

# INDICATORS OF RHYTHM PERCEPTION IN COMPETITIVE EXERCISES BY KARATE ATHLETES AT THE PRELIMINARY BASIC TRAINING STAGE

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The article examines the issue of enhancing the technical skills of karate athletes during the preliminary basic training stage. The importance of improving specific sensations, particularly the sense of rhythm, in the successful mastery of karate techniques underscores the relevance of scientific research. *The aim of the study* was to determine the indicators of rhythm perception in karate athletes at the stage of preliminary basic training. *Material and methods.* The study was conducted at the theoretical and empirical levels. At the theoretical level, existing scientific data were analyzed and generalized. At the empirical level, a pedagogical experiment was conducted, the results of which were processed using methods of mathematical statistics. Sixty karate athletes aged 10-11 years old who are training at the preliminary basic training stage participated in the study. *Results.* The rhythmic indicators of the competitive exercise technique of karate athletes were determined. According to the data obtained, young athletes reproduce the rhythm of a single-combination competitive exercise with high accuracy, while the reproduction of the rhythm of two, three, and four-combination techniques by karate athletes has slightly lower indicators. The established low indicators of rhythm perception, such as a large absolute error in reproducing the given rhythm or a significant deviation of the rhythm coefficient from the reference value, indicate possible incorrect fixation of motor skills or insufficient development of kinesthetic sensitivity, which is an indicator of low technique efficiency in competitive conditions. *Conclusions:* monitoring the rhythm indicators of competitive exercises, which was implemented in the study, allows for the differentiation of training tasks and the targeted development of the coordination abilities of young karate practitioners. The data obtained is planned to be used as a basis for developing a program to improve the sense of rhythm of competitive exercises for karate athletes at the preliminary basic training stage.

**Keywords:** karate-do, technique, rhythm, competitive exercises.

## Introduction

One of the main factors in acquiring sports skills in karate, along with the development of strength and speed qualities, is the improvement of technical skills [23; 28]. Karate-do technique has a complex rhythmic structure and requires a high level of coordination skills [23]. In the process of developing specific sensations, special requirements are placed on the sense of rhythm.

At the same time, different karate athletes may have their own characteristics of rhythm manifestation. However, as proven [14], they should not go beyond certain limits, which are determined by the objectively necessary rhythmic structure of competitive exercises. Possessing

**Іван Мудрик, Леся Петрина, Сергій Потапчук.** Показники відчуття ритму змагальних вправ спортсменів каратистів на етапі попередньої базової підготовки

**Анотація.** Розглянуто питання удосконалення технічної майстерності спортсменів каратистів на етапі попередньої базової підготовки. Важливість вдосконалення специфічних відчуттів зокрема відчуття ритму для успішного засвоєння техніки карате-до визначає актуальність наукового пошуку. **Мета дослідження** полягала у визначенні показників відчуття ритму у спортсменів каратистів на етапі попередньої базової підготовки. **Матеріал та методи.** Дослідження реалізовано на теоретичному та емпіричному рівні. На теоретичному застосовано аналіз та узагальнення наявних наукових даних. На емпіричному рівні здійснено педагогічний експеримент, результати якого опрацьовано з використанням методів математичної статистики. У дослідженні приймали участь 60 спортсменів каратистів у віці 10-11 років, які тренуються на етапах попередньої базової підготовки. **Результати.** Визначено ритмічні показники техніки змагальних вправ спортсменів-каратистів. Згідно отриманим даним, юні спортсмені з високою точністю відтворюють ритм однокомбінаційної змагальної вправи, тоді як відтворення ритму двох, трьох та чотирьох комбінаційної техніки спортсменами-каратистами має дещо нижчі показники. Установлені низькі показники відчуття ритму, як от велика абсолютна помилка відтворення заданого ритму або значне відхилення коефіцієнта ритму від еталонного свідчать про: можливу неправильну фіксацію рухових навичок, або недостатній розвиток кінестетичної чутливості, що є показником низької ефективності техніки у змагальних умовах. **Висновки:** контролю показників ритму змагальних вправ, який реалізовано у проведенні дослідження, дозволяє диференціювати тренувальні завдання і цілеспрямовано розвивати координаційні здібності спортсменів-каратистів. Отримані дані плануються використати у якості основи для розробки програми удосконалення відчуття ритму змагальних вправ спортсменів каратистів на етапі попередньої базової підготовки.

