[1]Yuan Yao

Influence of Functional Training on Special Technical Movement Ability and Athletic Performance of Male Basketball Players

Abstract: - Functional training, since Beijing Olympic Games, from field of medical rehabilitation to field of competitive sports, advanced scientific training concepts and training methods have gradually been recognized by domestic competitive sports workers and coaches. Therefore, functional training should be developed to grass-roots team to lay a solid foundation for sustainable development of competitive sports in our country. In this paper, a complete set of functional physical training program is designed by using methods of literature, expert interviews, experiments, mathematical statistics, and logical analysis. Finally, it is found that functional training can improve physical coordination of men's basketball. And symmetry, flexibility of athletes' ankle joints, thoracic spine, shoulder joints and stability of knee joints and cores have been improved, reducing probability of sports injuries, providing a theoretical basis for innovative scientific training of male basketball players in my country.

Keywords: men's basketball; functional training; physical fitness evaluation; training program

1 INTRODUCTION

In recent years, sport of basketball has developed into most popular collective sport with a very wide range. From increase of various basketball leagues at all levels, to small basketball friendly games in various towns, it can be said that basketball project has developed very rapidly. For professional athletes or general basketball fans, it is their pursuit and desire to rapidly improve their basketball skills in a short period of time. When movement learning and skill development of these basketball players reach a certain limit, progress of basketball technology begins to encounter a bottleneck. This is actually limited by their own physical fitness. After realizing this problem, basketball training introduced special physical training. In basketball special physical training, in order to increase muscle dimension and improve muscle strength in early stage of training, it is mainly to imitate some other strength training. After a long period of development and research, basketball-specific physical training for basketball was gradually introduced. This training mode is based on characteristics of basketball, emphasizing strengthening of muscles such as brachii major and quadriceps femoris, and these muscles are all important muscles in basketball. This training mode can improve a player's basketball skills. However, many athletes have been injured in this physical training, which has a negative

[1] Moray House School of Education and Sports, University of Edinburgh, Edinburgh EH8 9YL, UK

yaoyuan8w998@163.com

impact on their basketball. The muscle structure of human body is like a precise instrument. Suppose torso strength of a basketball player is regarded as an engine. The bottom of engine corresponds to muscles on lower side of medullary joint, front side corresponds to muscles of lower chest and upper abdomen of athlete, and back side corresponds to muscles of lower chest and upper abdomen of athlete. It corresponds to muscles above medullary joint and upper back, while lid corresponds to diaphragm. Agility and trunk strength can provide speed and explosiveness, so if you want to greatly improve level of basketball competition, then agility and core strength must be strong. For example, when some basketball players are in one-on-one defense, if agility is insufficient and speed of moving left and right is slow, it will be difficult to defend offensive players. Therefore, in process of regular basketball training, it is quite necessary to increase training of sensitive qualities. The training of agile quality is mainly based on one's own "active force", emphasizing coordinated force of whole body, which coincides with "kinematic chain" theory of functional training.[1-2]He believes that important training method to improve agility of athletes is to carry out functional training.

Functional training was originally a rehabilitation method derived from field of injury rehabilitation. In process of treating injured athletes, physical therapists found that sports injuries of athletes were mainly due to poor stabilizing muscle function, and force was applied to another. caused by muscle transfer. Athletes use functional training to restore their own function when their body is not functioning properly after an injury. Therefore, there is a point of view that sports injuries can be recovered through functional training[3]. From this point of view, if athletes are allowed to perform functional training in advance, can injury be prevented? A detailed experimental study has been carried out, and results also prove that functional training in advance can not only reduce sports injuries of athletes, but also promote athletes' competitive ability to a certain extent[4-5]. Although many literatures have well analyzed benefits of functional training, and used principles of biomechanics to systematically analyze and explore biomechanical principles of various basketball qualities and muscle groups involved, however, there is a There is a lack of research results on improving basketball skills through functional training, and even research on functional training for a certain part of basketball players' limbs is still blank at present. By adopting special functional training in line with characteristics of basketball, physical quality and basketball skills of basketball players can be improved to a great extent[6-7]. Therefore, college men's basketball team should keep up with pace of times and popular trends. If you want to improve performance of game, you must improve your physical fitness through scientific physical training methods, and then improve basketball team's technical, tactical level and competitive ability.

