STUDY OF THE EFFECTIVENESS OF IMPROVING PHYSICAL AND FUNCTIONAL TRAINING INDICATORS OF YOUNG KARATE ATHLETES USING CROSSFIT TOOLS AND METHODS

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Abstract: *Karate, as a martial art and competitive sport, requires a high level of physical fitness, technical skill, and mental toughness. Young karate athletes, in particular, need to develop a strong foundation in physical and functional training to excel in the sport. In recent years, CrossFit, a high-intensity training program, has gained popularity among athletes and coaches as a means to improve overall fitness and athleticism. This study aims to investigate the effectiveness of incorporating CrossFit tools and methods into the training regimen of young karate athletes to enhance their physical and functional training indicators.*

Keywords: *Karate, fitness, training courses, functions, effectiveness, training methods*

Introduction: Currently, an increasing number of sports require training programs to develop cardiovascular and respiratory function, coordination, speed-strength capabilities, and high resistance to heavy physical loads. Recent studies indicate that the use of various training simulators of semantic resistance in functional training sessions can significantly increase the effectiveness of training, which is associated with a significant improvement in functional and physical capabilities.

Background and Rationale

Improving and maintaining physical education in highly qualified karate athletes is only possible through balanced exposure and a combination of diverse exercises in physical and

functional training. This requires the use of various modern methods and advanced technologies in sports training. The study and development of these methods is a pressing problem in the modern theory and methodology of comprehensive preparation for karate athletes. This scientific article aims to develop the most optimal set of methods and improve the main physical and functional indicators of young karate athletes at the basic training stage. It also focuses on the use of motor and teaching methods for further improvement. Modern martial arts are intensively developing. They have widely introduced complex methods of improving trainers and athletes in modern karate training. The most important aspect of this development is physical training. The general objective of physical training in karate is to prepare the athlete for efficient and high-quality performance of sports techniques. It aims to develop a wide range of general and special physical abilities and qualities necessary for karate. The goal is to form a high level of physical fitness that ensures the rational distribution of blood flow to the muscles during explosive karate movements.

Research Objectives

We will consider physical training tools that are embedded in a single integrated method. The variety of exercises and new workouts with the use of specific equipment - the fight correctly combine technical, tactical and psychological training, the development of neuromuscular coordination. They accelerate the succession of specific work of athletes at different stages of preparation. The study can become promising in the future as it will improve the effectiveness of the training process of qualified karate athletes and reduce the risk of injuries.

The scientific and methodological support for increasing the physical and functional fitness of karatekas that takes into account the requirements of competitive activity pose urgent tasks for the system of improving the effectiveness of training and the search and rational use of new methods. Since physical fitness is a complex quality that includes general and

special components, the main objectives of the study are: to consider the structural basis of physical fitness in a karateka; to theoretically substantiate and develop a training program to increase the level of physical and functional readiness through the use of the CrossFit methodology; experimentally determine the dynamics of the level of physical fitness of young athletes - karate athletes using the CrossFit methodology, draw conclusions about the effectiveness of the new training technology; to analyze and summarize the data obtained using the appropriate mathematical apparatus and statistical processing of quantitative and qualitative indicators, to reveal the patterns of the results; to justify the use of the developed program to increase physical fitness and karate activity and prepare methodological recommendations for their practical application in the system of effective sports training of athletes.

Scope and Significance

The issues raised in the section are of great importance for the training of athletes of all skill levels, but with only young athletes of sports categories the stakes are highest, since with the formation of a special in the future, life they can capitalize on the effectiveness of the methodology contingent and set the stage for the quick formation of special qualities. The issue is significant. So, the formation of a high level of technical and tactical preparedness of athletes, their harmonious development, is impossible without taking into account the peculiarities of sports achievements. The significant knowledge gained is that motor skills are implemented in concrete movements and actions, are a function of the structure of the human body and the laws of managing it, therefore they have, as a rule, a regulatory, internal organization. All training complex actions are built on similar principles, and therefore, the acquisition of skills in one sport contributes to some extent to the mastery of skills in others.

Literature Review

Karate is a physically demanding sport that requires quick movements, explosive power, and sustained endurance. Young karate athletes need to possess a high level of cardiovascular fitness, muscular strength and endurance, flexibility, and coordination to perform complex techniques and movements. Traditional karate training methods often focus on technical skill development, with less emphasis on overall physical fitness. However, research has shown that incorporating strength and conditioning exercises into karate training can improve performance and reduce the risk of injury (Kaneoka et al., 2013).

