

## Improvement of special training of karatists for kumite competitions using Kata

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### Abstract

Oriental martial arts has millions of fans around the world. Successfully develop and cultivate all styles of martial arts from Chinese Wushu to full contact Muetai, Kyokushinkai karate, and many others. Kyokushinkai Karate is one of the most popular types of martial arts, cultivated by more than 16 million people in 140 countries, which has a well-established training system, one of the elements of which is the development of specialized kata complexes. This is a formalized sequence of movements, combined on the principles of a duel with imaginary one or more opponents. The purpose of the study is to improve the special training of qualified Kyokushinkai karate athletes in the competitive discipline of Kumite with the use of kata complexes. The following research methods were used: theoretical analysis and generalization of scientific and methodological literature; sociological methods (questionnaires); pedagogical observation; pedagogical testing, pedagogical experiment; medical and biological methods, and methods of mathematical statistics. The priority of the executioner "Sanchin" and "Tensho" as elements of special training and the significance of their impact on the physical condition of the athlete. The author's technique of training process with the use of kata complexes is developed and introduced, for the directed influence on separate indicators of the level of development of special physical qualities and functional state of karate. As a result of the use of kata in the preparation of qualified karate for Kumite in the athletes of the experimental group, there were significant positive changes in the level of development of special physical qualities and speed and strength indicators when performing many shock combinations. There was a statistically significant ( $p < 0.05$ ) increase in power and time parameters of complex, multi-stroke combinations "Shita Tsuki" - "Mavashi Tsuki" - 25.8%, "Shita Tsuki" - "Mavashi Tsuki" - "Mavashi Geri" - 28.4%.

**Key words:** kata, qualified karate players, Kyokushin karate, special training.

### Introduction

Kyokushinkai Karate is one of the most popular types of martial arts, which is cultivated by more than 16 million people in 140 countries (Kindzer et al., 2018; Bliznyuk, 2009; Kindzer, 2015d; Saenko, 2010). Competitive activity in Kyokushinkai karate, according to scientists, involves the manifestation of maximum muscular effort; performing complex technical actions for a long time; moving in difficult conditions associated with limited space and time limit; static voltage; high degree of mental stress (Kindzer, 2018; Blair, 2005; Kindzer 2015c; Korobeynikov et al., 2005).

In Kyokushinkai karate, a specialized system of the kata has been developed - a formalized sequence of movements, which are combined according to the principles of fighting with an imaginary opponent or a group of opponents (Kawaishi, 1998). In essence, it is the quintessence of the technique of a particular style of martial arts and a powerful means of mobilizing the physical, functional, and psycho-emotional reserves of the athlete, which is achieved through the following indicators: passive and active meditation; formation of rational, perfect and variable technique, consolidation of clear motor reflexes; active-dynamic psychotraining; accumulation, control, stimulation and self-direction of bioenergy to activate physiological and energy processes, the implementation of the necessary dynamic structures at the level of maximum capabilities of the individual (Kawaishi, 1998; Taylor, 2005; Guziy, 2013; Berezhansky, 2015; Zhukov et al., 2014).

According to experts (Cynarski, 2015; Pietrzak, 2000; GV Korobeynikov, 2017), one of the most important factors in achieving high results in responsible competitions is the level of development of special physical qualities, technical skills, psychological stability, ability to rapid recovery of functional reserves. For decades, the scientific and methodological literature has been discussing the improvement of certain components of special training in the training structure of qualified athletes (Cynarski, 2013; Maksimenko, 2008; Obodyński, 2000; Korobeynikov, 2005; Kashuba et al., 2020; Lavrin et al., 2019; Nesterchuk et al., 2020; Savliuk et al., 2020). However, scientifically substantiated studies of complex improvement and control of components of special training are practically absent.

Therefore, the problem of finding effective ways to increase the level of special training of qualified karate fighters in the discipline of Kumite needs to be solved. This will make it possible to improve physical fitness, level of functional condition, and, accordingly, sports results when performing optimal amounts of training loads.

## Materials and methods

The following methods were used: theoretical analysis and generalization of scientific and methodological literature; sociological methods (questionnaires); pedagogical observation; pedagogical testing, pedagogical experiment; medical and biological methods and methods of mathematical statistics.