2 RELATED WORK

Experts and scholars at home and abroad have been researching and practicing functional training for many years, so they are gradually deepening and mature in both theory and practice. At present, foreign researchers have not unified concept of functional training, and Chinese and foreign scholars have not reached a consensus on concept of functional training[8-9]. The application of functional training in fields of fitness and rehabilitation has been quite popular in some developed countries, such as United States[10-11]. The application and research in field of competitive sports are also quite extensive, and functional training has been widely used in many projects, such as track and field, football, golf and so on. After functional training, athletes are tested by

FMS system, and FMS scores of athletes are also constantly improving[12-13].

The incidence of sports injuries has been controlled to a certain extent, and some limiting factors have been gradually eliminated. It can also allow athletes to train in a better sports state. And some scholars and coaches use functional training to provide athletes with effective functional training for rehabilitation, which is beneficial to athletes' injury recovery[14-15]. If it is in field of rehabilitation, methods and forms used in this field mainly include following: 1. Enhance stability of central axis through strengthening of spine and muscles around spine; 2. Through balance exercises and proprioception Exercise to improve neuromuscular control; 3. Improve overall athletic ability of athletes through sensitive training; 4. Improve basic strength and functional strength of athletes through resistance strength exercises. Through outstanding achievements of functional training in field of sports rehabilitation, concept and practice of functional training have been gradually introduced into sports training to improve performance of athletic ability.

[16-17]Believes that in field of functional training, many do not use large-scale republic equipment, but exercise unstable movement, exercise to overcome one's own body weight, and exercise to improve one's functional ability. This is in practice. The effect is also very prominent. For example, unsteady exercises against body weight or small equipment in unstable situations. [18-19]Through "Following Path of Functional Training", "Functional Model" and later "Strength and Function" have all explained this training profoundly, which is mainly reflected in following points: "Functional training is a multi-joint, A series of movements related to body's own functions, including ability to decelerate, accelerate and stabilize, ability to control trunk in an unstable state, movement and control of center of gravity, ground integration of responsiveness and impulse”.

3 ARCHITECTURE

The "Functional Fitness Training Pyramid" is basic framework for functional fitness training of national women's handball team in preparation for 2012 London Olympics, and application of this model has been successful in national women's handball team. Figure 1.

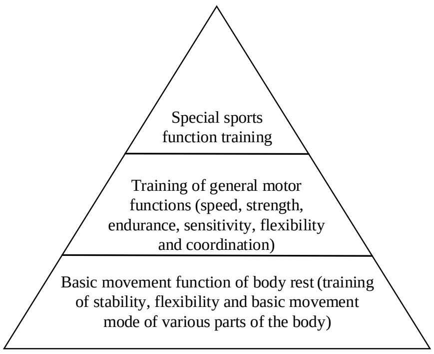


Figure 1 Pyramid model of functional fitness training

The Functional Movement Screen (FMS) is widely used in athletic ability assessment of American professional athletes, and physical assessment standards of International Tennis Association (ITF) and ATP. Functional movement screening is an innovative movement model known as a movement quality assessment system[20,21]. It is very simple and easy to operate, and is mainly used for evaluation of basic sports ability of various human bodies. Using this evaluation method, some basic sports ability of subjects can be tested. It can detect balance between flexibility and stability, amplify action compensation, so that we can better find out where our own problems lie, that is, these irregular movements will cause injury to a certain part of body, it can expose Subject's dysfunction or pain, through these 7 test methods, can reduce risk of injury during exercise. The test method is shown in Figure 2.

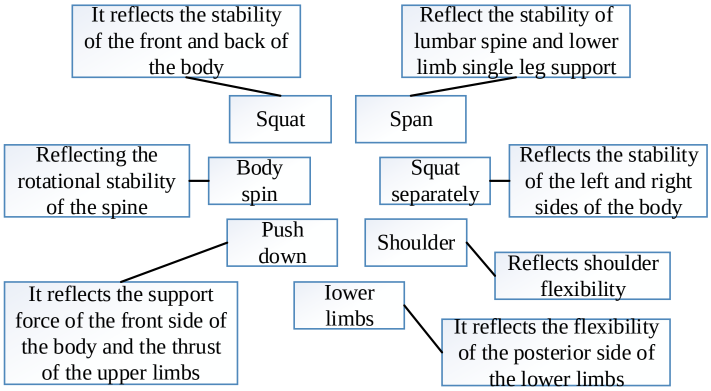


Figure 2 FMS Screening Diagram

Physical function training is not contradictory with general physical training and special physical training. The three complement each other and fill gap. When traditional physical training is difficult to improve sports performance, physical function training can be used to improve human athletic ability, thereby improving sports performance. score. Functional training is a new method of physical training in current world, and it is an unprecedented innovation. Its scientific nature, advanced nature, and timeliness have been proven in practice around world. Functional movement screening is logical starting point for implementation of physical function training. The formulation of training plan provides basis and is cornerstone of physical function training. Figure 3.

