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Development of upper limb strength in 8-10-year-old children practicing karate

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Abstract: *Karate training for children unites the physical and psychological aspects, playing a key role in their development. Physically, karate helps children improve coordination, strength, flexibility and endurance. Punching and blocking techniques, as well as various balance and speed exercises, stimulate muscle mass and motor skill development. Psychologically, karate promotes discipline, self-control and respect for oneself and others. Children learn the importance of concentration and focus, skills that can be applied to other areas of their lives. Importantly, karate creates opportunities to build confidence and self-esteem while encouraging teamwork and social interactions. Training not only develops physical qualities, but also mental resilience, helping children cope with stress and challenges. The general well-being of children is improved thanks to the balance between physical activity and mental development that karate offers.*

Keywords: karate training, psychological aspect, physical exercises, children

Introduction

Karate is a martial art with a long history that originated in Okinawa, Japan in the 14th century when the locals began using unarmed self-defense techniques. In the 20th century, karate developed and modernized to include various styles, including Shotokan, Wado-Ryu, and Shito-Ryu.

After World War II, karate became popular around the world as it spread through competitions and fighting tournaments. Today, karate is recognized as an Olympic sport and is practiced by millions of people for physical health, self-defense and spiritual development [1].

A stagnant lifestyle has a negative impact not only on the physical condition and motor functions, but also on a psycho-emotional level in people [2]. Practicing karate is an extremely useful way of developing children, offering a comprehensive approach to their physical and psychological well-being. In terms of physical aspects, karate training improves the general fitness level and cardiorespiratory endurance of students.

Through the systematic exercises of strikes, blocks and kata, they develop muscle strength, flexibility and coordination. These physical benefits not only improve children's health, but also prepare them for participation in other sports and physical activities [3] [4].

Just as Yoga is a spiritual science of the integrated holistic expansion and enhancement of physical and mental capabilities, the practice of karate also takes a holistic approach [5].

Already at the time of Hippocrates, the action and methods of using physical exercises in certain diseases of the heart, lungs, endocrine system and surgical diseases were described [6].

Regarding the psychological aspects, karate training contributes to the development of discipline, persistence and self-discipline in children. Through their constant engagement with the technique and the execution of the movements, children learn skills of concentration and attention. They learn to cope with stress and control their emotions, gaining more self-confidence. The psychological benefits of karate training also include the development of problem-solving strategies and the ability to adapt to changing circumstances.

In addition, practicing karate offers an opportunity to develop social skills in children. They learn to work in a team and to get along with the other participants in the class. Through interaction with their coaches and classmates, children develop communication, respect and cooperation skills. These social skills are essential for their adjustment in society and for the development of healthy interpersonal relationships [7].

Overall, karate training not only improves children's physical fitness, but also prepares them to face life's challenges more successfully. Just as therapeutic riding focuses on cognitive, psycho-physical, social well-being [8].

By combining physical and psychological aspects, karate offers a holistic approach to children's development that prepares them for successful functioning in the future [9].

Materials and Methods

A precise search of scientific journals, articles in both medical, socio-medical and non-medical forums and databases related to the problem at hand was performed. From November 2023 until November 2024 a review of available literature related to physical and psychological aspects of karate training was performed. We identified an extensive number of scientific publications on this issue. Basic guidelines for physical and psychomotor development of practitioners are noted. The literature used is mainly synthesized from the past 5 years. The review of available literature on scientific publications reports empirical and theoretical developments investigating physical and psychological aspects in children. The databases Pubmed, CrossRef, Google Scholar were searched for reports by keywords.

The main purpose of the study is to determine the forearm muscle strength of students from the "Fighters" Karate Sports Club in the city of Varna. Before starting the study, written consent was obtained from

the parents for the voluntary participation of their children. For our research, we used an Electronic hand dynamometer (EH106), which can record up to 19 user data. It is suitable for rehabilitation training and grip strength training. It can be used for a variety of purposes such as physiotherapy, sports medicine and general fitness testing.

To realize the set goal, the following tasks must be completed:

- Survey development.
- Conducting karate classes in a predetermined schedule.
- Improving the motor activity of adolescents, based on the karate classes.

