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Application of functional motion screening test in physical fitness test of No.14 Middle School of Kaifeng

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Abstract: *The obesity rate of students is increasing year by year, the physical health status is declining, and the incidence of cardiovascular disease is also increasing. The physical fitness test of students involves strength, cardiorespiratory endurance, flexibility, explosive power and other aspects. The overall poor physical test results of middle school students are related to training. Functional screening is a way of physical training evaluation. Scientific evaluation methods are introduced into the physical fitness training of middle school students. Diagnostic evaluation can effectively guide students to correct bad movement patterns during training, ensure the normal performance of movement patterns, and effectively prevent sports injuries. Combining students' physical fitness training with functional screening, and scientifically arranging training plans for movement diagnosis can better promote the overall development of middle school students' physical fitness. This research takes the students of the 14th Middle School of Kaifeng City as the research objects, and adopts scientific research methods such as literature data method, expert interview method, experimental method, mathematical statistics method and so on. The study found that in the physical fitness test of the experimental group of students, the 50 meters, sitting forward bending, pull-ups/sit-ups, 1000-meter running/800-meter running were significantly improved compared to before the experiment, and the improvement was even greater than that of the control group. Significantly, after being diagnosed by the FMS test, students in the experimental group developed a targeted training plan. Not only did their physical fitness test scores improve, but also their physical fitness test scores. That is, the higher the FMS test score, the better its athletic ability and performance.*

Keywords: *Middle school students; FMS test; Physical fitness; Training plan*

1. Introduction

Nowadays, the obesity rate of middle school students is increasing year by year, their physical health status is declining, and the incidence of cardiovascular diseases is also on the rise. The declining physical health condition of middle school students has aroused the attention of education department. The release of "National Students' Physical Health Standards" only limited the rising trend of students' obesity rate to a certain extent, but students' physical health status has not been effectively improved. Students' physical fitness test involves strength, cardiopulmonary endurance, flexibility, explosive power and other aspects. The overall poor performance in physical tests of middle school students is related to training. Functional screening is a means of evaluation of physical training. By introducing scientific evaluation means into physical fitness training of middle school students, diagnostic evaluation can effectively guide students to correct bad movement patterns in training, ensure the normal play of movement patterns, and effectively prevent sports injuries. [1] Combining students' physical fitness training with functional screening and arranging training plans scientifically for motion diagnosis can better promote the overall development of physical fitness of middle school students.

2. Research Object and Research Method

2.1. Research Object

This paper takes Kaifeng 14th Middle School students as the research object.

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2.2. Research Methods

2.2.1. Literature method

Refer to the previous research results related to this study in literature, master the research status of students' physical health and functional screening, and provide a theoretical basis for the writing of this study.

2.2.2. Expert interview method

According to the research needs of this paper, I consulted experts in physical education and physical training in schools to understand the training methods for improving physical health of middle school students at the present stage, consulted the feasibility of functional test actions in middle school students, and analyzed the functional screening action indicators. In addition, I consulted experts on the research ideas and methods to provide practical guidance for the writing of the paper.

2.2.3. Experimental test method

According to the research needs, 20 students from No.14 Middle School of Kaifeng were selected to conduct 7 basic movement tests including physical fitness, motor ability and functional ability. Through the tests, defects in students' physical fitness, motor ability and movement pattern were understood to provide support for the formulation of training plans.

2.2.4. Mathematical statistics

According to the physical fitness, athletic ability and functional screening results obtained by the experimental test, statistical software EXCLE and SPSS were used for data statistics and analysis, and the physical differences of different groups of students were compared horizontally to provide quantitative basis for the text analysis.

3. Research Results

3.1. Definition of Related concepts

3.1.1. Constitution test and evaluation content

Constitution is the quality of human body, which refers to the health condition of human body and the ability to adapt to the outside world. [2] Constitution is a comprehensive and stable characteristic of human form, structure, physiological function and psychological factors on the basis of heredity and acquisition. Physical health test in middle school includes three indicators: body shape, body function and body quality.The contents of physical health test evaluation of middle school students were shown in Table 1.