Pedagogical observations were aimed at studying the features of training and competitive activities of qualified karate, identifying optimal volumes, as well as the direction of training loads to improve the psychophysical fitness of athletes in the immediate preparation for the main competitions. Observations were conducted in the conditions of training meetings, training meetings of national teams, and competitions using a video camera.

*Participants.* The pedagogical experiment was conducted in natural conditions and was aimed at identifying the influence of Kata on the level of psychophysical fitness of qualified karate athletes in preparation for the main competitions in Kumite. Classes were held simultaneously in two groups, control and experimental. 28 qualified karate athletes of different weight categories took part in the testing.

*Procedure / Test protocol / Skill test trial / Measure / Instruments.* **Organization of the study.** The study involved 28 qualified karate athletes of different weight categories, age 18-25 years, the experience of at least 5 years, sports qualifications from 2nd kyu to 3 given on the Japanese scale, or a candidate for master of sports, master of sports according to the Unified sports classification of Ukraine. All athletes practiced under the guidance of coaches of the national team of Ukraine in Kyokushin Karate according to the curriculum approved by the Kyokushin Karate Federation of Ukraine.

*Data collection and analysis.* Pedagogical tests were conducted to diagnose the level of physical fitness of karate players of different skill levels using a battery of tests recommended by the Kyokushin Karate Federation of Ukraine. The results were recorded using a set of technical means and tools according to standard methods.

Application of the chronodynamometry technique and specialized shock ergometer "Spuderg-9" (Savchin MP, Dedik GS, Savchin LL Boxing projectile: A. s. № 1718994) were used to study the following technical characteristics of karate: continuous measurement of various parameters of the athlete's impact work, including the strength of each impact, time intervals between strokes, power, special impact endurance. This technique has been tested in various types of martial arts (Dunets-Lesko et al., 2009; Ivanochko, 2009; Kashuba et al., 2020; Korobeynikov et al., 2017) and adapted to Kyokushin Karate.

Assessment of physical performance was based on PWC170.

*Statistical analysis.* Methods of mathematical statistics were used to analyze the obtained data and determine the main indicators.

## Results

Previous research has shown that the main determining factors in the manifestation of sportsmanship at the stage of direct preparation for the main competitions in Kumite are: the level of general endurance; the level of development of abdominal and arm muscles, the explosive power of the upper and lower extremities, speed and agility; power and time parameters of multi-shock combinations; latent reaction time; the number of errors when testing the latency of the selection reaction; reaction time to a moving object; an indicator of dynamic efficiency; the average time of the Schulte test; vegetative coefficient; level of anxiety; voltage index (Kindzer, 2015; Korobeynikov, 2006; Priymakov et al., 2008; Taylor, 2005).

Also, a survey of experts in Kyokushinkai karate made it possible to identify three kata as a training element in preparation for Kumite competitions: kata "Sanchin", kata "Tensho", and kata "Yantzu". Coefficient of agreement of answers ( $W = 0,633$ )

The results of a survey of Kyokushinkai karate experts allowed to rank the kata, which is used by the interviewed specialists as a training element in preparation for Kumite competitions.

Thus, specialists with a high level of consistency ( $W = 0.633$ ) distinguish three kata as a training element in preparation for Kumite competitions, namely: kata "Sanchin", kata "Tensho", and kata "Yantzu".

Table 1. Ranking of the executioner according to the results of the survey

N <sup>o</sup>	KATA	%	N
1.	Sanchin	25,0	78
2.	Tensho	20,8	65
3.	Yantzu	17,7	55
4.	Tsuki no kata	11,8	37
5.	Pinan 1-5	9,3	29
6.	Taikioku 1-3	7,7	24
7.	Others	4,2	13
8.	Socugi	3,5	11

It is established that the factors that do not allow a qualified karateka to show a high sports result when participating in responsible competitions are the level of competition; information about the enemy; insufficient special training and level of the emotional state of the athlete (Kindzer, 2015; Korobeynikov et al., 2017; Kindzer, 2015; Pietrzak, 2000).

The conducted researches allowed to development of the author's program and the following algorithm of preparation of karate athletes for the main competitions in Kumite (fig. 1).