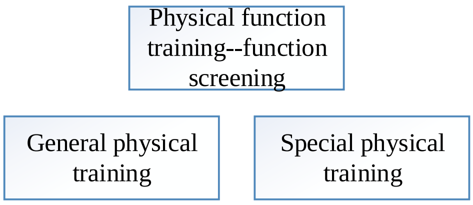


Figure 3 The relationship between physical function training (functional movement screening), general physical training, and special physical training

Human movement is composed of two aspects: external features (action) and internal features (energy metabolism). Body parts include upper body, lower body and whole body. The way body moves is divided into push, pull and rotation. In basketball, actions of passing and shooting are upper-body pushes, actions of catching and rebounding are upper-body pulls, defensive footsteps and offensive breakthroughs, take-offs are lower-body pushes and pulls, pick-and-rolls and high-distance passes are body rotations. The flexibility and stability of body are foundation. Only by prioritizing development of flexibility and stability and reducing muscle compensatory movements will probability of sports injuries be reduced. Upper body push-pull, lower body push-pull, and body rotation will affect development of speed, strength, and endurance of human body[22,23]. At same time, strength, speed, and endurance require different energy metabolisms. Strength training requires phosphogen for energy, with short time and high intensity; speed requires phosphate and glycolysis for energy; endurance requires glycolysis and glycolysis. Aerobic energy supply, long time and low intensity (Figure 4).

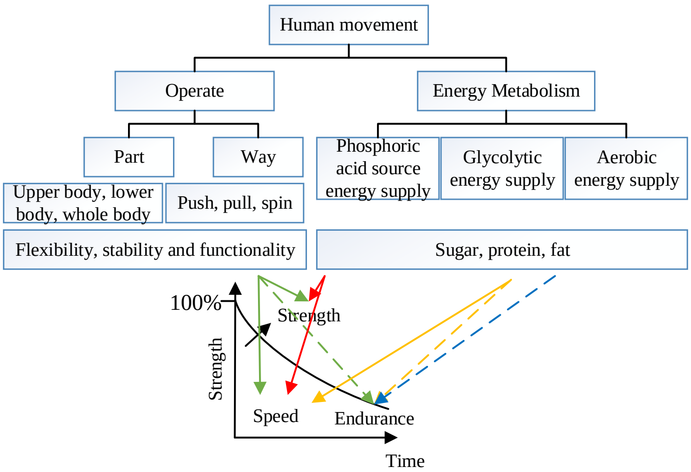


Figure 4 Schematic diagram of essence of human motion

The general process of training session for men's basketball team is similar to steps in functional training mode (Figure 5). The first step is foam roller rolling to relax fascia; second step is static stretching; third step is flexibility, activation And dynamic warm-up, fourth step of explosive power exercises, medicine ball throwing, fast-stretching compound training (plyometric training) and speed training, fifth step of strength training, sixth step of energy system training. Intensity from scratch, from low to high, impact from scratch, is a relatively scientific training system for men's basketball players.

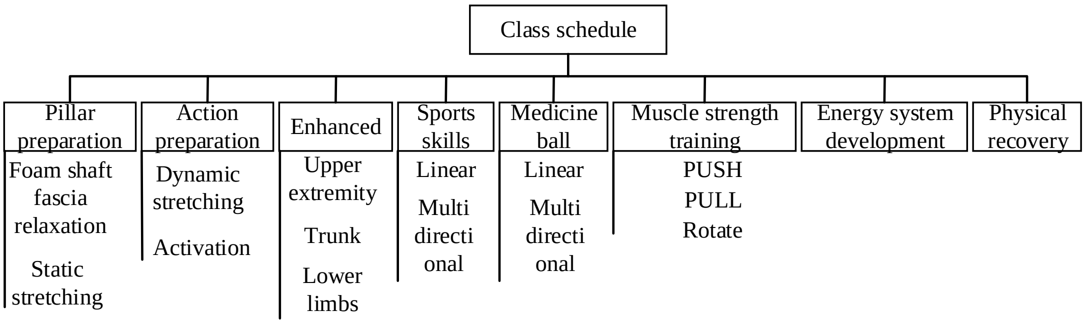


Figure 5 Arrangement of functional training mode

Agile Testing: This is one of most common ways to measure speed and agility. 3 cones, each 5 meters apart, are placed horizontally in a straight line (see Figure 6). First, stand on No. 1 cone and wait to start. After giving order, quickly run to No. 2 and touch No. 2 cone with your right hand. Then sprint backwards to cone 3, touch cone 3 with your left hand, sprint backwards to return to cone 1 at starting point, and stop watch.

