

THE IMPORTANCE OF USING BIOMECHANICAL ANALYSIS IN THE PROCESS OF LEARNING TECHNICAL ELEMENTS IN ARTISTIC GYMNASTICS AMONG JUNIORS

ЗНАЧЕННЯ ВИКОРИСТАННЯ БІОМЕХАНІЧНОГО АНАЛІЗУ В ПРОЦЕСІ НАВЧАННЯ ТЕХНІЧНИХ ЕЛЕМЕНТІВ ХУДОЖНЬОЇ ГІМНАСТИКИ СЕРЕД ЮНІОРІВ

Currently, the issues related to the accuracy of technical execution are the main criterion for an ascending trend regarding performance.

The purpose of this paper was to present the importance of biomechanical analysis in the process of learning technical elements in artistic gymnastics among juniors. In this respect, our research proposes to highlight, from a critical perspective, the complexity of technique in artistic gymnastics, requiring new technologies able to decipher the inner movement mechanisms leading to performance improvement.

The analysis of technique reveals the following components: technical element, technical procedure, style and basic mechanism of technical procedure. Learning any technical procedure is based on models established by specialists following up numerous and thorough studies of biomechanics. The study of technique and the determination of its rules lead to increasing speed of execution, optimal coordination, identification of mistakes etc

By applying the quantitative analysis of video-technical training in gymnastics, especially in juniors, they made premises that technical training should be based on biomechanical recommendations, making the training objective scientific and implemented in practice. The detailed knowledge of kinematic and dynamic characteristics intervention of specialists in sports training objective, technical training by converting quantitative information of motion parameters in precise exercise instructions that marks the exercise basic methods. The objective conducting of the technical training process can thus contribute to the rapid evolution towards higher technical requirements, and the detection of technical and physical potential reserves that can help harness the increasing difficulty of execution and the transition to a high technical group for the athletes who display such unexplored reserves.

Key words: *artistic gymnastics, biomechanical, technical analysis, female juniors, training.*

В даний час питання, пов'язані з точністю технічного виконання, є основним критерієм

висхідної тенденції щодо продуктивності.

Метою даної роботи було представити значення біомеханічного аналізу в процесі навчання технічних елементів художньої гімнастики серед юніорів. У цьому відношенні наше дослідження пропонує висвітлити з критичної точки зору складність техніки художньої гімнастики, що вимагає нових технологій, здатних розшифрувати внутрішні механізми руху, що ведуть до покращення продуктивності.

Аналіз техніки виявляє такі складові: технічний елемент, технічну процедуру, стиль та основний механізм технічної процедури. Вивчення будь-якої технічної процедури базується на моделях, створених фахівцями після численних і ретельних досліджень біомеханіки. Вивчення техніки та визначення її правил веде до збільшення швидкості виконання, оптимальної координації, виявлення помилок тощо.

Застосовуючи кількісний аналіз відеотехнічної підготовки зі спортивної гімнастики, особливо у юніорів, вони зробили передумови, що технічна підготовка має базуватися на біомеханічних рекомендаціях, роблячи навчання об'єктивним науковою та реалізованою на практиці. Детальні знання кінематичних і динамічних характеристик втручання фахівців у спортивну тренувальну мету, технічну підготовку шляхом перетворення кількісної інформації параметрів руху в точні інструкції до вправ, що позначають основні методи вправи. Таким чином, цілеспрямоване проведення технічного тренувального процесу може сприяти швидкому розвитку до вищих технічних вимог, а також виявити резерви технічного та фізичного потенціалу, які можуть допомогти використати зростаючу складність виконання та перехід до високої технічної групи для спортсменів, які відобразити такі нерозвідані запаси.

Ключові слова: *художня гімнастика, біомеханіка, технічний аналіз, юніорки, тренування.*

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Introduction

Artistic gymnastics is, beyond doubt, one of our most comprehensive sports. It has brought great service to the Romanian people, hard to estimate. It has made us known as a nation throughout the world and domestically. Thanks to it, we have been admired everywhere, and it has brought us remarkable satisfactions, the conscience of the value and talent characterising us as a nation. The Romanian gymnastics school is a prestigious reality, proven by the results often monopolising the medals of the great international competitions and the enthusiasm and admiration of spectators. It is also proven by the other features related to the notion of school [1].

