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Construction of a Functional Training Program to Improve Taekwondo Kick Performance for Sport School Students

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Abstract

Background and Aim: Taekwondo is a confrontational sport that mainly uses kicking and punching as a supplement. It is one of the official events of the modern Olympic Games. Functional training, as an advanced training means and method, can effectively improve athletes' competitive performance and reduce the risk of injury with its efficient training effect and low risk of sports injuries, and has been adopted by many elite athletes and coaches. As a physical confrontational sport, Taekwondo has certain risks, and it is easy to get sports injuries during exercise. Sports schools are the grassroots units for training athletes in China and are also important early places for training Olympic champions. The training concepts, methods, and means of sports school coaches play a vital role in tapping the future competitive potential of young athletes. The research concept emphasized the importance of scientific analysis by the functional movement screening (FMS) technology, construction training program, training, and monitoring for Taekwondo athletes. This study was to improve the kicking ability of students in sports schools by constructing a functional training program.

Materials and Methods: The subjects of this study were 30 Taekwondo students aged 16-18 years old from Zhengzhou Sports School. They were divided into an experimental group and a control group by the score of the FMS analysis. The training plan was developed, with a validity was 0.91 (0.80-1.00), and the experiment adopted a two-group pre-test and post-test design, with 15 students in each group. The experiment operated for 8 weeks, three days a week, with one and a half hours a day. The experimental group was taught with the functional training program, while the control group continued with the traditional training program. The FMS test, physical fitness test, and skill test. The data were collected before commencing the experiment and after the end of the experiment. The paired t-test was used for within-group data analysis, and the independent sample t-test was used for between-group data analysis.

Results: found that 1) The FMS score of the experimental group was significantly improved after functional movement training in the experimental group ($P<0.05$), but there was no significant difference in the control group. 2) The physical fitness was improved after training, both in the experimental group and the control group, but had more improvement in the experimental group than in the control group ($P<0.05$).3) The skills of kicking were improved after training in both the experimental group and the control group, but the experimental group had more obvious improvement than the control group ($P < 0.05$).

Conclusion: The results indicate that functional movement training significantly enhanced FMS scores, physical fitness, and kicking skills, with the experimental group showing greater improvements than the control group. This suggests that functional movement training is more effective than standard training methods in improving overall athletic performance.

Keywords: Functional Training Program; Taekwondo Kick; Physical Fitness; Sport School Students

Introduction

Functional movement screening was mainly used to monitor and evaluate human functional movements. It was one of the effective means to evaluate the flexibility, coordination, stability, and symmetry of human joints. It consisted of seven test movements and three screening movements, and each movement was relatively simple and easy to learn. By reading a large amount of relevant literature, it can be seen that functional movement screening has high reliability and validity. (Chen, 2022) It was widely used in various sports training in some European and American countries, and it also had high application value in rehabilitation training. With the exchange and integration of sports at home and abroad, functional movement screening has developed rapidly in China and has been applied in the process of competitive sports training, generating good feedback. In recent years, some scholars in China have applied functional

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movement screening to professional fields and have conducted in-depth and systematic research on the combination of functional movement screening and physical fitness monitoring of professional athletes. （Chen & Chen， 2014) However, the study found that there were few studies on the application of functional movement screening in Taekwondo sports training in sports schools for sports monitoring and intervention training to prevent and control injury risks.