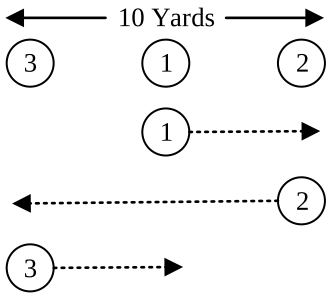


Figure 6 15-10-5 Agile Test

4 ALGORITHMS

The MRAN algorithm is developed on basis of RAN learning algorithm and RANEKF learning algorithm. The learning process of MRAN algorithm involves introduction of new hidden layer neurons, adjustment of network parameters and deletion of hidden layer neurons[24]. The learning algorithm is as follows:

(1) For each input x_i, calculate:

$$\varphi_k\left(x_i\right)=\exp\left(-\frac{1}{\sigma_k^2}\left\|x_i-c_k\right\|^2\right), k=1,\ldots K \quad (1)$$

$$\hat{y}_i=f\left(x_i\right)=w_0+\sum_{k=1}^{K} w_k\varphi_k\left(x_i\right) \quad (2)$$

$$d_i=\min_{1\le k\le K}\left\|x_i-c_k\right\| \quad (3)$$

$$\delta_i=\max\left\{\gamma^i\delta_{\max},\delta_{\min}\right\} \quad (4)$$

$$e_i=y_i-\hat{y}_i \quad (5)$$

$$e_{ms}^i=\sqrt{\sum_{j=i-(M-1)}^{i}\frac{\left\|e_j\right\|^2}{M}} \quad (6)$$

Where, d_i is Euclidean distance between x_i and center of hidden layer nearest to it, $\delta_{\max}$ and $\delta_{\min}$ are maximum and minimum distances between input data, respectively. $0<\gamma<1$ is an attenuation coefficient. With increase of input data, δ_i decreases exponentially until $\delta_{\min}$. M is width of RMS sliding window (generally 40-50, which needs to be set empirically), e_{rms}^i is root mean square (RMS) of output error after windowing when i sample enters RBFNN.

(2) If three conditions $|e_i| > \varepsilon, d_i > \delta_i \$ \$ e_{rm}^i > \varepsilon_i$ (where ε is expected approximation accuracy and ε_i is preset threshold) are satisfied at same time, a new hidden layer neuron is added to network, and $K = K + 1$. The parameters of newly added hidden layer neuron are:

$$w_{K+1} = e_i \quad (7)$$

$$c_{K+1} = x_i \quad (8)$$

$$\sigma_{K+1} = \kappa d_i \quad (9)$$

Where, κ are overlap factors, which are used to determine response width of hidden layer neurons.

If conditions are not met, go to step (3) and update network parameters with EKF.

(3) Update network parameters according to following formula:

$$v_i = v_{i-1} + K_i e_i \quad (10)$$

$$K_{i(z \times n_y)} = P_{i-1} B_i \left[R_i + B_i^T P_{i-1} B_i \right]^{-1} \quad (11)$$

$$P_i = \left[I_{z \times z} - K_i B_i^T \right] P_{i-1} + q_0 I_{z \times z} \quad (12)$$

(4) Calculate output vector of all hidden nodes $O_k^i = \left(o_{k1}^i, \ldots, o_{kj}^i, \ldots o_{ky}^i \right), i = 1, \ldots N, k = 1, \ldots, K, j = 1, \ldots, n_y$ and $\left\| o_{j,\max}^i \right\| = \max \left(\left\| o_{1,j}^i \right\|, \left\| o_{2,j}^i \right\|, \ldots, \left\| o_{K,j}^i \right\| \right), \left(j = 1, \ldots, n_y \right)$, which represents maximum absolute value of all hidden nodes to j output unit when input sample i. Calculate normalized output vector of each hidden node:

$$r_{kj}^i = \frac{\left\| o_{k,j}^i \right\|}{\left\| o_{j,\max}^i \right\|}, (k = 1, \ldots K) \quad (13)$$

During input of N_w consecutive samples, if $r_{kj}^i < \varepsilon_2$ are all established, k hidden node is deleted, and dimension of P_i is correspondingly reduced, so as to adjust EKF parameters in next step.