The study was conducted in the "Fighters" Karate Sports Club in the city of Varna, under the guidance of a rehabilitator and trainer. The students who take part in the study are 18 in number, aged 8-10 years.

Research results

The questionnaire developed for conducting the research consists of 5 closed-ended questions. The first of the questions asks for respondents' opinion regarding their age. The results show:

- 33% of the students surveyed are 8 years old.
- 45% of the students surveyed are 9 years old.
- 22% of the students surveyed are 10 years old.

The responses to the second question of the survey found that of all students surveyed, 67% were boys and 33% were girls.

In response to the question Why do you practice the sport of karate? The distribution of answers to this question are: because I am getting stronger 33% because I will be able to defend myself 22% and 45% answered because my friends train.

Table 1. Distribution of student responses to question 3 of the survey by gender

Gender	Why do you practice karate?			Total
	Because I'm getting stronger	Because I will be able to defend myself	Because my friends are working out	
Boy	76%	13%	11%	100%
Girl	27%	16%	57%	100%

The distribution of boys, according to the answers to this question, is 76% because they become stronger with karate training, 13% will be able to defend themselves and 11% train because their friends also practice karate.

The distribution of girls according to the answers to this question is 27% train because they get stronger, 57% train because their friends train and 16% practice karate because they will be able to defend themselves.

The distribution of boys, according to the answers to this question, is 7% can hardly perform Chudan-ski and 93% can perform Chudan-ski.

The distribution of girls, according to the answers to this question, is 14% can hardly perform Chudan-ski and 86% can perform Chudan-ski. The data of the students' opinion on question No. 4 of the survey are presented in Table 2.

Table 2. Distribution of students' answers to question 4 of the survey by gender

Gender	Can you perform a Chudan-ski (a straight punch to the stomach)			Total
	No	Difficult	Yes	
Boy	0%	7%	93%	100%
Girl	0%	14%	86%	100%

The distribution of boys, according to the answers to this question, 79% do not practice karate outside the gym, 13% rarely practice karate outside the gym, and 8% practice karate outside the gym.

The distribution of girls, according to the answers to this question, 92% do not practice karate outside the gym, 6% rarely practice karate outside the gym, and 2% practice karate outside the gym.

Table 3. Distribution of students' answers to question 5 of the survey by gender

Gender	Do you practice karate outside the gym?			Total
	No	Rarely	Yes	
Boy	79%	13%	8%	100%
Girl	92%	6%	2%	100%

The results provide good evidence and clearly demonstrate the beneficial effects on children's well-being and health.

Table 4. Examination of forearm muscle strength

A part of the body	Examination of forearm muscle strength in kilograms	
	At the beginning of the study (kg)	At the end of the study (after 3 months) (kg)
Left	17	19
Right	19	21
Total	36	40

The results of the muscle strength measurement conducted at the beginning of the study are: statistical muscle strength for the left arm was 17 kg and for the right arm it was 19 kg. When measured again at the third month, muscle strength had increased by 2 kg for each arm

Improving physical fitness and flexibility

Motor activity is a mechanism for dealing with functional disorders and improving the physical and mental health of children. Scientific research shows that regular physical activity has psychophysical effects on the health of people of all ages [10].

Karate training is an extremely effective way to improve children's fitness and flexibility. During training, children perform a variety of exercises and movements that improve their muscle tone and cardiorespiratory endurance and mobility of nervous tissue. This allows the nervous system to adapt to body and limb movements [11] [12]. Punches, blocks and kata, which are a major part of karate practice, require the active participation of different muscle groups, which leads to their strengthening and development.

The physical activity associated with karate training helps build muscle strength and endurance, especially in the abdominal muscles, legs and arms [13]. Children learn to use their muscle strength in an effective way when performing various techniques and combinations. This not only improves their fitness, but also prepares them for participation in other sports and physical activities [14].

In addition, karate training helps improve children's flexibility. Regular practice of various strikes, blocks and kata requires good flexibility in different parts of the body. Through systematic stretching and flexibility exercises, children gradually increase their flexibility and improve their movement [15].

It is important to note that karate practice is done under the guidance of qualified instructors who provide a properly targeted training program that takes into account the age and skill level of the children. This approach ensures the safety of the participants and maximum effectiveness of training to improve their physical fitness and flexibility.

