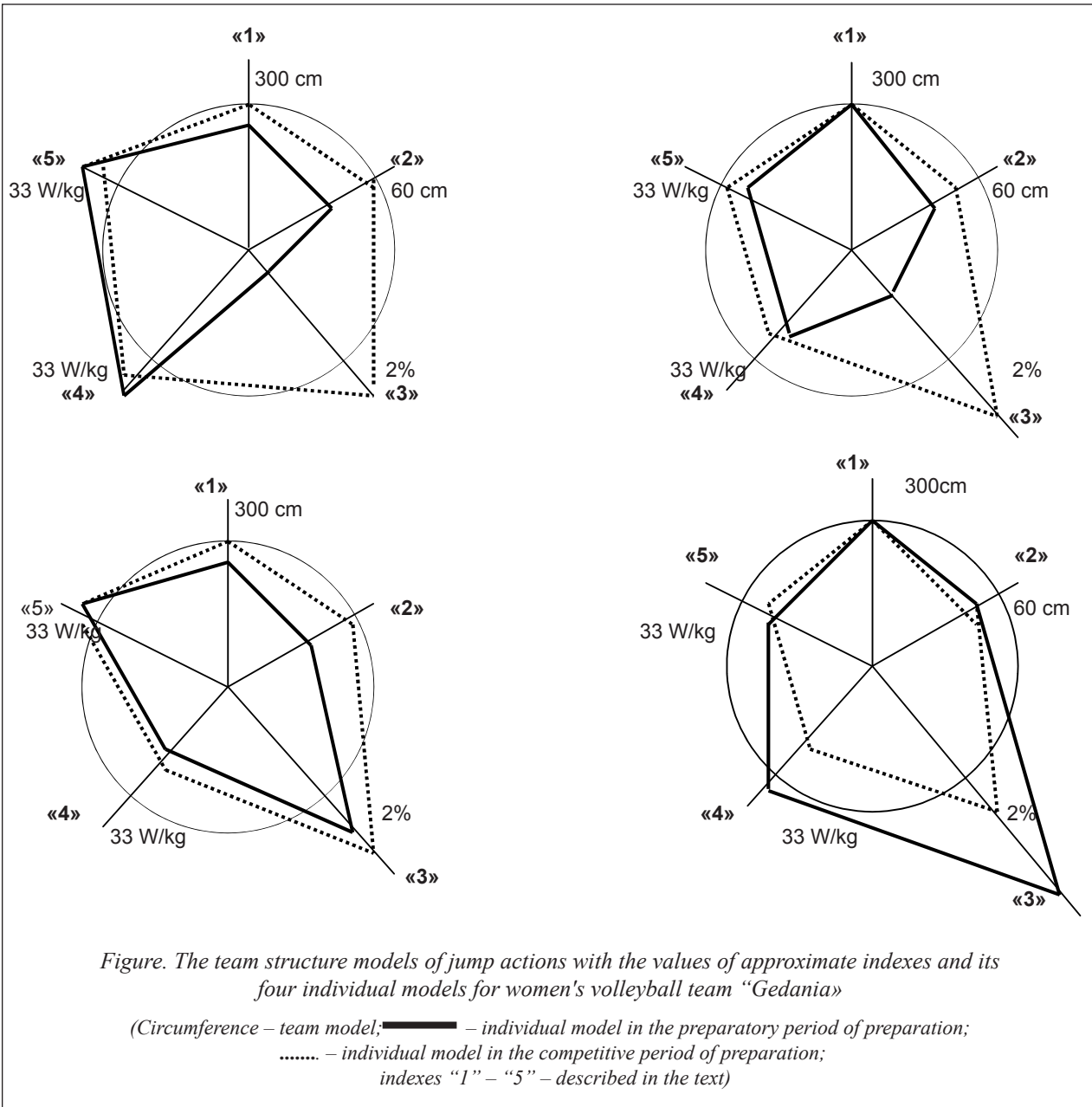
In connection with the above the **purpose** of this study was to develop generalized and individual models of the jump actions of skilled women volleyball players.

Material and methods

The main prerequisite for the development of the jump actions models were the results of our earlier studies of the factor structure of jump actions of 10 sportswomen of the Polish volleyball team "Gedania" (Premier League) in the preparatory and competitive periods of the annual training cycle of preparation [7-10]. The athlete's age was 22.0 ± 2.9 years, the sports experience – 8.1 ± 3.1 years, body height – 181.9 ± 8.4 years and body weight – 72.8 ± 10.8 kg. Mathematical and statistical processing of the data (determining $M \pm SD$ and significant differences between the samples) was performed using a standard computer program «STATISTICA 7.0».