Parameter status. $K_{i(x\times n_y)}$ is Kalman gain matrix:

$$K_{i(\{\times n_j)} = P_{i-1}B_i\left[R_i + B_i^T P_{i-1} B_i\right]^{-1} \quad (14)$$

Where, $z = n_y + K \times (l + n_y + 1)$ is number of network parameters, n_y is number of output nodes, and R_i is variance matrix of measurement noise. And $B_i = \nabla_v f(x_i)$ is gradient matrix of $f(x)$ with respect to parameter vector v_i:

$$\begin{aligned} B_i = \Big[& I, \varphi_1(x_i) I, \varphi_1(x_i)\left(2w_1/\sigma_1^2\right)(x_i - c_1)\Big]^T, \\ & \varphi_1(x_i)\left(2w_1/\sigma_1^3\right)\|x_i - c_1\|^2, \ldots, \\ & \varphi_K(x_i) I, \varphi_K(x_i)\left(2w_K/\sigma_k^2\right)(x_i - c_k)^T \\ & \varphi_K(x_i)\left(2w_K/\sigma_k^3\right)\|x_i - c_k\|^2 \Big]^T \end{aligned} \quad (15)$$

P_i is output error covariance matrix, which is updated using following formula:

$$P_i = \left[I_{z\times z} - K_i B_i^T\right] P_{i-1} + q_0 I_{z\times z} \quad (16)$$

Here, I_{zxz} is an identity matrix and q_0 is a scalar, representing a random step size, which is used to determine size of random walk in gradient direction. When a new hidden layer node is introduced into network, dimension of P_i is increased, and new rows and columns need to be added in P_{i-1}:

$$P_i = \begin{pmatrix} P_{i-1} & 0 \\ 0 & p_0 I_{z| \, x1} \end{pmatrix} \quad (17)$$

Where p_0 is a parameter value of initial estimation, and here is covariance of sample data x_i and y_i. z_1 is number of parameters added due to introduction of new hidden layer nodes, $z_1 = l + n_y + 1$.

5 RESULTS

Table 1 FMS test results of men's basketball team before experiment (n=16)

Full name	Squat	Step over fence	Split leg squat	Shoulder flexibility	Supine leg lift	Trunk stability push ups	Rotational stability	Total score

ZJC	3	2	3	3	3	3	2	19
HSY	2	2	2	3	2	3	2	16
LHK	2	2	2	3	3	3	2	17
LJH	2	1	2	2	2	2	2	13
ZLJ	1	1	1	1	2	3	2	11
LR	2	2	2	1	2	3	2	14
WC	2	1	2	2	3	3	2	15
YYE	1	2	2	2	2	3	2	14
LBC	1	1	1	1	3	2	1	10
TLK	1	1	2	2	2	2	2	12
DBY	2	2	2	2	3	3	3	17
SZQ	2	2	2	2	2	3	2	15
LJ	2	2	2	1	2	2	2	13
WH	2	2	2	2	2	2	2	14
ZJW	1	1	1	1	1	2	2	9
CPH	2	2	1	2	2	1	2	12
Average value	1.81	1.63	2.00	2.00	2.43	2.62	1.88	14.38
Standard deviation	0.65	0.52	0.65	0.65	0.53	0.53	0.35	3.88

It can be seen from Table 1: The average test of men's basketball team is 14.38, and there are 5 people who have a score lower than 14. Among them, ZLJ's test value of squat, hurdle step, and split squat is 1 point each. From analysis of following four movements, it shows that his shoulder flexibility is poor, flexibility of spinal joint and stability of core General sex. The test values of LBC's squat, hurdle step, and split squat are 1 point each. From analysis of following four movements, it shows that his shoulder flexibility and core muscle stability are poor. ZJW's squat, hurdle step, and split squat test values are each 1 point[25]. From analysis of following four movements, it shows that stability of his core muscles is poor. If in next training process If not corrected, weaker parts of body will be compensated by other muscles, and their risk of sports injury will be greatly increased.

Table 2 Men's basketball team FMS test results after experiment (n=16)

Full name	Squat	Step over fence	Split leg squat	Shoulder flexibility	Supine leg lift	Trunk stability push ups	Rotational stability	Total score
ZJC	3	3	3	3	3	3	2	20
HSY	2	3	3	3	2	3	2	18
LHK	2	3	3	3	3	3	2	19
LJH	2	2	2	2	2	3	3	16

ZLJ	2	3	2	2	2	3	2	16
LR	2	3	2	2	2	3	2	16
WC	2	3	2	3	3	3	2	18
YYE	2	3	2	2	3	3	3	18
LBC	2	2	3	3	3	3	3	19
TLK	2	3	2	3	2	3	2	17
DBY	3	3	3	3	3	3	3	21
SZQ	2	3	3	3	3	3	3	20
LJ	2	2	2	2	2	3	3	16
WH	2	2	2	3	3	3	2	17
ZJW	3	2	2	2	2	3	2	16
CPH	2	2	2	2	2	2	3	16
Average value	2.18	2.63	2.38	2.56	2.50	3	2.44	17.69
Standard deviation	0.40	0.50	0.50	0.51	0.52	0.00	0.51	1.70