Modern artistic gymnastics has evolved in line with the regulations and trends of sports worldwide. Artistic gymnastics development and enhancement as a process, the details of methodology followed the analyses necessary for the Olympic cycles, thus leading to an effective management of multi-annual sports practice [16].

Artistic gymnastics has recorded remarkable progresses, highlighting the fact that it develops in accordance with the trends of performance sport, but it has its specific features too, such as: increase of sports mastership, increase and rivalry of competitive programs, processing of new complex routines, sports mastership that reaches virtuosity; improvement of

components that provide the training of high classification gymnasts [16; 17].

General aspects

Nowadays, the issues related to the accuracy of technical execution constitute the main criterion for an ascending trend of performance as a whole. The complexity of gymnastics technique requires the use of a new technology able to decipher the inner movement mechanism, to know and increase performance. Modern trends derive from knowing biomechanics as a branch of science, the main target of which is to discover these mechanisms [14].

In the specialized literature, the general problems of biomechanical analysis of contemporary technique and the knowledge of factors decisive for the technical training and contents of the optimization of gymnastics training are insufficiently treated and known. Current concerns in scientific research on the biomechanical issues in gymnastics and the characteristics of rotation routines were expressed by many researchers, including those presented in this research.

In addition, in the specialized literature, the general problems of biomechanical analysis of the current technique and the knowledge of the determining factors for technical training and the content of training sessions improvement in gymnastics are insufficiently treated and known. Current concerns in the scientific research on the biomechanical aspects of gymnastics and the characteristics of rotation exercises have been manifested by [6].

Biomechanical researches in artistic gymnastics can be performed using biomechanical methods and also methods taken from other fields of knowledge (pedagogical, mechanical, physiological, psychological, medical ones etc.), mainly intended to highlight the features of movement on various apparatus by selecting the means of recording, processing and analyzing the data obtained [15].

In this context, it is clear that each one of the modern sports is based on exercises that vary depending on general volume of the material and on specific structure; the problem of motor skills transfer is highlighted differently [11].

The macro methods of learning difficult acrobatic and gymnastics exercises of coordination, also the logical structural diagram for achievement in sports training are well presented by Prof. V. Boloban (1988). Structurally, the macro methods introduce the functional assembly of long-term programs for learning the exercises of "movement school", the basic level of specialization, of the arbitrary and final programs, also the development of physical qualities consistent with the technical training based on the influence of key concrete goals of gymnasts' sports training [3].

The biomechanics is an important science the physical education, thereby sports analyzed and thereafter correct the technical errors.

Gymnastics is more related with biomechanics than other sports, this science contribute in the analysis, illustration, understanding, and improvement of sports technique. Biomechanics discover and identify the errors that we cannot found by visual observation and require camera or specific programs, this happen only by partition the skill and therefore decision the nature of each one [4].

To improve the vault technique in gymnastics is to obtain an ideal trajectory of the mass center, to increase the height and length of flight, namely the flight time in the second part of the vault. The trajectory must be broad to allow full body rotation of the gymnast around horizontal and vertical axis. All this implies running speed, springboard attack and take-off of great effectiveness, the vaulting platform attack and take off from two hands with a clear rise of center of gravity with a distinct and unmistakable manner of body position, leading to a higher sports score. The video method and image analysis with specialized software objectivise and improve the technical training at this apparatus. Internationally, there is a clear trend of sports training orientation on quantitative criteria based on IT technology instead of a traditional training based on qualitative informational methods with procedures based on practical experience [5].