Table 1: Contents of physical health test evaluation of middle school students

Physical health test content	evaluation index
Height, weight	body shape
vital capacity	somatic function
50-meter race	Physical fitness (speed fitness)
sit and reach	Physical quality (flexibility)
Pull-ups (Men)/One-minute Sit-ups (women)	Physical fitness (coordination, strength)
standing broad jump	Physical quality (explosive power)
1000m Race (Men) / 800m Race (Women)	Physical fitness (endurance fitness)

3.1.2. Functional action screening

Functional motion Screening system Functional motion screening (FMS) test is mainly used in the field of sports injury rehabilitation and physical training. [3] Functional motion screening consists of seven movements: squat, hurdle step, straight lunge squat, shoulder joint flexibility, straight leg active lift, torso stable push-up, and rotation stability. Functional motion screening is an assessment technique used to assess imbalances in flexibility and stability. FMS test magnifies the problem of motion compensation of the tester, which is easy to find the problems in motion and the risk of sports injury. This kind of test can measure some basic motor ability of the subjects, and the test results are the starting point of formulating the exercise training plan (Figure 1).

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Figure 1: Schematic diagram of functional test actions

3.2. Experimental Procedure

Twenty eighth grade students from No. 14 Middle School of Kaifeng were selected as experimental subjects and randomly divided into experimental group and control group, with 10 students in each group and 5 men and 5 women. The experiment was carried out for 12 weeks.

Experimental procedure:

Experimental group:

Step 1: the national physical health test was conducted before the experiment.

Step 2: Perform a functional motion screening test and record the score.

Step 3: Develop a training plan according to physical test data and functional screening results, execute the training plan, and conduct physical health and functional screening tests again after the training plan, and record the scores respectively.The t*raining plan of experimental group* were shown in Table 2.

Table 2: Training plan of experimental group

Training objective	Training action
Soft tissue activation	Rolling foam shaft
Pillar activation	Shoulder joint surround, plank, hip bridge
dynamic stretching	Whole body muscle group
Neural activation	Jumping jacks, trotting
Static drawing	Whole body stretch, way
upper body strength	Dumbbell rowing, bench press, TRX upper body training
Lower limb strength, coordination, stability	Weight-bearing squats, weight-bearing lunges, heel raises, lower limb static stretching, ball balance exercises
Explosiveness and agility	Kettlebell, rope ladder training, sprint run, quadrant jump
aerobic exercise	Belly curl, combat rope, squat, 400-meter run

Control group:

Step 1: National physical health test was conducted before the experiment.

Step 2: Formulate a training plan according to the physical test results, execute the training plan, and conduct the physical health test again after the end of the training plan, and record the scores respectively. *The training plan of control group* were shown in Table 3 below.

Table 3: Training plan of control group

Training objective	Training action
strength training	Push-ups, sit-ups, squats, lunges, leg lifts, frog jumps
explosion	Belly jump, lunge switch leg jump, squat jump, longitudinal jump,
speed quality	Reactive games, in situ high lift leg turn acceleration run, left and right leg cross jump, relay run
Aerobic endurance quality	Variable speed run, 800-meter race, obstacle run
Sensitivity and coordination	Running back, jumping rope, aerobics

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Before the experiment, the physical health conditions of the two groups of students were compared and tested for differences:The variation range of physical health test values of experimental group students before and after the experimentwere shown in Table 4 below.

Table 4: Variation range of physical health test values of experimental group students before and after the experiment

test item	experimental group x±S	control group x±S	T	P
50-meter race(s)	8.55±0.87	8.3±0.57	2.134	0.15
sit and reach(cm)	15.4±2.97	14.5±2.15	3.154	0.24
standing broad jump(cm)	1.93±0.26	1.96±0.22	2.118	.36
Pull-ups/sit-ups	18.2±17.6	17.9±16.5	1.614	0.14

According to the data in the table above, there is no significant difference between the two groups of students in the five tests before the experiment, which will not interfere with the experimental results.

3.3. Analysis of two groups of students' physical health test data

3.3.1. Numerical change analysis of physical test items in experimental group before training

Table 5: Variation range of physical health test values of experimental group students before and after the experiment

Test item	1	2	3	4	5	6	7	8	9	10
50-meter race(s)	0.2	0.6	0.4	0.3	0.2	0.4	0.5	0.1	0.4	0.3
sit and reach(cm)	4.5	4.1	3.8	2.6	2.1	3.2	2.6	3.8	4.7	2.5
standing broad jump(cm)	0.02	0.21	0.04	0.17	0.25	0.06	0.51	0.16	0.05	0.14
Pull-ups/sit-ups	3	5	4	6	1	15	13	19	14	16
1000-meter race/800-meter race (s)	0.16	0.28	0.17	0.24	0.11	0.32	0.24	0.19	0.28	0.13

Students in the experimental group were tested before and after the experiment, and the changes of the five test indexes of physical fitness are shown in Table 5. The test data showed that the performance data of five physical fitness tests had improved to some extent compared with that before the experiment.