**Ключові слова:** карате-до, техніка, ритм, змагальні вправи.

this structure, a karate-do athlete can consciously form and regulate the rhythms of competitive exercises.

It is believed [21] that knowledge of the rhythmic patterns of sports technique in karate-do is a factor in improving the control of technical actions and, therefore, the effectiveness of competitive activity. The latter is one of the most difficult to master and toughest in combat types of karate.

The importance of improving specific sensations for the successful mastery of karate-do techniques determines the relevance of scientific research in identifying methodological techniques for the purposeful improvement of rhythm in karate athletes at the stage of preliminary basic training.

Analysis of recent studies and publications. Scientists emphasize the leading role of the expedient implementation of technical actions in karate-do [7; 13; 23]. The need to increase the efficiency and economy of technical actions has been identified [19] to implement effective control over the motor act and clarify spatial and temporal relationships. It has been proven [20] that when mastering karate-do exercises, it is better to set the rhythm than to describe the components of the movements in detail. This approach, as researched [4], helps to quickly understand the features of technical actions in their implementation and structure.

According to information [23], a characteristic feature of a rational rhythm is the identification of key points in the rhythmic structure on which to focus effort during the exercise. At the same time, there are opinions [26] that the accents in the rhythm of karate-do movements are directly related to the leading elements of coordination.

It has been proven [1; 6] that the specificity of rhythm, i.e., its organic connection with the technical and tactical goals of specific actions, determines the composition of means and methods for improving technical skills in a particular sport. At the same time, growing competition in the global sports arena and increasing demands for reliability and stability of karate practitioners' technical skills [17; 25] require the search for new modern approaches to the technical training of karate practitioners at the preliminary basic training stage.

All this has led to the relevance of fundamental scientific research aimed at developing new theoretical provisions and effective methodological principles for the formation of technique based on improving rhythm in karate athletes. Even though modern publications highlight certain aspects of the technical, mental, and physical training of karate athletes, the problem of rhythm formation in karate athletes has not been addressed.

*The aim of the study* was to determine the indicators of rhythm perception in karate athletes at the preliminary basic training stage.

#### **Materials and methods**

The study was conducted at the theoretical and empirical levels. At the theoretical level, an analysis of information from literary sources on the specific issue and a generalization of available scientific data were carried out.

At the empirical level, a pedagogical experiment was conducted, the results of which were processed using methods of mathematical statistics.

The pedagogical experiment was formative in nature, as it was based on the development of new theoretical and methodological provisions for the training of karate

athletes. In terms of conditions, it was natural, i.e., it did not involve significant changes in the usual conditions of the training process for athletes; in terms of nature, it was open: the purpose and objectives of the study were sufficiently disclosed to the participants of the experiment.

*Study participants.* Sixty karate athletes aged 10-11 participated in the study. All participants in the experiment are training at the preliminary basic training stages. The participants in the experiment have 3-4 years of training experience.

*Research methods.* The Rhythmic program was used to implement the pedagogical experiment. This program is used to diagnose and train the tempo-rhythmic characteristics of ideomotor movement patterns from two independent sources. Such signal sources can be movements of the arms, legs, the «arm-leg» complex, etc.

«Sense of rhythm» was expressed as the accuracy of reproducing a sequence of signals accented with different durations. For this purpose, the moments of the beginning and end of each signal in a template rhythm and the accuracy of reproducing the motor task are recorded.

*Organization of the study.* The testing was conducted over one day. The following competitive exercises were used in the testing: «Pickup», «Attack through a pause», «Front point», «Support», «Repeated attack», «Float», «Tsu-gyashi».

*Statistical analysis.* Mathematical statistics methods were used to process the numerical data obtained. When analyzing the research results, we were guided by the general provisions set forth in the manuals on mathematical statistics [30].

*Research results.* First, we note that the acquired incorrect rhythm is changed by destroying the previously established rhythm, rather than by a gradual transition from incorrect to correct. Such a transition is quite lengthy and is accompanied by several problems related to the process of mastering the technique [8].

At the same time, depending on the influence of external conditions and their characteristics, the manifestations of rhythm vary to a certain extent. According to data [20], rhythm is an individual characteristic and depends on innate characteristics of a person, such as height, weight, limb length, joint mobility, etc.

