

Розділ 6. Олімпійський і професійний спорт

УДК 797.217.071.5

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Effect of Anthropometric Data of Qualified Athletes on the Kinematic Structure of the «Standard» Sculling Motion for Execution of the Position «Ballet Leg»

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Introduction. Motion of human body parts represent a movement in space and time, which are performed in many joints simultaneously and consistently. Motion in the joints are very diverse in their shape and nature, they depend on the action of many of the forces applied. All the movements naturally integrated into holistic, organized actions which are controlled by muscles. Given the complexity of human movement in biomechanics, both of their characteristics – mechanical and biological – must be investigated, and must go hand in hand.

One of the characteristics of motor activity in synchronized swimming is that all actions occur in an aqueous medium which has a specific effect on mechanisms for implementation of programmable movements. In particular, the nature of execution, intensity, tempo, duration, speed and other characteristics of sculling motion largely determine the possibility of achieving the desired result. Unfortunately, modern scientific literature contains no information on the effect of anthropometric data on the performance of motor actions in synchronized swimming.

Therefore, in this article we analyzed the influence of anthropometric data on the kinematic structure of the «standard» sculling motion.

Objective. Comparative analysis of the anthropometric data of two types of «standard» sculling motion.

Methods: video-computer biomechanical analysis, statistical methods, methods of anthropometry.

Results of the study and discussion. It should be noted that the scientific sources have not studied enough the effect of anthropometric data of synchronized swimming athletes on the various parameters of the kinematic structure of the technique of implementation of sculling motion and the location of the total center of mass for the implementation of the basic elements of a compulsory program.

As we know the position of the common center of mass in humans have different localization region. It depends on the athlete's anthropometric indices, as well as the position it takes when performing exercises.

Whereas the place of location of the hand depends on the location of the common center of mass of the body during the performance of the basic elements of the figures in the compulsory program, therefore in accordance with this we have defined a common center of mass of all the athletes perform this basic position, «a ballet leg» in relation to anthropometric data of the athletes.

As a result of studies, we found that the common center of mass of each of the athletes is on the same level according to the body. Therefore the anthropometric data did not affect the location of the common center of mass in athletes performing a given position.

In accordance therewith, is it appropriate to reveal the influence of parameters of the synchronized swimmers' body on individual parameters of the kinematic structure of the technique of sculling motion. We measured the length and weight of the body, the length of the shoulder, forearm, hand, thigh, ankle and foot.

As a result we obtained the data presented in Table 1, «Anthropometric indicators of qualified athletes who specialize in synchronized swimming». In this table we have presented not only anthropometric data studied, but also a comparative analysis of athletes performing the first and second kind of «standard» sculling motion. As can be seen from the data differences between athletes have been identified.

To determine the impact of the physique of the synchronized swimmers on different types of «standard» sculling motion, we performed a correlation analysis between the paired data in Table 1 and the parameters of the kinematic structure of the technique of implementation of sculling motion. Namely, the speed of the centers of mass of the arms, the angles between biolinks (body – shoulder, shoulder – forearm, forearm – hand), and the force of water pressure on hand at the boundary points of the sculling cycle.

As a result, we received only a few meaningful measures of the correlation coefficient. One of them was a correlation $r = 0,85$ ($p < 0,05$) when the first type of «standard» sculling motion between the length of the

hands and the speed of the CM in the hands in the boundary positions of the phases, and $r = 0,75$ ($p < 0,05$) between the indices of the speed and the length of the forearms, both right and left.

We also evaluated the second type of «standard» sculling motion, the correlation $r = 0,94$ ($p < 0,05$) between the length of the hands and the speed of the centers of mass of hands in the boundary positions of the phases, and $r = 0,83$ ($p < 0,05$) between the indices of the speed and the length of the forearms, both right and left.

Conclusion. Based on studies we can conclude that in a given set the anthropometric data of synchronized swimming athletes do affect various parameters of the kinematic structure of the technique of implementation of the «standard» sculling motion in the performance of the basic positions of the compulsory program of synchronized swimming.

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Annotations

The comparative analysis of the anthropometric data of two types of «standard» sculling motion. The objectives of the work are: the analysis of the scientific and methodological literature, and the study of the impact of the anthropometric data of skilled athletes, who specialize in synchronized swimming, on sculling technique. The results got by us will enable in future to build the model of kinematics structure of «standard» sculling motion.

Key words: common center of mass, synchronized swimming, sculling motion.

Мария Гордеева, Томара Хаби́нец, Светлана Саидова. Влияние антропометрических данных квалифицированных спортсменов на кинематическую структуру «стандартного» гребкового движения при выполнении позиции «балетная нога». Выполнен сравнительный анализ по антропометрическим данным двух видов «стандартного» гребкового движения. Задачами работы являются анализ научно-методической литературы и изучение влияния антропометрических данных высококвалифицированных спортсменов, специализирующихся в синхронном плавании, на технику гребковых движений. Полученные результаты в дальнейшем дадут возможность построить модель кинематической структуры «стандартного» гребкового движения.

Ключевые слова: общий центр масс, синхронное плавание, гребковые движения.

Марія Гордєєва, Томара Хабі́нець, Світлана Саїдова. Вплив антропометричних даних кваліфікованих спортсменок на кінематичну структуру «стандартного» гребкового руху при виконанні позиції «балетна нога». Здійснено порівняльний аналіз за антропометричними даними двох видів «стандартного» гребкового руху. Завданнями роботи є аналіз науково-методичної літератури та вивчення впливу антропометричних даних висококваліфікованих спортсменок, які спеціалізуються в синхронному плаванні, на техніку гребкових рухів. Отримані результати в подальшому дадуть можливість побудувати модель кінематичної структури «стандартного» гребкового руху.

Ключові слова: загальний центр мас, синхронне плавання, гребкові рухи.