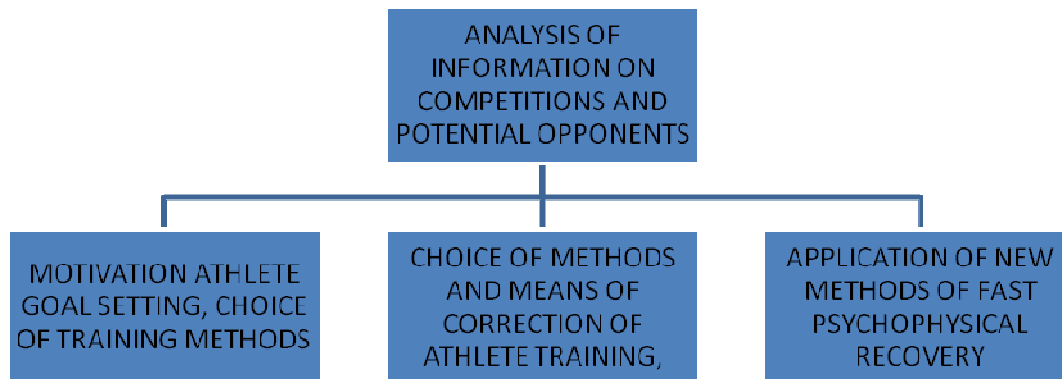


Fig. 1. Algorithm of preparation of karate athletes for Kumite competitions

The author's program conditionally consisted of three interconnected components: construction of process, its realization, and control over the course of realization.

In the process of sports training, the integrity of the training process was ensured on the basis of the generally accepted structure (micro-, meso-, macro-cycles), which was a relatively stable order of combining components, their natural relationship, and overall sequence. The structure of the training was characterized by the order of interconnection of elements of the content of the training (means, methods of general and special physical, tactical and technical training, etc.); a certain ratio of training load parameters (quantitative and qualitative characteristics of volume and intensity); defined the sequence of different parts of the training process (individual classes and their parts, stages, periods, cycles).

In addition, the following methodological provisions were taken into account: gradual application of tasks, tools, methods, organizational forms of training; focus on achieving higher sportsmanship in the training process; the optimal ratio of different aspects of preparedness; growth of general and special training, the ratio between which is gradually changing. Correspondence in the development of general endurance and speed qualities, general endurance and strength qualities, which are based on various physiological and biochemical mechanisms, has been observed.

The cycle of preparation of qualified karate fighters for the main competitions provided for four periods, namely: preparatory; pre-competitive, competitive; restorative.

The preparatory period lasted on average four months, the pre-competition period - four weeks, the competitive period - one week, the recovery period - one month.

The program to improve the special training of qualified karate practitioners in the discipline of Kumite with the use of formal kata complexes assumed that the preparatory period is the longest structural unit of the training macrocycle. During this period the functional base for performance of large volumes of special work was laid, motor skills were improved; carried out tactical and psychological training, etc. The applied exercises differed significantly in nature and structure from the competitive ones, as the main task of this stage was not the

development of complex physical qualities that determine the level of sports results, but increasing the capabilities of individual factors that are their basis. This involved the widespread use of a variety of special training exercises, largely close to the general training. Later, as the preparatory period progressed to the next stages, the composition of tools and methods changed: the share of competitive exercises and special training, close to the competition in terms of form, structure, and nature of the impact on the body.

In the course of the research, the structure of the pre-competition mesocycle of preparation of qualified karate athletes for the main competitions was determined. It is developed taking into account the recommendations of experts (Blair, 2005; Platonov, 2004; Kindzer, 2015) and the main tasks of training karate at the stage of pre-competition training, namely: achieving the maximum level of endurance, high reliability of technical and tactical actions, optimal psychological stability. In particular, the basic microcycle (7 days) provided a load of 40% of the total, aerobic-anaerobic nature (heart rate up to 180 - 185 beats/min); special-preparatory microcycle (7 days) included a load of 30%, within the glycolytic anaerobic zone (heart rate up to 200 beats/min); model microcycle (7 days) - load volume 20% within the glycolytic anaerobic zone (heart rate up to 200 beats/min); competitive conditions (sparring, free fights) were modeled at training; underwater microcycle (7 days) - the amount of training load 10% in aerobic mode (heart rate up to 170 beats/min) two classes - sparring, the predominant direction of the training load was performed.