Results and discussion

The presented in our paper [8] comparative analysis of the factor structure of 20 jump action in the preparatory and competitive periods of on annual training cycle indicates, on the one hand, the existence of both common features in the structures and, on the other hand, their differences. In particular, the competitive period of a one- year training cycle is allocated 4, and in the preparation period – 3 major factors, whose contribution to the total variance of the sample was 83.3% and 85.5 % respectively. In this case, the possibility of factor analysis as a method of classification and reduction of the data



enabled distinguishing from among the twenty studied jump characteristics only five of the most informative indexes and assessment criteria, which are offered to use to create the optimal generalized and individual structure models of the jumping actions.

The basis for selection of these indexes was that they had the extra weight coefficients in the whole factor structure, as well as the fact that they both individually and in various combinations with each other can determine the diversity of factor structures depending on the level of sports volleyball skills, the training period, etc. These indexes and their assessment characteristics are as follows:

The maximum height of the hand touching the markup at a jump by push of two feet with one-step swoops. As in the competitive and in the preparatory periods of a one – year cycle this index is the most informative in the factors, the significance of which is determined, above all, a body length of female athletes. In drawing up the average model

characteristics for the whole team and individual athletes characteristics, the value of this index in a generalized optimal model of jump actions may correspond to 300 cm;

The difference between the above indicator and the maximum height of touching the markup by hand extended upwards from the place (the actual height of the jump in attack). A high ratio value of this index in both periods of a one – year training cycle is set in the factors of which the efficiency of jumping action is due by interrelation of the actual jump height in attack with more pronounced involvement in jumping of the plyometric effect. The value of this parameter in the generalized optimal model of jump volleyball action may correspond the 60 cm;

The factors presented in the previous paragraph can serve to characterize the index of power in the vertical jump push of two feet after jump from the bench ($W \cdot kg^{-1}$). Its value in the generalized optimal model of jump volleyball action may correspond to $33 W \cdot kg^{-1}$;

Expressed as a percentage difference between the index "1" and an average height of touch the markup extended upwards by hand during performing consecutive 20 maximum vertical jumps by push off two feet with one step. In both periods of a one-year cycle this index is the most informative among the factors which we call factors of jump endurance. The value of this parameter in the generalized optimal model of jump actions for top-level female volleyball players can correspond to its 1% reduction;

Average $W \cdot kg^{-1}$ in the test with 5 successive maximal vertical jumps by push off two feet on a strain-gauge track. This index is chosen to analyze the factors in which the volleyball jump action is characterized by resistance to manifestation of maximum explosive power in the vertical jump. Its value in the generalized optimal model of jump action corresponds to $1933 W \cdot kg^{-1}$.

The above criteria may be to use as guidelines in creating both the team and individual model characteristics of jump actions of skilled female volleyball players at different stages of their preparation (Fig.).

It should be noted that only the rare athlete of high

sports skill on their data corresponds to the «averaged ideal.» An illustrative example of such variation is shown in the figure above, which depicts individual characteristics of jump action of four female volleyball players from "Gedania" team in comparison with the generalized model. An analysis of such a variation creates favorable conditions for an individual approach to the organization of athletes jump training.

A general scheme of the study and the obtained data are recommended to be used during research on related team sports in which the effectiveness of jump actions is given considerable importance.

Conclusion:

1. A grounded approach and the proposed criteria to the formation as generalized and individual models of the jump actions structure of high performance women volleyball players, which is based on the results of factor analysis of these actions.
2. The presented data are recommended to be used in the preparation of volleyball teams and as well as in research on related team sports in which the effectiveness of jump actions is given considerable importance.