The manifestation of rhythmic characteristics depends on the level of development of physical qualities [9]. The same applies to individual variations in rhythmic characteristics: they manifest themselves individually in each person due to their inherent characteristics [11].

It should be noted that rhythm expresses the regular order of elements within a whole technical action. Despite possible variations, the rhythmic structure of a technical action is basically preserved, as in the case of acceleration or deceleration of a technical action, provided that the spatial, temporal, and speed characteristics of movements change proportionally [18; 31].

It has been determined [5] that different athletes may have their own characteristics of rhythm manifestation, but they should not go beyond certain limits, which are determined by the objectively necessary rhythmic structure of competitive exercises in karate-do. With knowledge of this structure, the athlete can consciously form and regulate the rhythms of technical actions.

Compared to the biological rhythms of the body, motor rhythms have a higher degree of functional activity organization, characteristic only of humans, in which mental factors are purposefully involved, including the sense of rhythm, tempo, time, etc. Therefore, the purposeful formation and improvement of the rhythm of competitive exercises is recognized as the basis of technical training in karate-do in general.

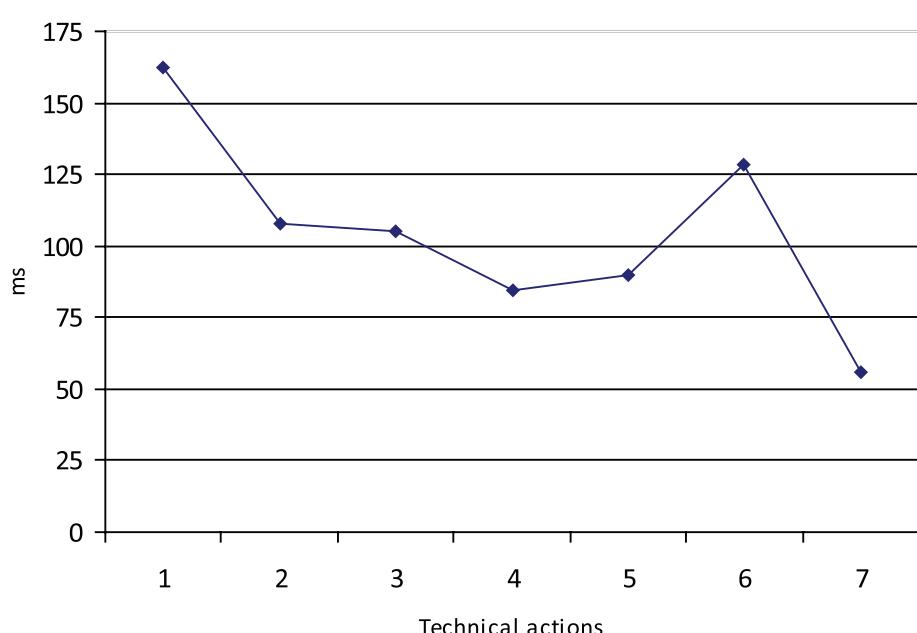
During the study, the rhythmic indicators of the technique of competitive exercises of karate athletes were

determined. The «sense of rhythm» was expressed as the accuracy of reproducing a sequence of signals accentuated by different durations. To do this, the moments of the beginning and end of each signal in a template rhythm and its reproduction are recorded.

The competitive exercises selected for the experimental study «Attack through a pause», «Attack through a squat», «Attack through a footwork» and «Lunge» belong to the first group. These exercises have a simple rhythmic structure and are performed in 1-2 acts, so their level of difficulty is low and does not require maximum concentration and attention from athletes.

The second group of competitive exercises includes such competitive combinations as «Support» and «Pickup», «Undercut through a strike», which are performed in 2-3 acts and whose rhythmic structure contains a significant number of accentuated phases.

According to the data obtained (Fig. 1), the athletes in the study sample reproduce the rhythmic single-combination competitive exercise «Tsugashi» with high accuracy, with an error of 56.2 ms. Obviously, such accuracy of reproduction is due to the relatively simple rhythmic structure of this exercise.