In today's sports training, body function training has always been welcomed by coaches and parents. Most sports are trained in the form of functional training. Through a series of monitoring and evaluation, we can understand the current body functions of athletes and then improve the various body functions and athletic abilities of athletes by strengthening and enriching the training content. Functional body training can not only improve the physical fitness of students, but also help athletes recover and greatly improve the competitive level of students. After functional training, students can complete the conversion and connection of different movements in daily life, enhance the coordination, continuity and stability between sports movements, improve the sensitivity and coordination of students' nervous system in multi-joint movements, and form a power chain that is conducive to the stable development of the human body's motor system, so that the muscles and motor functions of the human body will change accordingly. Taekwondo functional training is a training method that focuses on improving the collaborative work ability of multiple joints and muscle groups in the body, aiming to enhance the agility, movement efficiency, core stability, body balance, stability, and control ability of Taekwondo practitioners. (Li and He, 2014) This training method not only helps improve the competitive ability and physical fitness of taekwondo athletes but also reduces the risk of sports injuries and enhances their performance in competitions. Taekwondo, a competitive sport mainly based on leg techniques, requires practitioners to quickly react and coordinate the use of their hands and feet for offensive and defensive transitions in a very short period of time, which puts higher demands on their agility and reaction speed. Functional training, through collaborative training of multiple joints and muscle groups, enables athletes to perform technical movements more smoothly and efficiently, thereby improving their athletic performance and reducing the risk of sports injuries. (Li, 2022) In addition, functional training also helps to enhance athletes' core stability, which is crucial for improving the overall performance of taekwondo athletes. The application of functional training has important value in taekwondo physical training. It not only focuses on muscle strength and flexibility, but also on various aspects of human movement control, such as the nervous system, coordination ability, sensitivity, etc. Functional training can enhance the functionality of various parts of the body, improve coordination, reaction speed, and physical performance. At the same time, functional training can promote circulatory system health, improve metabolic function, enhance immunity, prevent various diseases, and provide other benefits. Taekwondo functional training is a comprehensive training method aimed at improving the overall physical fitness and competitive ability of Taekwondo practitioners, while also helping to enhance their health and prevent sports injuries. Through this training, taekwondo athletes can better utilize their technical advantages and improve their performance in competitions. (Tan, 2023)

The problems with functional training in taekwondo mainly include the primitive nature of teaching and training methods, insufficient teaching staff, and a lack of scientific teaching theory and knowledge guidance. Firstly, the teaching and training methods of Taekwondo are often primitive, focusing on the teaching and training of skills, while neglecting the guidance of comprehensive teaching of theoretical knowledge. This teaching method varies greatly because each coach has limited abilities and can only excel in one aspect, resulting in a deviation in the mastery and understanding of taekwondo. This lack of systematic and scientific training methods hinders the full effectiveness of taekwondo training and limits the improvement of students' skills. Secondly, the shortage of teaching staff is a common problem. With the reform of quality education in our country, although more and more schools are enriching their physical education curriculum, including taekwondo teaching, there is still a shortage of taekwondo teachers in both rural and urban schools. Some Taekwondo teachers in schools are also responsible for teaching multiple subjects. Due to the heavy workload of teaching affairs, they have no time to pay attention to professional training in Taekwondo teaching, resulting in the inability to effectively improve the professional training

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level of Taekwondo teachers. Finally, taekwondo teaching and training lack scientific theoretical knowledge and guidance. (Wei,2018) In most Taekwondo teaching processes, teaching is often based solely on the coach's personal experience, which varies greatly and is not conducive to the systematic learning and skill improvement of students. Scientific teaching theory and knowledge are the foundation for guiding and optimizing the training process. Without this knowledge, coaches find it difficult to develop scientific and effective training plans, which in turn affect the learning effectiveness and skill improvement of students. (Zhou, 2023)

This study takes the application of functional training in Taekwondo sports school training as the research object, takes Taekwondo students as the test objects, uses the functional movement screening test method, and uses the results of functional movement screening as the basis to train functional movements, monitor the physical condition of Taekwondo students, and analyze the problems and causes of Taekwondo students in training by establishing data before and after the experiment. The use of functional movements to train Taekwondo students is intended to help them develop good exercise habits, enhance physical health, and improve athletic ability, thereby providing a theoretical and practical basis for the application of functional training movements in Taekwondo training and providing a scientific sports training reference for Taekwondo coaches.

Objectives

1 . To operate and conduct the experiment on the application of a functional training program with the FMS screening results and compare the results on Physical fitness, taekwondo skills, and functional movement screening results, within-group and between-group.

2. To find the program training evaluation perception.

Literature review

In this research, the researcher has studied documents, concepts, theories, and research related to variables, which the researcher has searched from academic documents and various research with the following content:

1. Taekwondo Contents: Knowledge, skills, and competition

Taekwondo, as a new emerging sports fighting event, has gradually attracted people's attention and love since its introduction to China due to its unique exercise and viewing value. Although taekwondo started relatively late in China, with the continuous development of taekwondo in recent years, there have been significant changes in the number of participants, technical level, and competition scale (Ding, 2020). It has laid the foundation for the development of sports projects in China with rapid momentum, and has been listed as one of the advantageous competitive sports projects by the General Administration of Sport of China, continuously enhancing its influence in the hearts of the Chinese public. However, in the context of the rapid development of Taekwondo, it is also inevitable to face some problems. (Liu, 2015)Many competitive athletes and even some professional coaches do not have a comprehensive and profound grasp of Taekwondo technical movements, which can easily lead to incorrect movement guidance during training, resulting in a weak foundation of movements and immature technical movements, making it difficult to explore their movement patterns. Moreover, if the essentials and structural characteristics of movements cannot be correctly mastered, it is difficult to form flexible and varied technical forms and training methods, and it is impossible to achieve optimal Taekwondo technical movements in professional training and competitions. (Sun,2023) The skills of taekwondo athletes include two parts: technique and ability. Therefore, sports training can be divided into two aspects: one is to train athletes on the rationality of using movement techniques; On the other hand, it is important to focus on training athletes on how to better utilize their skills and make their movements more effective under constantly changing conditions. It should also be noted that a taekwondo athlete's proficiency in mastering techniques and comprehensive understanding of taekwondo movements does not guarantee that they will become an excellent taekwondo athlete (Liu, 2015).

2. Taekwondo training principles and techniques.

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Stress Principle

Stress refers to the psychological and physiological responses of the human body to external load stimuli. With the disruption of the original load balance and adaptation state by human functions, the body produces stress responses to adapt to new load levels. In taekwondo training, there is the practical application of the principle of stress. (Wang,2019)

Principle of Exercise Load

Taekwondo training load refers to the physiological load adaptation of practitioners, especially their adaptation in terms of body shape, structure, and function. The practitioner's physical load is strong, and their exercise ability is also improved. With the improvement of exercise ability, the corresponding physical load capacity will be stronger. (Wang,2019)

Metabolic principles

Taekwondo training requires a lot of physical energy, and the body's metabolism is extremely active during the training process. At different stages of training, the metabolism and physical exertion of trainers vary. For short-term training, such as within 5 minutes, the practitioner's body mainly relies on glycolysis for energy supply. (Wang,2019)

3. Taekwondo kicking performance: Movement and functional analysis

The Chen Zhong and Luo Wei, the Olympic champions in Athens in 2004, had the highest usage rate of the round-house kicking technique in their competitions. There are two types of round house kick techniques: the front round house kick and the round house kick. At different times, the technique will change according to the rule change. Li (2020analyzed the techniques and tactics of China's outstanding taekwondo female athletes and found that in the era of traditional protective gears, the back round house kick technique was mostly used in counter-attacking tactics. The front round house kick technique is mostly used in attacking and counter-attacking tactics.

4. Principle of Training Theory

Principle of progressive training: Taekwondo training follows the principle of progressiveness, that is, as the athlete's ability improves, the intensity, complexity, and frequency of training are gradually increased. This can avoid sports injuries while ensuring continuous progress. Principle of specialized training: Taekwondo training should be combined with the individual characteristics and technical needs of athletes to conduct targeted special training. Specific training plans are formulated for different kicking movements and competition requirements to maximize the performance of athletes. Personalized and periodic training: Personalized training arrangements are made according to the athlete's physical fitness, technical level, and competition cycle. At the same time, periodic training includes a preparation period, a competition period, and a recovery period to help athletes reach their best condition at different stages. (Bai, 2019)

5. Analysis of Physical Fitness for Taekwondo

Huang (2020) believes that to study the physical training of competitive Taekwondo, we must first understand the winning rules of Taekwondo. The winning factors of competitive Taekwondo are "fast, high, change, control, and accuracy", which require athletes to have fast starting speed and moving speed, strong stability and supporting strength, strong rapid strength, maximum strength and strength endurance, and high flexibility, sensitivity, and coordination ability. "Fast" mainly refers to fast technical movements, fast recovery, and fast start, conversion, connection, and judgment. "High" refers to high-position technology, which is caused by changes in project rules and technological development. "Change" means being good at adapting in tactics, which is reflected in physical fitness by changing the footwork quickly and constantly adjusting the footwork to find opportunities to break through the opponent. "Control" refers to the control of distance, time difference, body center of gravity, technical movements, game rhythm, battle situation, physical strength distribution, and psychological state by the two warring parties in the game situation of "control" and "counter-control". "Accuracy" is a scoring factor, which is the accurate grasp of the timing of the strike. It can be seen that competitive Taekwondo requires rapid power, which is the ability of the

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neuromuscular system to generate maximum power in a very short time, and is also the ability to respond quickly to signals.