3.3.2. Analysis of numerical changes of physical test items before and after training in the control group

The students in the control group were tested before and after the experiment, and the changes of five test indexes of physical fitness were shown in Table 6 below. The overall scores of students in the control group also improved, but there were also cases of declines after individual experiments.

Table 6: Variation range of physical health test values of students in control group before and after the experiment

Test item	1	2	3	4	5	6	7	8	9	0
50-meter race(s)	0.1	0.3	0	-0.1	0.2	0	0.14	0.23	-0.15	0.04
sit and reach(cm)	1.2	2.6	1.5	0.6	1.7	2	1.3	1.8	0.4	1.5
standing broad jump(cm)	0.02	0.13	0.05	0.15	0.26	0.14	0.03	0.06	0.04	0.1
Pull-ups/sit-ups	1	0	0	1	0	5	6	4	7	3
1000-meter race/800-meter race (s)	0.02	0.09	0.1	0.04	0.02	0.1	0.17	0.05	0.09	0.03

3.3.3. Comparative analysis of results of experimental group and control group

(1) Comparison of 50-meter race results between the two groups of students

The average score of the experimental group increased by 0.34s in 50m events, while that of the

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control group increased by 0.11s. The average score improvement of the experimental group was higher than that of the control group, but the score improvement of No.8 was lower than that of the control group. According to the data in Figure 2, the numerical changes of the 50-meter race between the two groups show that the performance of the control group has limited improvement, while the performance of No. 4 and No. 6 students has decreased.

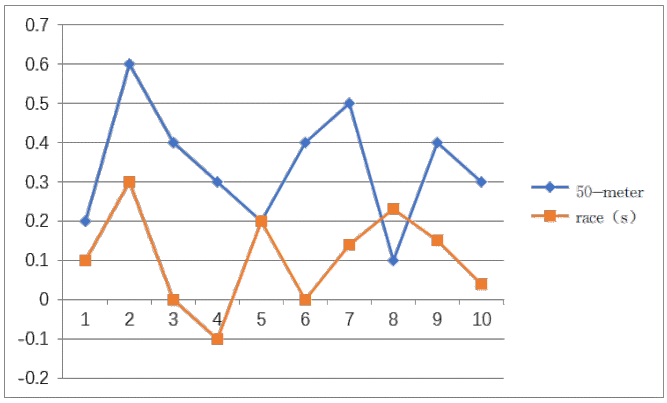

Figure 2: Comparison of the results of the 50-meter race

(2) Comparison of sit and reach scores between the two groups

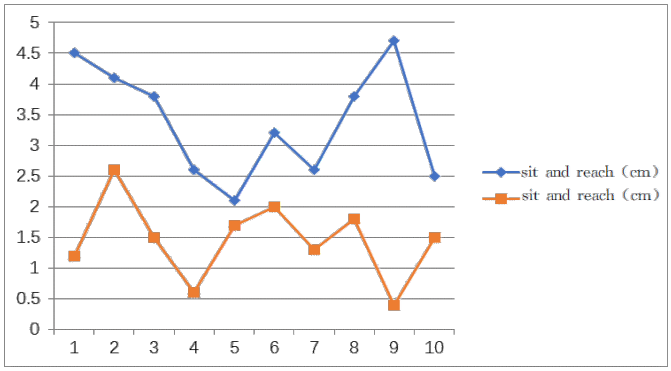

Figure 3: Comparison of the change values of forward flexion scores

The average score of sit and reach items increased by 3.39cm in the experimental group and 1.46cm in the control group. The average score improvement of the experimental group was higher than that of the control group. It is not difficult to find that the diagnostic evaluation increased the pertinence of the training plan. The students in the experimental group realized their lack of flexibility through the FMS test and added flexibility targeted training content to the training plan, so the improvement effect was more significant.The comparison of the change values of forward flexion scores were shown in Figure 3.