References

1. Кузнецов В.В., Петровский В.В., Шустин Б.Н. Модельные характеристики легкоатлетов, Киев, Здоровья, 1979. – 200 с.
2. Розин Е.Ю. Компьютерная программа диагностики и контроля за физическим состоянием и подготовленностью занимающихся гимнастикой. Теория и практика физической культуры 1995, №3, 19 -22.
3. Шустин Б.Н. Состояние и основные направления разработки модельных характеристик соревновательной деятельности. ВНИИФК, Москва 1985, 4-17.
4. Banister E. Modeling elite athletic performance. Physiological testing of high performance athletes. Champaign, Illinois: Human Kinetics Books 1991, pp. 403-424.
5. Kochanowicz K., Zaporozanow W. Modelowanie jako podstawa indywidualizacji w procesie szkolenia w gymnastyce sportowej Rocznik Naukowy, AWFis w Gdansku 2002, vol.12, pp. 9-19.
6. Платонов В.Н. Общая теория подготовки спортсменов в олимпийском спорте. Киев, Олимпийская литература, 1997. 584 с.
7. Stech M. Factor structure of the jump actions of female volleyball players at different periods of annual training cycle. IX Міжнародний науковий конгрес "Олімпійський спорт і спорт для всіх". Київ, 2005, с. 427.
8. Stech M., Smulsky V. The estimation criteria of jump actions of high performance female volleyball players. Research Yearbook, Med-sportpress. 2007, vol.13, pp. 82-86.
9. Козина Ж.Л., Ермаков С.С., Погорелова А.О. Методологические основы определения индивидуальных особенностей волейболисток на этапе специализированной базовой подготовки. Физическое воспитание студентов. 2012, №3, с. 53-60.
10. Рыцарев В.В. Методологическая концепция биомашинны как основа для разработки эффективной методики подготовки спортсменов высокого класса. Физическое воспитание студентов. 2012, №1, с. 91-99.

Информация об авторах:

Стех М.
 mirellastech@wp.pl
 Академия физического воспитания и спорта
 ул. Виесика, 1, 80-336 Гданьск, Польша

Скробески Я.
 mirellastech@wp.pl
 Академия физического воспитания и спорта
 ул. Виесика, 1, 80-336 Гданьск, Польша

Вноровски Л.
 mirellastech@wp.pl
 Академия физического воспитания и спорта
 ул. Виесика, 1, 80-336 Гданьск, Польша
 Поступила в редакцию 27.10.2012г.

References

1. Kuznecov V.V., Petrovskij V.V., Shustin B.N. *Model'nye kharakteristiki legkoatletov* [Model characteristics of light-athletes], Kiev, Health, 1979, 200 p.
2. Rozin E.Iu. *Teoriia i praktika fizicheskoi kul'tury* [Theory and practice of physical culture], 1995, vol.3, pp. 19 -22.
3. Shustin B.N. *Sostoianie i osnovnye napravleniia razrabotki model'nykh kharakteristik sorevnovatel'noj deiatel'nosti* [State and main directions of development of model characteristics of competitive activity], Moscow, SSSIPC, 1985, pp. 4-17.
4. Banister E. *Modeling elite athletic performance. Physiological testing of high performance athletes*. Champaign, Illinois: Human Kinetics Books, 1991, pp. 403-424.
5. Kochanowicz K., Zaporozanow W. Modelowanie jako podstawa indywidualizacji w procesie szkolenia w gymnastyce sportowej [Modelling as a basis for individualization of the training process in sports gymnastics], *Scientific Annual* [Rocznik Naukowy], Gdansk, APC, 2002, vol.12, pp. 9-19.
6. Platonov V.N. *Obshchaia teoriia podgotovki sportsmenov v Olimpijskom sporcie* [A general theory of preparation of sportsmen in Olympic sport], Kiev, Olympic Literature, 1997, 584 p.
7. Stech M. Factor structure of the jump actions of female volleyball players at different periods of annual training cycle. *Olimpijs'kij sport i sport dlia vsikh* [Olympic sport and sport for all], Kiev, Olympic Literature, 2005, p. 427.
8. Stech M., Smulsky V. The estimation criteria of jump actions of high performance female volleyball players. *Research Yearbook*, 2007, vol.13, pp. 82-86.
9. Kozina Zh.L., Iermakov S.S., Pogorelova A.O. *Fiziceskoe vospitanie studentov* [Physical Education of Students], 2012, vol.3, pp. 53-60.
10. Rycarev V.V. *Fiziceskoe vospitanie studentov* [Physical Education of Students], 2012, vol.1, pp. 91-99.

Information about the authors:

Stech Mirella
 mirellastech@wp.pl
 Academy of physical Education and Sport
 ul. Wiesjka 1, 80-336 Gdansk, Poland

Skrobecki J.
 mirellastech@wp.pl
 Academy of physical Education and Sport
 ul. Wiesjka 1, 80-336 Gdansk, Poland

Wnorowski K.
 mirellastech@wp.pl
 Academy of physical Education and Sport
 ul. Wiesjka 1, 80-336 Gdansk, Poland
 Came to edition 27.10.2012.