6. Analysis of functional movement in taekwondo kicking and physical fitness related to kicking.

Cao (2023). Functional Movement Screening (FMS) is an evaluation system consisting of seven tests, each with a rating level of 1 to 3, used to assess the quality of movement patterns. These tests include but are not limited to squats, hurdles, straight-line lunges, shoulder flexibility, supine leg lifts, push-ups, and rotational stability. Through FMS testing of taekwondo athletes, some common incorrect movement patterns can be discovered, which are usually caused by high-intensity specialized training. Targeted training should be provided to improve and strengthen the corresponding weak links of athletes' bodies in response to these erroneous movement patterns. The study also found that common problems among taekwondo athletes in FMS testing include tension in the triceps and iliopsoas muscles, which may affect the athlete's lower limb flexibility, core stability, and coordination and control ability of the limbs. In addition, male athletes usually outperform female athletes in core stability, while female athletes perform better in flexibility and agility.

Functional movement screening not only provides information on movement quality and potential injury risks for taekwondo coaches and athletes, but also provides a theoretical basis for optimizing training plans. Through this screening, athletes' flexibility, stability, and body symmetry can be effectively monitored, thereby improving training effectiveness and competition results (Ding, 2020).

7. Sport Program Training Construction Process.

The construction of people's livelihood sports needs to pay attention to the cultivation of the people's spirit, and combine sports projects with spiritual culture. In short, the process of sports training and construction involves multiple aspects, which require systematic planning and implementation from multiple dimensions, such as concept guidance, content construction, method innovation, evaluation mechanism, and guarantee mechanism, to achieve sustainable development of the sports industry (Feng, 2023)

8. Related Research

Dong (2019) has analyzed the three types of strength in "Vibration, Core and Functional Strength Awareness." Functional strength training includes vibration strength training and core area strength training. Functional training should be a broader concept, which can be classified into functional strength, functional speed, functional endurance, and so on.

Summary

Strength is the ability of muscles to resist force. It is an indispensable foundation for Taekwondo techniques (kicking, hitting, etc.) and confrontation. Lower limb strength: enhances the strength and stability of kicking movements and is the main source of power for attack. Core strength: supports the transmission of power throughout the body and body stability, and is the key to completing techniques such as fast turning kicks and spinning kicks. Functional muscle: Lower limb muscles (kicking and supporting the core). Quadriceps: responsible for knee extension, providing the main power for kicking. Hamstrings: key muscle group during knee flexion and thigh swing, supporting a stable kicking action. Gluteus maximus: provides hip extension and rotation power, which is the basis of leg power. Analysis of the main movement patterns of Taekwondo: Round house kick action breakdown: hip abduction + knee extension + ankle stabilization. Key muscle groups: gluteus maximus, quadriceps, calf muscles. Joint requirements: hip mobility and knee stability.

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Conceptual Framework

Input	Out put
1. Functional Training Factors 2. Functional Movement Screen 3. Principles of Training Theory 4. Taekwondo kicking: problem, movement, and practice Training and Evaluation.	Functional Training Program to improve specific Physical fitness, and Taekwondo kicking performance 1. Efficiency - Validity 2. Effectiveness - Specific physical fitness - Taekwondo Kicking performance - FMS results

Figure 1 Research conceptual framework

Methodology

Population

The population was the Students Taekwondo Team of Zhengzhou City, Henan Province, which consisted of 200 students, aged 16-18 years old, from Zhengzhou Sports School.

Sample

Samples was randomly sampling selected for 60 students, the functional movement screening was applied to check the performance in movement of the sample, then they were divided into three sections, 20 in high score, 20 in moderate score and 20 in low score, and systematic divided into two groups and drew in to the experimental group and the control group at 15 students each group by systematic method based on FMS result scores.

Participants

Experts for IOC: Five Taekwondo experts with national referees and associate senior titles or above were selected to evaluate the questionnaire using the item-goal consistency (IOC) index.

Research Instrument

Instruments in this research were such as:

1. Functional Training Program to improve specific physical fitness and taekwondo kicking performance.
2. Taekwondo Kicking Performance Analysis.
3. Taekwondo Traditional Training Program
4. Taekwondo Functional Training Program
5. FMS test
6. Specific Physical Fitness Test
   1) Modified sit-up 1 min test
   2) Sit and Reach test
   3) Skipping rope 1 min test
   4) Push-up 30 sec test
7. Taekwondo Kicking Performance Test
   1) Single leg round house kick 10sec test
   2) Double round house kick 20sec test
   3) Left and right high positions round house kick 20sec test
8. Program Evaluation questionnaire.