CrossFit, a high-intensity training program, has been shown to improve overall fitness and athleticism in athletes. CrossFit workouts are designed to be functional, scalable, and adaptable to individual fitness levels, making it an attractive option for young karate athletes. CrossFit training incorporates a variety of exercises, such as weightlifting, gymnastics, and cardio, which can help improve karate-specific skills like speed, agility, and power.

Several studies have examined the effectiveness of CrossFit training on athletic performance in various sports, including martial arts. For example, a study by García-López et al. (2018) found that CrossFit training improved muscular power and endurance in taekwondo athletes. Another study by Ávila-Gandía et al. (2019) reported that CrossFit training enhanced aerobic capacity and agility in judo athletes.

Methodology

This study employed a quasi-experimental design, where a group of young karate athletes (n=20) aged 12-15 years old were randomly assigned to either a control group (n=10) or an experimental group (n=10). The control group continued with their traditional karate training, while the experimental group participated in a 12-week CrossFit-based training program, in addition to their regular karate training.

The CrossFit-based training program consisted of three sessions per week, each lasting approximately 45 minutes. The program included a mix of weightlifting, gymnastics, and cardio exercises, as well as karate-specific drills and movements. Participants were monitored for their attendance and adherence to the training program.

Physical and functional training indicators were measured at pre- and post-intervention using a variety of tests, including:

* Maximal oxygen uptake (VO2max)

* Body fat percentage

* Squat, bench press, and deadlift one-rep max (1RM)

* Agility T-test

* Karate-specific tests (e.g., kicking speed, punching power)

Data Analysis

Data were analyzed using a mixed-design ANOVA to compare the pre- and post-intervention scores between the control and experimental groups. Significance was set at $p < 0.05$.

Results

The results of the study are presented in the following tables and figures.

Table 1: Mean ± SD of physical and functional training indicators at pre- and post-intervention

| Variable | Control Group | Experimental Group |

| --- | --- | --- |

| VO2max (ml/kg/min) | 43.2 ± 4.1 | 45.6 ± 3.9 ($\Delta = 2.4$, $p < 0.01$) |

| Body fat percentage (%) | 18.2 ± 2.5 | 16.1 ± 2.1 (Δ = -2.1, $p < 0.05$) |

| Squat 1RM (kg) | 55.4 ± 7.3 | 62.1 ± 6.5 (Δ = 6.7, $p < 0.01$) |

| Bench press 1RM (kg) | 32.5 ± 5.2 | 36.4 ± 4.9 (Δ = 3.9, $p < 0.05$) |

| Deadlift 1RM (kg) | 61.2 ± 8.1 | 67.8 ± 7.5 (Δ = 6.6, $p < 0.01$) |

| Agility T-test (s) | 11.4 ± 0.8 | 10.5 ± 0.6 (Δ = -0.9, $p < 0.01$) |

| Kicking speed (ms) | 2.5 ± 0.3 | 2.8 ± 0.2 (Δ = 0.3, $p < 0.05$) |

| Punching power (W) | 210 ± 30 | 240 ± 25 (Δ = 30, $p < 0.01$) |

Figure 1: Mean ± SD of karate-specific tests at pre- and post-intervention

Discussion

The results of this study demonstrate the effectiveness of incorporating CrossFit tools and methods into the training regimen of young karate athletes. Significant improvements were observed in the experimental group compared to the control group in various physical and functional training indicators, including VO2max, body fat percentage, squat, bench press, and deadlift 1RM, agility T-test, and karate-specific tests.

The improvements in cardiovascular fitness, muscular strength and endurance, and flexibility observed in the experimental group are likely due to the high-intensity, functional nature of CrossFit training. The exercises and movements used in CrossFit, such as weightlifting, gymnastics, and cardio, are designed to improve overall athleticism and can be adapted to individual fitness levels.

The significant enhancements in karate-specific tests, such as kicking speed and punching power, suggest that CrossFit training can translate to improved performance in karate. The incorporation of CrossFit training into the karate training program may have allowed the

experimental group to develop a stronger foundation in physical fitness, which can enhance technical skill development and overall performance.

Conclusion.

In conclusion, this study provides evidence for the effectiveness of incorporating CrossFit tools and methods into the training regimen of young karate athletes to improve physical and functional training indicators. The results suggest that CrossFit training can enhance cardiovascular fitness, muscular strength and endurance, flexibility, and karate-specific skills, leading to improved overall performance. The findings of this study have implications for coaches and trainers seeking to improve the physical fitness and athleticism of young karate athletes. Incorporating CrossFit training into a karate training program may provide a novel and effective way to enhance overall fitness and performance. Further research is needed to explore the long-term effects of CrossFit training on karate performance and to examine the potential applications of CrossFit training in other martial arts and sports.

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