

**ЭЛЕКТРОМИОГРАФИЯ КАК СПОСОБ ОЦЕНКИ
МЕЖМЫШЕЧНЫХ ВЗАИМОДЕЙСТВИЙ ПЛОВЦОВ**

**ELECTROMYOGRAPHY AS A WAY TO ASSESS THE
INTERMUSCULAR INTERACTIONS OF SWIMMERS**

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АННОТАЦИЯ. В статье рассмотрена одна из объективных методик оценки межмышечных взаимодействий пловцов, опробованных на практике. Полученные экспериментальные данные позволяют характеризовать взаимодействие крупных мышечных групп, выполняющих основной вклад в движение при плавании баттерфляем.

КЛЮЧЕВЫЕ СЛОВА: межмышечные взаимодействия; электромиография; спортивное плавание.

ABSTRACT. The article considers one of the objective methods for assessing the intermuscular interactions of swimmers tested in practice. The experimental data obtained allow us to characterize the interaction of large muscle groups that make the main contribution to movement during butterfly swimming.

KEYWORDS: intermuscular interactions; electromyography; swimming.

Most experts consider that the main criteria for the effectiveness of the technique of a competitive exercise are stability of motor coordination and accuracy of movement, which, eventually, athletes strive for in the process of improving their technical skills [1]. Despite the diversity of muscle interactions, electromyographic method (EMG) can be used to identify their certain patterns in making the same or similar movements. In sports swimming, certain factual material has been accumulated that characterizes neuromuscular coordination during the crawl and breast-stroke swimming in terms of the sequence, in which the muscles are

switched on and off, their interaction, the duration of electrical activity periods and its connection with some kinematic and dynamic movement characteristics [2, 3]. At the same time, other aspects of intermuscular interaction remain poorly understood both highly qualified swimmers and novice athletes.

The EMG allows to register the following main indicators: the average oscillation biopotentials amplitude of the studying muscle, the oscillation frequency, the activity duration. The amplitude is taken as the oscillation range between extreme values or the amount of deviation from the zero potential line, and the frequency is the average number of oscillations per unit of time. At the same time, impulse frequency reflects the number of active motor units, and the oscillation biopotentials amplitude characterizes the amount of the effort of the involved motor units [4, 5].

To assess the muscular coordination of qualified and novice swimmers, we conducted a testing, imitating the undulating trunk and legs movements as swimming butterfly in a standing position. The test takers performed the test twice: the first time with their eyes open, the second time with the visual analyzer turned off. The test assessed the total bioelectric activity of 7 pairs of large muscles of the trunk and limbs that make the main contribution to the movement during the butterfly swimming, namely: the widest back muscle, rectus abdominis, biceps of the shoulder, triceps of the shoulder, rectus femoris, biceps femoris, calf muscles. As a result of the research, it was revealed that with an increase in sports skills, the characteristics of EMG with the visual analyzer turned off are aligned and tend to the values shown under normal conditions, which indicates a high level of proprioception development and a high degree of mastery of the technical element. Meanwhile, the average amplitude of arbitrary tension of all muscles of swimmers engaged in initial training groups in the closed eyes test are significantly lower than the values obtained in the test with open eyes. This indicates that to perform motor activities young swimmers require less tension of the muscles, involved in the movement, when the visual analyzer is turned off. This is probably because of the fact that proprioceptive sensitivity increases and «escalates» in the closed-eye exercises [6].

EMG also makes it possible to study the relationship of antagonist muscles by introduction of various coefficients. For example, in another research, we used the reciprocity coefficient (reflects the degree of mus-

cle activation in antagonistic tension mode in relation to the amount of activity of the agonist muscle) and the synergy coefficient (determines the activation degree of the arbitrarily non-activated muscles in relation to an arbitrarily tensed muscle). The analysis of the obtained statistical data indicates a strong reliable relationship between the required coefficient indicators of the biceps and triceps muscles of the shoulder and rectus femoris muscles of young swimmers. In addition, the research made it possible to establish that these coefficients of the muscles of the upper and lower limbs have reliable correlations with the technical proficiency of novice athletes [7].

Thus, EMG allows to determine the initial level of interaction of muscle groups of swimmers, to control its development, as well as to determine the degree of involvement in the movement of certain muscles. In this regard, it would seem appropriate to start paying attention to the development of intermuscular interactions of young swimmers from the initial training level, which will not only improve athletic performance during this period, but also lay a reliable coordination and technical foundation for further successful long-term training.

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МОДЕРНИЗАЦИЯ ТЕХНИКО-ТАКТИЧЕСКОЙ ПОДГОТОВКИ ТЕННИСИСТОВ НА ЭТАПЕ УГЛУБЛЕННОЙ СПЕЦИАЛИЗАЦИИ

MODERNIZATION OF TECHNICAL AND TACTICAL TRAINING OF TENNIS PLAYERS AT THE STAGE OF ADVANCED SPECIALIZATION

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АННОТАЦИЯ. В статье представлена усовершенствованная программа технико-тактической подготовки, которая внедрена в учебно-тренировочный процесс теннисистов занимающихся на этапе углубленной специализации и апробирована в ходе педагогического эксперимента.

КЛЮЧЕВЫЕ СЛОВА: техника; тактика; блоки упражнений; педагогический эксперимент; контрольная и экспериментальная группы.