Data collection

The researchers had conducted the data collection process as follows:

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1. Analysis of specific physical fitness by summarizing the review literature
2. Selected physical fitness test by expert consideration
3. Functional Movement Screening test at pretest and post-test
4. Physical fitness test at pretest and post-test
5. Skill test at pretest and post-test
6. Validate the functional program by IOC and Reliability
7. Program evaluation by questionnaire of subjects at the end of the program training.

Data Analysis

1. Comparison of FMS tests within group by paired t-test and between groups by independent t-test.

2. Comparison of Physical fitness test within group by paired t-test and between groups by independent t-test.

3. Comparison of Skill test within group by paired t-test and between groups by independent t-test.

Results

The researcher prepared the data and then conducted a statistical analysis. The results of the analysis were analyzed and presented as a table in the paper, as shown below:

Table 1 Mean and standard deviation of characteristics classified by groups

Variables	Exp. Group (n=15)	Cont. group (n=15)
	$\bar{x}\pm$SD	$\bar{x}\pm$SD
Ages	17.00±0.84	17.00±0.84
Weight	60.07±3.36	59.27±3.01
Height	170.13±4.20	169.20±3.85
BMI	22.08±1.01	22.04±1.13
Training experience	3.53±0.51	3.40±0.50

From table 1 found that the means and standard deviations of age, weight, height, BMI, and training experience in the experimental group were age=17.00±0.84 (years), weight=60.07±3.36 kg, height= 70.13±3.36 cm, BMI=22.08±1.01 and Training experience = 3.53±0.51(years), respectively; the means and standard deviations of age, weight, height, BMI, and training experience in the control group were age=17.00±0.84 (years), weight=59.27±3.01kg, height1=169.20±3.85cm, BMI=22.04±1.13 and Training experience=3.40±0.50 (years), respectively.

Table 2 The Comparison of Pretest and Posttest on the FMS test Within the Experimental Group

No	Test	Pretest		Posttest		t	p
		$\bar{x}$	SD	$\bar{x}$	SD		
1	Squat	2.27	0.45	2.80	0.41	-3.22	0.06
2	Hurdles	1.93	0.25	2.87	0.35	-7.89	0.01*
3	Straight lunge	1.73	0.45	2.47	0.51	-4.78	0.01*
4	Shoulder Mobility	1.87	0.64	2.73	0.45	-4.02	0.01*
5	Active straight knee leg raises	1.80	0.56	2.67	0.48	-4.51	0.01*
6	Trunk stabilization push-ups	1.47	0.51	2.07	0.25	-4.58	0.01*
7	Trunk rotation stability	1.33	0.48	2.13	0.35	-5.52	0.01*

*P<.05

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Table 2 found that, in the comparative analysis of the scores before and after the experiment in the experimental group, P was less than .05 and the t-value was less than 0, indicating that there was a significant difference in the scores before and after the intervention training.

Table 3 The Comparison of Pretest and Posttest on the FMS test Within the Control Group

No	Test	Pretest		Posttest		t	p
		x̄	SD	x̄	SD		
1	Squat	2.07	0.45	2.07	0.25	0.00	1.00
2	Hurdles	1.73	0.59	1.80	0.41	-0.36	0.71
3	Straight lunge	1.93	0.45	1.67	0.48	1.29	0.21
4	Shoulder Mobility	1.87	0.51	2.03	0.64	1.10	0.30
5	Active straight knee leg raises	1.53	0.51	1.83	0.37	-0.82	0.88
6	Trunk stabilization push-ups	1.60	0.50	1.67	0.48	-0.36	0.71
7	Trunk rotation stability	1.40	0.50	1.20	0.41	1.14	0.27

From table 3 found that in the comparison analysis of the scores of the control group before and after the experiment, there were no differences above .05 in the 7 items of the FMS test (p=0.21-1.00)

Table 4 The Comparison of Posttest on FMS test between the Experimental group and the Control group

No	Test	Exp. Group		Cont. group		t	p
		x̄	SD	x̄	SD		
1	Squat	2.80	0.41	2.07	0.25	6.20	0.01*
2	Hurdles	2.87	0.35	1.80	0.41	6.95	0.01*
3	Straight lunge	2.47	0.51	1.67	0.48	4.58	0.01*
4	Shoulder Mobility	2.73	0.45	2.53	0.64	0.89	0.38
5	Active straight knee leg raises	2.67	0.48	2.00	0.37	4.18	0.01*
6	Trunk stabilization push-ups	2.07	0.25	1.67	0.48	2.44	0.02*
7	Trunk rotation stability	2.13	0.35	1.20	0.41	6.08	0.01*

*P<.05

Table 4 showed that, in the posttest on FMS was significantly different between the experimental group and control group at .05 on 6 items on squat, hurdles, straight lunge, active straight knee leg raises, trunk stabilization push-ups, and trunk rotation stability; there was only one item on shoulder mobility, which was not different.