Improving children's fitness and flexibility through karate training has both long-term and immediate benefits. In addition to strengthening muscles and improving flexibility, karate training also helps develop basic motor skills such as balance, coordination and spatial awareness [16].

Karate provides a systematic approach to training the body, incorporating different types of exercises for different parts of the body. This includes stands, strikes, blocks, kata and more. As a result, children develop muscle strength and flexibility evenly throughout the body. In addition, karate training encourages children to maintain proper posture and control over their bodies. Through exercise, children learn to move with flexibility and grace, which not only improves their physical abilities, but also contributes to the development of their general posture and self-confidence [17].

It is also important to note that karate offers an individually tailored approach to students. This allows children to progress at their own pace and meet the challenges of training within their capabilities. This personalized approach not only ensures the effectiveness of training, but also helps keep children motivated and engaged with practice. The bottom line is that karate training has age and developmental benefits. They can help children build healthy habits throughout their lives, ensuring not only physical, but also psychological and emotional well-being throughout their lives.

Development of coordination and balance

Karate training plays a key role in developing children's coordination and balance. Through the systematic exercises and techniques characteristic of karate, children improve their motor skills and their ability to control their body movements.

One of the main goals of karate training is to teach children to perform various strikes, blocks and kata with accuracy and precision. This requires good coordination between different parts of the body, such as arms, legs and torso. Through the exercises, children learn to synchronize their movements and control their strength and speed, which leads to an improvement in their balance and coordination [18].

Karate also develops children's ability to respond quickly and effectively to different situations and challenges. Through training, they learn to make quick reactions and move with certainty and confidence. This aspect of karate practice is directly related to the development of their coordination and balance, as it requires precision and control of their movement. In addition, karate training offers a variety of exercises and techniques that aim to improve children's balance. These include stances, the execution of techniques on one leg, as well

as various dynamic and static balancing exercises. Through these exercises, children learn to control their center of gravity and move with stability and confidence [19].

After all, karate training is an extremely effective way to improve children's coordination and balance. Through their constant commitment to karate practice, they develop not only physical but also mental skills that help them achieve greater self-confidence and success in various aspects of life.

Strengthening of muscles and basic motor skills

Practicing karate is an extremely effective way to strengthen muscles and develop basic motor skills in children. This ancient Japanese method not only develops physical fitness, but also reinforces discipline, self-discipline and determination. Compared to Iyengar yoga, karate can also be performed by any person regardless of age and health and gives real results [20].

Karate training stimulates muscle development through a variety of physical exercises. The training process includes strength and endurance exercises that mainly engage the muscles of the arms, legs and abdominal area. The constant practice of these exercises leads to gradual strengthening of the muscles and improvement of their strength and endurance.

Apart from physical fitness, practicing karate also improves children's coordination and balance. Every movement in karate requires precision and synchronization between different parts of the body. This involves precision strikes, blocks and dodges that require good coordination and balance. Regular practice of these movements helps children develop better connectivity between their muscles, nervous system and senses [21].

Flexibility is another key aspect of physical development that is improved through karate training. Karate incorporates a variety of stretching and flexibility exercises that help children develop greater range of motion and flexibility in their muscles and joints. This not only improves their karate techniques, but also reduces the risk of injury and improves their overall fitness [22].

Apart from the physical aspects, practicing karate also develops various motor skills in children. Reflexes and quickness are improved through training that requires quick reaction and execution of technical movements. Children learn technical skills by constantly repeating and perfecting the various techniques of strikes, blocks and dodges. These skills are useful not only in the context of karate, but also in all Eastern health systems [23].

Conclusion

Child health rehabilitation through the practice of karate is an integrated and effective approach to improving children's physical and mental well-being. Karate not only develops physical skills such as endurance, strength and coordination, but also promotes self-discipline, self-control and the improvement of

psychological aspects such as confidence, self-esteem and the ability to face challenges. This holistic approach not only prepares children for a healthy lifestyle, but also provides them with valuable tools for personal development and success in various aspects of their lives. Combined with appropriate medical care and community support, the practice of karate can be a valuable resource for improving public health and well-being.

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