(3) Comparison of standing broad jump results between the two groups of students

The standing broad jump scores of students in the experimental group increased by 0.16cm on average, while those in the control group increased by 0.1cm. The scores of the experimental group and the control group were basically the same. It is difficult for students to improve their lower limb explosive power in a short time, so there is little change in the improvement of students' standing broad jump performance in the two groups. But in the test, the coordination of the experimental group was significantly better than that of the control group. The diagnosis of students' coordination in the FMS test serves as a basis for increasing the adjustment of training content to help students achieve the improvement of coordination.The comparison of standing broad jump scores were shown in Figure 4.

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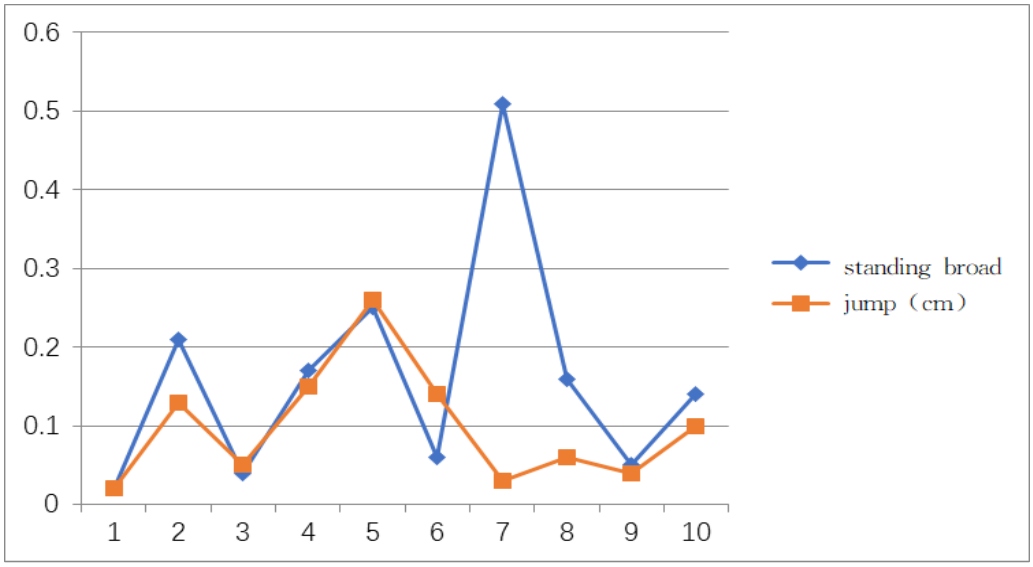

Figure 4: Comparison of standing broad jump scores

(4) Comparison of pull-up results between the two groups

Standing broad jump scores of students in the experimental group increased by 3.8 points on average, while those in the control group increased by 0.8 points. The experimental group was significantly better than the control group. After the FMS test, the training for students' upper body strength, body coordination and muscle endurance effectively improved students' pull-up performance and made up for the deficiency of poor pull-up performance. The comparison of pull-up performance change values were shown in Figure 5.