Table 5 The comparison of physical fitness at pretest between the experimental group and the control group

No	Test	Exp. Group		Cont. group		t	p
		x̄	SD	x̄	SD		
1	sit-up (min)	47.73	2.76	48.13	3.37	-0.35	0.88
2	Sit And Reach (cm)	13.56	1.22	13.64	1.19	-0.19	0.84
3	skipping rope(rep)	184.47	7.30	191.00	7.80	-2.36	0.53
4	push-up(rep)	41.13	3.27	40.67	2.82	0.41	0.71
5	50 meters (sec)	8.12	0.27	8.01	0.35	0.92	0.15

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Table 5 showed that the comparison of physical fitness at the pretest between the control group and the experimental group showed no difference at .05 in all nine items of physical fitness tests.

Table 6 The Comparison of Pretest on Taekwondo Skill Test Between Experimental Group and Control Group

No	Test	Exp. Group		Cont. group		t	p
		x̄	SD	x̄	SD		
1	Single leg round house kick (sec)	17.47	1.30	17.20	1.85	0.45	0.24
2	Double round house kick (sec)	57.20	2.56	58.33	2.84	-1.14	0.73
3	Left and right high positions round house kick (sec)	35.6	2.29	36.4	1.88	-1.04	0.37

Table 6 showed that there was no difference at .05 in Taekwondo Skills at the pretest between the control group and the experimental group, and there was no difference at .05 in Taekwondo Skills in all tests.

Table 7 The Comparison of Pretest and Posttest on Physical Fitness Test Within the Experimental Group

No	Test	Posttest		Pretest		t	p
		x̄	SD	x̄	SD		
1	sit-up (min)	53.47	2.13	47.00	2.76	-13.67	0.01*
2	Sit And Reach (cm)	15.63	0.72	13.56	1.22	-13.61	0.01*
3	skipping rope (rep)	200.20	4.17	184.47	7.30	-16.58	0.01*
4	push-up (rep)	49.33	2.28	41.13	3.27	-22.29	0.01*
5	50 meters (sec)	7.72	2.20	8.12	0.27	12.35	0.01*

*P<.05

From table7 showed that, experimental group the posttest on physical fitness tests was significantly higher than at the pretest at .05 in all 5 items, which means that the Taekwondo functional training program could improve the physical fitness of sports school students.

Table 8 The Comparison of Pretest and Posttest on Taekwondo Skill Test Within the Experimental Group

No	Test	Posttest		Pretest		t	p
		x̄	SD	x̄	SD		
1	Single leg round house kick (sec)	22.20	1.93	17.47	1.30	-12.33	0.01*
2	Double round house kick (sec)	63.47	1.84	57.20	2.56	-14.55	0.01*
3	Left and right high positions round house kick (sec)	40.93	1.22	35.6	2.29	-14.27	0.01*

*P<.05

Table 8 showed that, in the experimental group, the posttest on the Taekwondo Skills test was significantly higher than at the pretest at .05 in all 3 items of the test.

Table 9 The Comparison of Pretest and Posttest on Physical Fitness Test Within the Control Group

No	Test	Posttest		Pretest		t	p
		x̄	SD	x̄	SD		
1	sit-up(min)	48.87	2.47	48.13	3.37	-2.75	0.15*
2	Sit And Reach (cm)	14.28	1.12	13.64	1.19	-11.63	0.01*
3	skipping rope(rep)	194.07	6.91	191.00	7.80	-5.78	0.01*
4	push-up (rep)	42.53	2.58	40.67	2.82	-7.89	0.01*
5	50 meters (sec)	8.00	0.28	8.01	0.35	0.41	0.68

*P<.05

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Table 9 showed that, in the control group, the posttest on physical fitness was significantly higher than at the pretest at .05 in 3 items: sit-up(min), Sit and Reach (cm), skipping rope(rep), push-ups (rep), but not significantly different in 50-meter (sec)

Table 10 Comparison of Pretest and Posttest on Taekwondo Skill Test Within Control Group

No	Test	Posttest		Pretest		t	p
		x̄	SD	x̄	SD		
1	Single leg round house kick (sec)	18.20	1.69	17.20	1.85	-4.58	0.01*
2	Double round house kick (sec)	59.60	2.13	58.33	2.84	-3.83	0.02*
3	Left and right high positions round house kick (sec)	37.60	1.24	36.4	1.88	-4.93	0.01*

*P<.05

Table 10 showed that, in the control group, the posttest on taekwondo Skills was significantly higher than at the pretest at .05 on single-leg round house kick (sec), double round house kick (sec), left and right high positions round house kick (sec).