From Table 2, we can know that test results of men's basketball team are ideal, and average of whole team is 17.69. Because we have individually guided and corrected unqualified athletes during training, they have improved very quickly, among which LBC has improved most. After training, score has changed from 10 points to 19 points. His shoulder flexibility And stability of core muscle reached a full score. Through comparative analysis of data of each movement, highest score is trunk stability push-up. At same time, hurdles, squats, and torsional stability have also been improved, which fully reflects addition of corrective exercises and joint flexibility development goals in training cycle, such as kneeling spinal stretch, single-leg hip bridge, support lift Hand, plank support, side support, ground twist, etc. The ground twist can fix competitive joint and lumbar spine to rotate thoracic spine, improve flexibility of thoracic spine, prevent lumbar spine compensation from causing low back pain and stretch front side of athlete's thigh.

Table 3 Comparison of two test results (n=16)

	Squat	Step over fence	Split leg squat	Shoulder flexibility	Supine leg lift	Trunk stability push ups	Rotational stability	Total score
The first time	1.83±0.65	1.65±0.53	2.00±0.65	2.00±0.65	2.45±0.50	2.64±0.53	1.86±0.35	14.43±3.86
The second time	2.15±0.44	2.65±0.50	2.36±0.50	2.58±0.53	2.50±0.53	3±0	2.45±0.53	17.69±3.03
P value	0.029*	0.000**	0.029*	0.003**	0.333	0.009**	0.003**	0.000**

From Table 3, we can know that average score of 7 movements in men's basketball test has improved. The one that achieves full score is trunk stability push-up. The two tests of split squatting obtained. Shoulder flexibility two tests obtained. The two tests of supine leg raising showed. Two tests of trunk stability push-ups obtained. The average score of total score was 14.43±3.86 in first test and 17.69±3.03 in second test. There was no difference in supine leg raising, indicating that flexibility of spinal joints of Shanda men's basketball team was relatively strong, and improvement effect after training was not obvious. Squats, hurdles, split squat, shoulder flexibility, trunk stable push-ups, and rotational stability all showed differences in varying degrees, indicating that through these 12 weeks of functional training, athletes' ankle joints, thoracic spine The flexibility of shoulder joint and stability of knee joint and core have been improved, reducing probability of sports injuries for athletes.

Table 4 Test form of basic body shape after experiment (n=16)

Location	Name	Height (cm)	Weight (kg)	Quartet index	Chest circumference	Hip circumference
Defender	ZJC	176	67	381	95	94
	SZQ	180	83	461	98	102
	YYF	188	85	452	99	101
	TRK	183	80	437	97	102
	DBY	185	81	438	100	103
Center	CPH	198	100	505	110	110
	LJH	198	98	495	100	105
	LJ	204	97	475	95	104
	WH	197	120	609	128	125
	ZJW	206	112	544	125	126
Forward	HSY	197	93	472	100	104
	LR	190	87	458	102	105
	LHK	197	92	467	98	99
	ZLJ	192	93	484	95	102
	WC	194	86	443	99	99
	LBC	200	86	430	97	96
Average		192.82±8.55	91.27±12.72	471.8±51.45	102.36±10.2	104.83±8.92

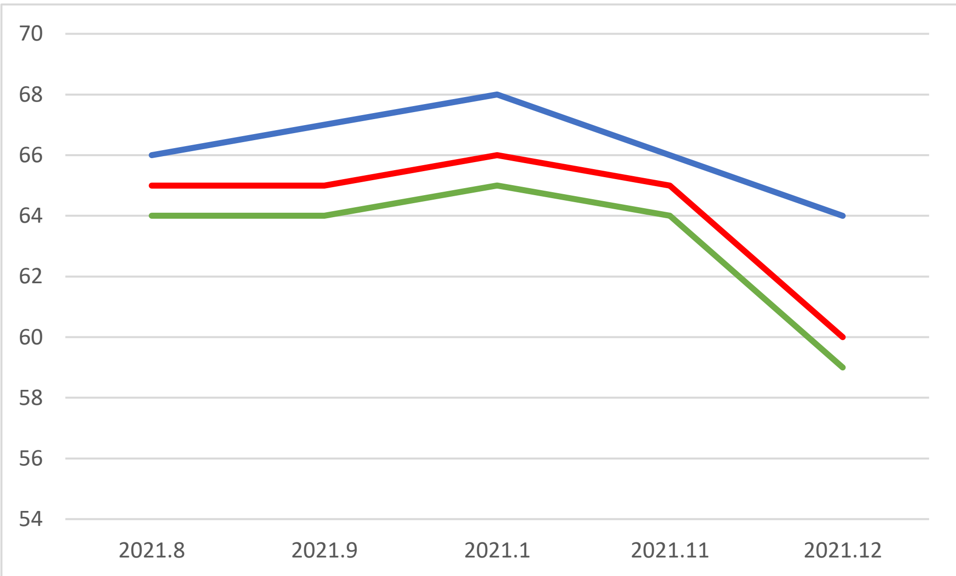
After periodic first stage of muscle-building training, weight, ketone index, chest circumference, and hip circumference of men's basketball players have increased to a certain extent, but compared with NCAA, there is still a certain gap, behind foreign teams. For average level, see Table 4.