**Fig. 1 Indicators of rhythm perception in competitive exercises by karate athletes at the preliminary basic training stage**

\*Note: technical actions: 1-«Lift»; 2-«Attack after a pause»; 3-«Front point»; 4-«Support»; 5-«Repeated attack»; 6-«Float»; 7-«Tsu-gyashi»

The reproduction of the rhythm of two, three, and four combination techniques by karate athletes has slightly lower indicators, respectively: «Lift» – 162.6 ms; «Pause» – 107.8 ms; «Support» – 84.3 ms; «Float» – 128.6 ms; «Repeated attack» – 89.9 ms; «Front point» – 105 ms.

These results can be explained by the fact that the listed technical actions have a complex rhythmic structure and significant duration. Accordingly, due to the influence of these factors, the duration of errors in reproducing the given rhythm increases.

**Table 1 – Indicators of rhythm perception in competitive exercises by karate athletes at the preliminary basic training stage**

Rhythm perception test	Technical actions (ms)						
	Lift	Attack after a pause	Front point	Support	Repeated attack	Float	Tsu-gyashi
$\bar{x} \pm m$	162.6 $\pm$ 1.6	107.8 $\pm$ 1.4	105 $\pm$ 2.3	84.3 $\pm$ 1.3	89.9 $\pm$ 2.4	128.6 $\pm$ 1.9	56.2 $\pm$ 5.1

Based on the results of the study, we conclude that low rhythm perception indicators, such as a large absolute error in reproducing the given rhythm or a significant deviation of the rhythm coefficient from the reference value, indicate: possible incorrect fixation of motor skills or insufficient development of kinesthetic sensitivity. Most importantly, this is an indicator of low technical efficiency in competitive conditions.

Thus, monitoring these indicators, as implemented in the study, allows for the differentiation of training tasks and the targeted development of coordination skills in karate athletes.

### Discussion

In scientific works [23, 27], research into aspects of sports training considers the rhythm of movements to be a prerequisite for their effectiveness. Scientific data [15; 17] has been expanded, showing that movements are easily automated through rhythmization. Accordingly, a motor action is transformed into a skill as periodic sensory information repeated over time, with a certain number of elements included in it.

We support scientific approaches [12; 21] that the sense of rhythm allows one to realize and program optimal trajectories of movements in karate-do. As proven [18], only with the targeted development of movements is it possible to correctly and effectively master the technique of competitive exercises.

Our research is consistent with the information [2; 8] that a high degree of development of the sense of rhythm leads to rapid mastery of new exercises, allows for economical execution of sports movements, and, therefore, prevents premature fatigue, which is a factor influencing the psycho-emotional state. In further scientific research, we are guided by the fact that the specificity of rhythm, i.e., its organic interconnection with the technical and tactical goals of specific actions [16], is the basis for choosing the means and methods of sports improvement. At the same time, as noted [22], the sports specificity of karate should be taken into account.

Scientific information [17, 24] on the need for purposeful development in karate athletes of a sense of rhythm of movements and understanding of its violations, which, as noted, is the basis for correction, has been expanded. We agree [4] that an important feature of rhythm is the change in the phases of movement: work and rest, tension and relaxation, long and short, accented and unaccented sounds, lowering and raising the tone of speech at certain intervals. This approach, in turn, is consistent with a multifaceted approach to technical training in karate [11; 21].

We agree with the proposals [3; 10] to conduct and disseminate interdisciplinary studies of large groups of karate athletes, noting [22] that these should be thorough studies.

We as well agree with the opinion [26] that the development of more effective training strategies for technical training in karate is based on knowledge of the impact on results in terms of understanding the basic parameters of movements.

### Conclusions

Improving karate techniques is a continuous process, where learning new technical techniques or training methods is a factor in the effectiveness of this process. The quality of an athlete's performance of technical elements, especially in changing conditions, is determined by the perfection of coordination abilities, in particular, a sense of rhythm. The perfection of the rhythm of exercises is the basis for reproducing the direction, speed, frequency of movements, the correct emphasis of motor actions, and the distribution of effort during the performance of competitive exercises. Rhythm is the basis for determining the minimum changes in the tempo of movements and reproducing them in repeated attempts.

The indicators of the sense of rhythm of competitive exercises of karate athletes at the stage of preliminary basic training have been determined. The data obtained is planned to be used as a basis for developing a program to improve the sense of rhythm of competitive exercises of karate athletes at the stage of preliminary basic training.

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