The main tasks of the competitive period were further improvement of special physical fitness and technical and tactical skills; creation and maintenance of high combat readiness of athletes due to regulation and self-regulation of states; modeling of competitive activities to bring to the start and control the level of preparedness; providing optimal conditions for the maximum use of all aspects of preparedness (physical, technical, tactical, mental) to transform it into the maximum possible result; prompt recovery of athletes between fights and after competitions.

Athletes of the experimental group to accelerate the recovery of special performance were recommended to perform kata "Sanchin" immediately after each fight and competition. The recovery period included mandatory rest after training and competitive loads, as well as maintaining a certain level of training to ensure optimal readiness of the athlete for the next macrocycle. Particular attention was paid to the physical and mental recovery of the athlete.

Training in the recovery period was characterized by a small total amount of work and low intensity of load. The volume of work compared to the preparatory period decreased by about 4-5 times; the number of classes during the weekly microcycle did not exceed four to six. The main means were active recreation and general preparatory exercises.

In the recovery period, the percentage of time allotted for the execution of the kata remained at the level of 5 - 6%, but the list of applied kata was expanded individually for each athlete. Thus, in addition to the kata "Sanchin" and "Tensho", the athletes of the experimental group additionally performed: "Tsuki no kata"; "Hekusaisho"; "Hecusai dai" kata.

At the end of the recovery period, the load was gradually increased, the amount of active recreation was reduced, and the number of general preparatory and auxiliary exercises was increased. All this made it possible to ensure a gradual transition to the first stage of the preparatory period of the next macrocycle.

As a result of the application of the author's program to improve the special training of qualified karate in the discipline of Kumite with the use of formal kata complexes in athletes of the experimental group, there were significant positive changes in the level of special psychophysical qualities and physical performance.

Thus, with the help of chronodynamometry and specialized shock ergometer "Spuderg-9" a statistically significant ( $p < 0.05$ ) increase in force and time parameters of complex, multi-stroke combinations "Shita Tsuki" - "Mavashi Tsuki" - 25.8% ; "Shita tsuki" - "Mavashi tsuki" - "Mavashi geri" - 28.4%).

The level of development of special speed and power qualities was assessed by determining the force and time of impact according to the method of MP Savchin using a chronodynamometer "Spuderg-9". We evaluated the result of a single blow (giyaku-Tsuki), two-stroke combinations (giyaku-Tsuki - oi-Tsuki, shita Tsuki - mavashi Tsuki) and a triad combination (shita Tsuki - mavashi Tsuki - mavashi Geri) (Table 2).

A correlation was established between the sports results of qualified karatekas and the level of development of special physical qualities in the stage of preparation for the main Kumite competitions in Kyokushinkai karate. Thus, the strength of single strokes of giaku-Tsuki on a punching bag (device "Spuderg-9" according to the method of MP Savchina have an average level of relationship with indicators of competitive activity and are at the level of 0.235 at  $p < 0.05$ .

However, complex combinations of strokes, such as two- and three-stroke combinations, are closely correlated with athletic performance. Thus, the relationship between the impact strength of the combination of giyaku Tsuki - oi Tsuki was set at 0.637, the relationship between the time parameters of this impact was set at -0.533 at  $p < 0.001$ . The performance of the two-stroke combination of shita Tsuki - mavashi Tsuki is set at 0.622 at  $p < 0.001$ , the time parameters are also closely related to the sports result in -0.412 at  $p < 0.05$ .

Table 2. Speed and power characteristics of single- and multi-stroke combinations of qualified karatekas (n = 28)

Special tests	Giaku Tsuki, kg	Giaku Tsuki - Oi Tsuki, kg / ms	Shita Tsuki - Mawashi Tsuki, kg / ms	Shita tsuki - Mavashi tsuki - Mavashi geri, kg / Ms
Power parameters (M±m)	184,3±39,3	401,3±98,8	467,3±103,8	631,3±150,8
Time parameters (M±m)	-	254,6±21,3	325,1±40,4	438,5±34,7

It is established that the total impact force of the three - shock combination of sewn Tsuki - mawashi Tsuki - mawashi Geri has a close correlation with the sports result at the level of 0.511 at  $p < 0.05$ , the time parameters of this combination have an average relationship and is set to levels of -0.258 at  $p < 0.05$ .