Table 5 Comparison of results of two body shape tests for athletes at each position (n=16)

	Position	Before test	After test	P value
Height	Defender	182.21±4.95	182.42±4.63	0.374

	Center	200.42±3.76	200.60±4.12	0.374
	Forward	194.81±3.77	195.00±3.67	0.363
Weight	Defender	79.62±7.22	79.22±7.07	0.587
	Center	102.22±13.22	105.42±10.16	0.191
	Forward	86.35±4.25	89.52±3.53	0.001*
Quotlet Index	Defender	433.82±31.15	436.41±32.53	0.521
	Center	510.62±69.26	525.60±52.93	0.204
	Forward	443.50±23.86	459.02±19.77	0.001**
Chest circumference	Defender	95.82±1.94	97.82±1.94	0.003**
	Center	108.22±14.66	108.22±15.77	0.040*
	Forward	95.07±3.56	98.53±2.45	0.007**
Hip circumference	Defender	98.00±3.37	100.50±1.65	0.00199
	Center	111.10±10.53	114.03±10.75	0.036*
	Forward	98.35±3.88	100.85±3.46	0.001**

From Table 5, we can see that bust and hip circumferences of defenders, forwards, and centers before and after test all show differences to varying degrees. It shows that resistance training such as deadlift, bench press, rowing, and squat was added to first stage of periodic muscle-building training, which made bust and hip circumference larger. The weight of striker increased, mass and strength of muscles also changed, and body's ability to resist There are also some enhancements.



Note: Blue Line Center; Red Line Forward; Green Line Defender

Figure 7 Changes in subject's resting heart rate

A 1-min morning pulse test is performed on first day of each month, and resting heart rate of each month is compared. The broken line table shows that average heart rate before test is 64, guard is lowest, striker is second, and center is highest. August to September was first stage of cycle, training volume increased, and fluctuation of resting heart rate was not large. September to October is second stage of cycle, and resting heart rate has a certain increase. October to November is third stage of cycle, training intensity is reduced, total exercise volume is also gradually reduced, and resting heart rate is gradually reduced. Prepare for next competition to reduce amount to prevent athletes from getting too tired. After three months of functional training, team's average resting heart rate dropped to 60.33 in December. The decrease in resting heart rate means that degree of exercise is increased, aerobic capacity is enhanced, and stroke volume of heart is increased. Scientific exercise training can improve myocardial blood circulation. Figure 7.

Table 6 Comparison of heart rate in two 17-turn run tests (n=16)

17 turn back run	High heart rate (bmp)	Average heart rate (bmp)	Immediate heart rate (bmp)	Heart rate 1min after exercise (bmp)
Before test	182.33±12.82	152.45±12.15	177.65±12.24	163.15±11.62
After test	179.00±10.16	146.66±11.25	164.45±10.53	151.05±10.35
P value	0.010*	0.038*	0.015*	0.029*

From Table 6, maximum heart rate and average heart rate decreased after test. From heart rate immediately after exercise, it can be seen that heart rate dropped from 177.65 to 164.45, indicating that it has characteristics of fast functional mobilization, small physiological response and fast recovery after exercise. One minute after exercise, heart rate also dropped from 163.15 to 151.05. The faster drop, shorter recovery time, better heart function, and training level gradually improved. Relevant studies have shown that rate of decrease in heart rate after exercise can reflect cardiopulmonary function of athletes, and faster recovery speed, better cardiopulmonary function. After paired sample T test, highest heart rate, average heart rate, resting heart rate, immediate heart rate, and heart rate 1 min after exercise all showed differences to varying degrees. It can be seen that functional training can enhance cardiopulmonary function. The reasons are as follows: In When training energy metabolism system of men's basketball players, they only focus on training their ATP-CP and glycolysis system. The training method is high-intensity interval method. ATP-CP red zone training adopts a 1:5 interval ratio. The interval ratio of 1:2 is adopted in yellow zone. Since physical fitness is arranged in morning, there are 3 hours of technical and tactical training in afternoon, which is fully enough for intensity of aerobic training.