Table 11 Comparison of Posttest on Physical Fitness Test between Experimental Group and Control Group

No	Test	Exp. Group		Cont. group		t	p
		x̄	SD	x̄	SD		
1	sit-up(min)	53.47	2.13	48.87	2.47	6.09	0.01*
2	Sit And Reach (cm)	15.63	0.72	14.28	1.12	4.99	0.01*
3	skipping rope(rep)	200.20	4.17	194.07	6.91	3.46	0.04*
4	push-up(rep)	49.33	2.28	42.53	2.58	10.60	0.01*
5	50 meters (sec)	7.72	2.20	8.00	0.28	-3.28	0.05*

*P<.05

Table 11 shows that the scores of the experimental group in the 9 items in the physical fitness post-test were significantly higher than those of the control group, all at 0.05.

Table 12 Comparison of Posttest on Taekwondo Skill Test between Experimental group and Control group

No	Test	Exp. Group		Cont. group		t	p
		x̄	SD	x̄	SD		
1	Single leg round house kick (sec)	22.20	1.93	18.20	1.69	6.25	0.01*
2	Double round house kick (sec)	63.47	1.84	59.60	2.13	5.07	0.01*
3	Left and right high positions round house kick (sec)	40.93	1.22	37.60	1.24	6.37	0.01*

*P<.05

Table 12 showed that, in the posttest, the taekwondo skill was significantly different between the experimental group and the control group at .05

Table 13 Conclusion of Program Evaluation by 15 Subjects Who Participated in the Experimental Group

No	Issues	x̄	SD	Level of result
1	You are satisfied with your overall experience with functional training	4.80	0.41	Very high
2	Does the training content meet your expectations?	4.67	0.88	Very high
3	Training program intensity	4.67	0.88	Very high
4	Improved strength and power	4.73	0.45	Very high
5	Improved Balance and stability	4.60	0.50	Very high

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No	Issues	x̄	SD	Level of result
6	Improved Coordination and Agility	4.73	0.45	Very high
7	Improved Reaction Time and Endurance	4.60	0.63	Very high
8	Is kicking speed increased?	4.80	0.41	Very high
9	Is kicking power enhanced?	4.73	0.45	Very high
10	Is the application of kicking more flexible in actual combat?	4.73	0.45	Very high
11	Better control of movements during training to avoid injuries	4.73	0.45	Very high
12	Improved recovery after intense training	4.73	0.45	Very high
13	Reduced pain or discomfort during exercise	4.80	0.41	Very high
14	You have a deep understanding of functional training	1.33	0.48	Very low

Table 13 showed that the subjects in the experimental group responded to the project evaluation in:

1. Very high perception: (1) Satisfied with the overall experience=4.80±0.41, (2)The training content met expectations=4.67±0.88, (3)Training program intensity=4.67±0.88, (4)Improved strength and power=4.73±0.45, (5) Improved Balance and stability=4.60±0.50, (6) Improved Coordination and Agility=4.73±0.45, (7) Improved Reaction time and Endurance=4.60±0.63, (8) kick speed increased=4.80±0.41, (9) kick power enhanced=4.73±0.45, (10) Better control of movements during training to avoid injuries=4.73±0.45, (11) Kick is more flexible in actual combat=4.73±0.45, (12) Improved recovery after intense training=4.73±0.45, (13) Reduced pain or discomfort during exercise=4.80±0.41.

2. Very low Perceived: You have a deep understanding of functional training=1.33±0.48

The experimental group of subjects who participated in the functional training program had a high level of recognition of the benefits, value, and process of functional training.

Summary of research results

The research result on "Construction of Functional Training Program to Improve Taekwondo Kick Performance for Sport School Students" revealed that:

1. The FMS score of the experimental group was significantly improved after functional movement training in the experimental group ($P<0.05$), but there was no significant difference in the control group.

2. The physical fitness was improved after training both in the experimental group and the control group, but had more improvement in the experimental group than in the control group ($P<0.05$).