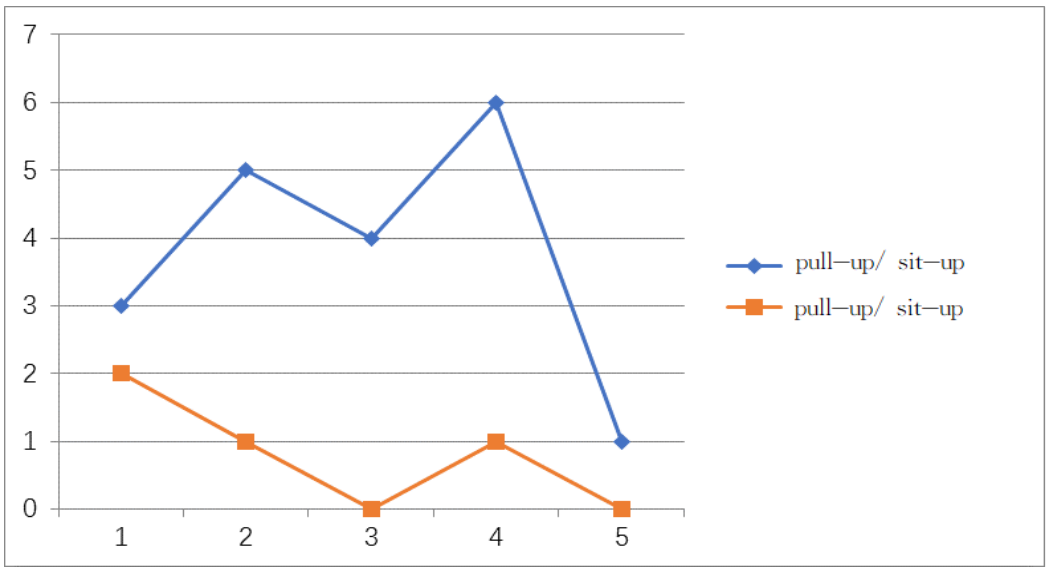

Figure 5: Comparison of pull-up performance change values

(5) Comparison of sit-up scores between the two groups

Students in the experimental group improved their sit-up scores by 15.4 points on average, compared with 5 points in the control group. The experimental group was significantly better than the control group. After the FMS test, the training for students' core strength and muscle endurance effectively improved students' sit-up performance, and the performance improved significantly. The comparison of the variation values of sit-up performance were shown in Figure 6.

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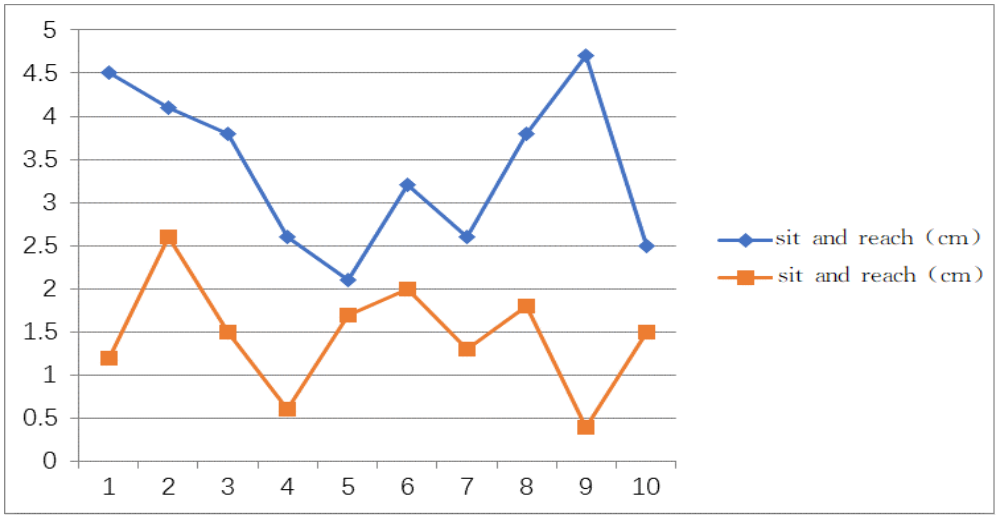

Figure 6: Comparison of the variation values of sit-up performance

(6) Comparison of 1000m / 800m scores between the two groups

The experimental group's 1000m / 800m performance improved by 0.21 seconds on average, while the control group's improved by 0.07 seconds. The endurance level of middle school students is poor in physical health. The experimental group that increased the FMS diagnostic test increased the aerobic training content in the training, as well as the training to improve the coordination of the upper and lower limbs. The improvement of the coordination of the upper and lower limbs of the students is of great help to the aerobic endurance duration of the students, and the performance of the students in the 1000m / 800m running is better than the simple aerobic endurance running training.The comparison of 1000m / 800m change values were shown in Figure 7.