In artistic gymnastics, technical training must be very demanding, because the primacy in competitions is determined by the accuracy of movement (amplitude, expressiveness, fluidity of movement a. s. o.). The analysis of technique reveals the following components: technical element, technical procedure, style and basic mechanism of technical procedure. Learning any technical procedure is based on models established by specialists following up numerous and thorough studies of biomechanics. The study of technique and the determination of its rules lead to

A new view of the latest technologies

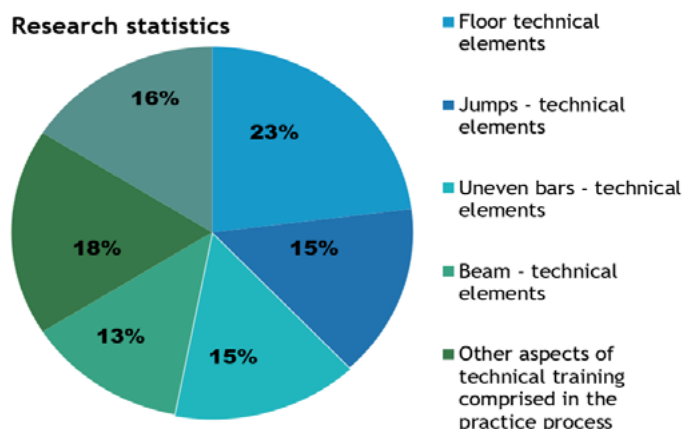


Fig. 1 Current state-of-the-art regarding the evaluation of technical training in gymnastics among juniors (resulted from the scientific literature)

increasing speed of execution, optimal coordination, identification of mistakes etc. [8].

The biomechanical analysis of artistic gymnastics elements highlights the dynamic and cinematic characteristics of the key-parts within an athlete's technique. The efficiency of using transfer technology throughout it improves the initial phase in women's artistic gymnastics [14].

The biomechanical analysis of technical elements specific to beam in artistic gymnastics contributes to a deep insight into the phasic structure of the technique and the elaboration of modern training teaching programs created to optimise these elements [18].

For efficiency purposes, in the technical training teaching programs, it is essential for the acquisition of procedure technique to be performed accurately, without any errors, from the initial phases of technical training among children [19].

The training process in artistic gymnastics

Elements performed by top athletes in gymnastics are, as a rule, an upgrade of basic elements that are taught in the training process in the younger categories. Technically correct performance of the basic elements allows the contestants' advancement and development in the youth and later the senior category. Points that distinguish top athletes from others are elements of the highest difficulty levels, which are usually extremely complex by their motor structures and where the possibility of error or injury during the performance is extremely high.

Therefore, in the construction of methodical procedures we implement the biomechanical analyses that in terms of kinematics and dynamics allow us to construct biomechanical models of movement, and to explain the important parts of the movement performance. In the selected element learning process this enables us to stay limited through individual methodical steps on the special part of the movement, which is for the final performance of the element presented as a whole, the most important [9, 10].

The problem of correct exercise techniques is now a necessary support to achieve maximum efforts saving energy and the main criterion for performance. (1) In this respect, we can say that technical training is higher if based on biomechanical principles for conducting motion, but also promoting a line that follows a methodical system of rules, rooted in scientific analysis. These aspects lead to the formation of stable and precise technical skills, without failures or accidents, by developing own resources of physical potential.

Optimization, simplification and rationalization of training methods content are the rules of modern sports training in gymnastics, supported by the requirements of competition and selective approach of effective technical structures, providing perspective and learning those movements, rated in competition [7].

All artistic gymnastics elements have a specific technique, which should be approached in the acquisition of all movement-related elements. There are elements with a simple structure, which is easy to understand and execute by the athletes. There are also elements with a complex structure, which sometimes require an alteration of the learning process and new methodical procedures and new methods [7].

Conclusions

Upon studying the literature, we have noticed that the effective use of learning transfer in gymnastics routines on various apparatus, based on the biomechanical analysis of the key-elements of sports technique may contribute to an increase in routine difficulty, in technical execution and in higher performances during competitions.

By applying the quantitative analysis of video-technical training in gymnastics, especially in juniors, they made premises that technical training should be based on biomechanical recommendations, making the training objective scientific and implemented in practice. The detailed knowledge of kinematic and dynamic characteristics intervention of specialists in sports training objective, technical training by converting quantitative information of motion parameters in precise exercise instructions that marks the exercise basic methods. The objective conducting of the technical training process can thus contribute to the rapid evolution towards higher technical requirements, and the detection of technical and physical potential reserves that can help harness the increasing difficulty of execution and the transition to a high technical group for the athletes who display such unexplored reserves.

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