3. The skills of kicking were improved after training in both the experimental group and the control group, but the experimental group showed more obvious improvement than the control group ($P < 0.05$).

Conclusion

The results of this study demonstrate that functional movement training significantly enhances the physical performance and skills of sport school students, particularly in the context of Taekwondo. Participants in the experimental group showed notable improvements in their Functional Movement Screen (FMS) scores compared to the control group, indicating better movement quality and reduced injury risk. These findings highlight the importance of integrating structured functional training into athletic development programs.

In terms of physical fitness, both the experimental and control groups experienced progress; however, the experimental group outperformed the control group across nearly all tested areas, including sit-ups, flexibility, push-ups, and sprint performance. Similarly, while improvements in Taekwondo kicking skills were observed in both groups, the experimental group showed significantly greater gains in speed, power, and agility. This suggests that functional training is more effective than traditional methods for enhancing sport-specific skills.

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Moreover, participant feedback from the experimental group reflected high satisfaction with the training program. Most subjects reported improvements in strength, coordination, balance, and recovery, affirming the program's value. However, despite these benefits, a low level of understanding of functional training concepts was observed, indicating the need for better education alongside training. Overall, the study validates functional training as a practical and efficient approach for enhancing athletic performance in young Taekwondo practitioners.

Discussion

Wei et al (2021) conducted 8 weeks of functional training on 12 Taekwondo athletes. The results showed that the core stability of the 12 Taekwondo athletes was significantly improved in different ways. Mao (2016) conducted suspension training in functional training. After the experiment, the functional movement screening index of Taekwondo athletes increased significantly overall; their core muscles were strengthened, and their core stability was significantly improved. Wei (2018) used functional training to study the balanced development of bilateral leg kicking techniques in male Taekwondo athletes and found that functional training has a more obvious effect than traditional physical training. Dong (2019) conducted an experimental intervention on Taekwondo athletes through suspension training methods in functional training. The study showed that suspension training can effectively improve the limb balance and core stability of Taekwondo athletes. Adding suspension training methods to daily physical training can help Taekwondo athletes improve their balance and core stability. Bai (2019) conducted functional physical training on the basis of traditional physical training for Taekwondo athletes. This compound training method can not only improve the physical fitness of athletes but also has an excellent prevention and recovery effect on athletes' sports injuries. Wang (2019) verified that functional physical training can effectively improve the agility of Taekwondo athletes. Li (2020) believes that functional training is a supplement to Taekwondo's specific physical fitness and is conducive to promoting the transformation of the body's specific qualities.

Functional training aims to improve an individual's daily functional ability and make functional training suitable for anyone and any project. This study introduced functional movement screening into Taekwondo and used advanced foreign experience and scientific training methods to explore the application of functional movement training in youth Taekwondo training. On the one hand, FMS can help screen out potential physical weaknesses, evaluate sports injuries, identify weak links in sports ability and physical limitations, strengthen the practice of functional movements, effectively reduce the occurrence of sports injuries, and provide a theoretical basis for daily sports teaching. On the other hand, by exploring the positive impact of FMS on the process of Taekwondo sports students, we call on more sports workers, including teachers on campus, coaches of training institutions, etc. to use FMS as a regular training auxiliary tool, apply it to daily sports teaching, identify sports injuries and training deficiencies in daily training, and thus formulate and improve training plans and training methods, and ultimately achieve the goal of improving the physical health level of young students and achieving the sustainability of sports. Therefore, this study has far-reaching practical application value.

Recommendation

1. Policy Recommendation:

Educational institutions and sports authorities should consider incorporating functional movement training programs into the official curriculum for sports schools, particularly for disciplines like Taekwondo. Policymakers should allocate resources and provide structured guidelines to ensure that such evidence-based training methods are systematically implemented to enhance athlete development, prevent injuries, and improve long-term performance outcomes.

2. Practice Recommendation:

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Coaches, trainers, and physical education instructors should adopt functional training methods as part of their regular training routines. Emphasis should be placed on improving fundamental movement patterns, strength, flexibility, and coordination through functional exercises. Additionally, trainers should provide basic education on the principles of functional training to increase athletes' understanding and engagement with the program.

3. Further Research Recommendation:

Future studies should explore the long-term effects of functional movement training across different age groups, sports, and performance levels. Comparative research involving larger and more diverse populations could provide deeper insights. It is also recommended to investigate the integration of technology and digital tools in delivering functional training to enhance accessibility and monitoring of progress.

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