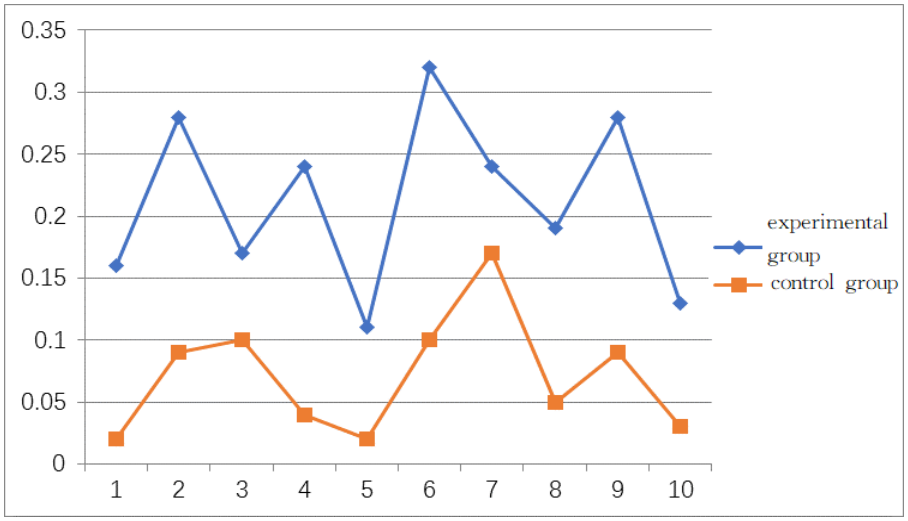

Figure 7: Comparison of 1000m / 800m change values

3.4. Analysis of FMS test data of two groups of students

Both groups scored an average of 9.7 on the FMS test before the experimental group and 9.5 on the FMS test before the control group. The average score of the experimental group was 15.2 and 10.5. Before the experiment, the average scores of the two groups of students in the FMS test were similar, and there was no significant difference. After the experiment, the average score of the experimental group increased by 5.5 points, while the average score of the control group increased by only 1 point. The FMS scores of the experimental group increased more significantly. After the training, the movement pattern, balance, coordination and stability of the students in the experimental group were greatly improved. Combined with the physical fitness test results, the experimental group of students after the FMS test diagnosis after the targeted development of training plans, not only physical fitness test results improved, but also improved the physical fitness test results. That is, the higher the FMS score, the better the athletic

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ability and performance. The Comparison graph of total score change of FMS test were shown in Figure 8.

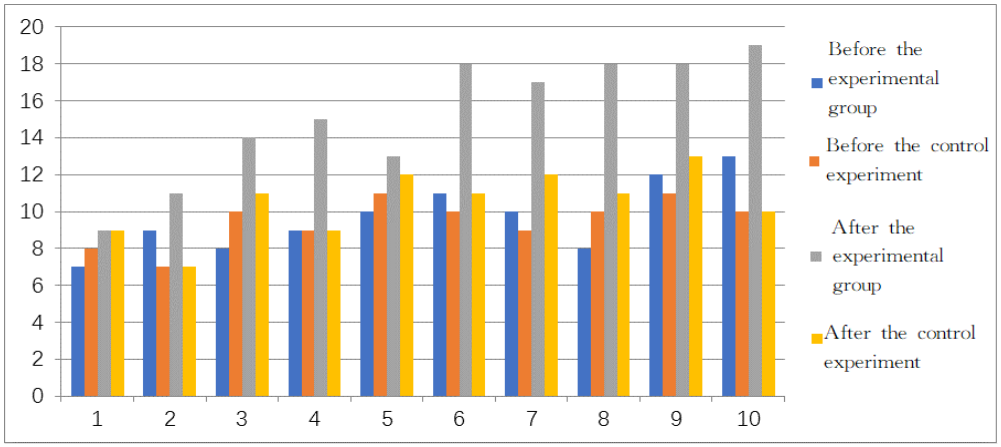

Figure 8: Comparison graph of total score change of FMS test

4. Conclusions and suggestions

4.1. Conclusions

First, before the experiment, there was no significant difference between the physical health test data of the two groups of students. In the experiment, FMS test was used to diagnose the exercise ability of students in the experimental group, so as to understand the situation of students' coordination, balance and stability, and formulate training plans according to the results of FMS test. The physical health test of students in the experimental group in 50m, sit and reach, Pull-ups/sit-ups, 1000-meter race/800-meter race was significantly improved compared with that of the control group.

Second, the average score of students in the two groups before the FMS test was 9.7 in the experimental group and 9.5 in the control group. After the experiment, the average score of the experimental group increased by 5.5 points, while the average score of the control group increased by only 1 point. The FMS scores of the experimental group increased more significantly. The experimental group of students after FMS test diagnosis after the targeted development of training plans, not only the physical health test results improved, but also improved the physical health test results. That is, the higher the FMS score, the better the athletic ability and performance.

4.2. Suggestions

First, the FMS test should be added to the physical health test of primary and secondary schools. The evaluation should be carried out according to the test results, and the training content of balance, coordination and stability should be added according to the evaluation results, so as to jointly improve the athletic ability and physical quality of students.

Second, in the FMS test, the plan to correct the movement pattern and improve the movement ability should be combined with the actual situation of students and be more targeted and effective.

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