In our opinion, this indicates that at the stage of preparation for the main competition in Kumite in Kyokushinkai karate, the technique of performing complex combinations and accentuation of the blow are important.

There were also positive changes in physical performance, in particular, in terms of PWC170 karate athletes of the experimental group ahead of athletes in the control group by 31%. In addition, the capacity of anaerobic energy supply mechanisms increased by 10.1% and aerobic energy supply mechanisms by 4.5%; the indicators of the total metabolic capacity increased by 9.5%, the indicators of maximum oxygen uptake increased by 12.4%.

## Discussion

The issue of preparing qualified athletes for major competitions is covered in the works of many sports professionals (Kindzer, 2015; Davidenko, Korkishko, 2010; Gozhenko et al., 2018a; Gozhenko et al., 2018b; Ivanochko, Hrybovska, 2011; Korobeynikov et al., 2017; Kindzer, 2015; ).

The result of the analysis of special scientific and methodical literature devoted to various aspects of martial arts showed that only a small part of the research is aimed at studying the issues of special training and recovery after significant loads (Kindzer, 2015; Cynarski et al., 2014; Hickey, 1997; Ta'kody, 2006).

However, at the stage of preparation for the main competitions, karate athletes must have a sufficiently high level of tactical and technical training, so you need to pay attention to the special training of the athlete.

Leading martial arts experts (Korobeynikov, et al., 2017; Kashuba et al., 2020; Kindzer, 2015a; Kindzer, 2015b; Korobeynikov et al., 2006; Cynarski, 2015; Saenko, 2007) found a close relationship between all aspects of training: physical (development of speed and strength abilities), technical (implementation of technical actions in attack and defense), tactical (correct decisions in choosing the manner of fighting) and psychological (features of information perception and state management in the process of combat).

The study allowed to develop and scientifically substantiate a program to improve the special training of karate in the discipline of Kumite using formal kata complexes and identify the positive impact of individual kata on the level of special training of qualified athletes and their effectiveness in preparing for competitions in Kumite.

The structure and content of the construction of preparatory, competitive microcycles and annual macrocycle of training of qualified karate fighters in the discipline of Kumite with the use of formal kata complexes have been improved.

Also developed further scientific provisions for the use of individual kata in pre-competition training and in the competition as an element of special training for the main competitions in Kumite; scientific data on the system of control of the functional state of karate athletes have been supplemented.

## Conclusions

1. In the practice of Kyokushinkai karate, as in other types of martial arts, there is no single approach to building a training process in the discipline of Kumite in pre-competitive mesocycles at the stage of maximum realization of individual capabilities. For the correct normalization of training loads in qualified athletes, it is necessary to obtain reliable information about the state of various aspects of training. However, research in this area is not enough.

2. The main factors that do not allow to show a qualified karate player a high sports result when participating in competitions are established: the level of competitions; information about the enemy; insufficient special training and level of the emotional state of the athlete. With a high level of consistency ( $W = 0.633$ ), three kata were identified as a training element in preparation for Kumite competitions, namely: kata "Sanchin", kata "Tensho", and kata "Yangtze". It was found that only 8.3% of respondents use athletes as a means of special training in the preparation of athletes for the main competitions.

3. As a result of the application of the author's program to improve the special training of qualified karate fighters in the discipline of Kumite with the use of formal kata complexes in athletes of the experimental group there were significant positive changes in the level of special physical qualities and functional state.

Thus, a statistically significant ( $p < 0.05$ ) increase was found: force and time parameters of performing complex, multi-stroke combinations "Shita Tsuki" - "Mavashi Tsuki" - 25.8%, "Shita Tsuki" - "Mavashi Tsuki" - "Mawashi Geri" - 28.4%). Thus, the conducted pedagogical experiment confirmed the effectiveness of the developed author's program of preparation of karate athletes (Kyokushinkai style) for the main competitions in the discipline of Kumite.

### Compliance with Ethical Standards

#### Ethical Approval

All procedures performed in studies involving human participants were in accordance with the institutional and/or national research committee's ethical standards and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed Consent Informed consent was obtained from all individual participants included in the study. All subjects of the institutional survey gave consent for anonymized data to be used for publication purposes.

#### Declaration of Conflicting Interests:

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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