Table 7 Comparison of two bench press 1RM test results for athletes in different positions (n=15)

Test items:	Position	Before test	After test	P value
Bench press 1RM	Defender	88±9.77	103±13.53	0.009**
	Center	87±13.05	105±17.69	0.049*
	Forward	92±9.77	104±17.85	0.070
	Average	89±10.37	104±15.25	0.000**

It can be seen from Table 7: 1RM bench press strength of guard is 88±9.77 before test, and it is 103+13.53 after test, and maximum strength has increased by 15kg. Strength before test was 87±13.05, after test was 105±17.69, maximum strength increased by 18kg; 1RM bench press strength of forward was 92±9.77 before test, after test It was 104±17.85, maximum strength increased by 12kg. From average of whole team, upper limb bench press strength of whole team increased by 15kg on average. It can be seen that training of maximum muscle strength is arranged in second stage of period, which can increase maximum strength of upper limbs of entire team as a whole, but effect on maximum strength of upper limbs of forwards is not obvious. The reasons are analyzed as follows: When doing strength training, due to limitations of training environment, they only have two bench press racks, two squats, and one pull-up equipment, so they can't divide strength so finely, so we divided team into two groups, one is a high-strength, and other is a small-strength. The reason for emergence of center is probably that training intensity and training volume given by physical coach to athletes are not enough.

Table 8 Comparison of results of three jump tests for athletes at each position (n=16)

Test items:	Position	Before test	After test	P value
Standing reach	Defender	305.5±4.12	307.62±4.35	0.000**
	Center	305.5±5.5	307.7±4.64	0.062
	Forward	290.5±8.55	295.2±7.88	0.000**
	Average	300.5±6.05	303.6±5.63	0.039*
Jump depth test	Defender	310.2±6.43	317.4±5.83	0.004**
	Center	305.5±8.65	315.6±4.06	0.004**
	Forward	292.5±8.36	299.2±7.33	0.066
	Average	302.5±7.83	310.8±5.76	0.027*
Maximum bounce	Defender	311.5±6.36	330.5±10.73	0.011*
	Center	309.5±8.45	327.1±7.35	0.001**
	Forward	296.6±9.66	304.5±7.44	0.018*
	Average	305.2±8.15	320.4±8.47	0.048*

It can be seen from Table 8 that in two comparisons of in-situ touch heights, it was found that average level of whole team increased by 3cm. The striker was 305.5±5.5 before test, and 307.7±4.64 after test. The reason is that maximum muscle strength period may only help him recover to level of previous test. The training intensity is related to insufficient training volume. In comparison of two depth jump tests, it was found that team's average level increased by 8.2cm. Centers and forwards have different degrees of difference. The guard was 292.5±8.36 before test, and 299.2±7.33 after test, improvement effect is not obvious, reason is that intensity and training volume of fast strength training in third stage of period are not same. in line with its own development. In comparison of two maximum bounces, it was found that average level of whole team increased by 15.2cm. The center, forward, and defender all have different degrees of difference in two maximum bounces.

Table 9 Comparison of results of two speed and agility tests of athletes at each position (n=16)

Test items:	Position	Before test	After test	P value
15-10-5	Defender	5.53±0.24	5.33±0.23	0.031*
	Center	5.06±0.26	4.93±0.27	0.022*

	Forward	5.06±0.14	4.97±0.05	0.101
	Average	5.17±0.33	5.05±0.23	0.001**
3 / 4 sprint	Defender	3.66±0.16	3.72±0.03	0.676
	Center	3.35±0.13	3.25±0.02	0.042*
	Forward	3.35±0.13	3.25±0.07	0.003**
	Average	3.45±0.17	3.44±0.25	0.033*

It can be seen from Table 9 that in comparison of two 5-10-5 agility tests, average score of whole team increased by 0.12 seconds. The center and forward were tested by sample T test before and after test, which was related to enhancement of joint flexibility and body balance of center and forward. The guard's first test score was 5.06±0.14, and second test score was 4.97±0.05. In comparison of two 3/4 sprint tests, team's average score increased by 0.06 seconds. Before and after test.

Table 10 Comparison of results of two 17-turn run tests for athletes at each position (n=16)

17 turn back running	Defender	Center	Forward	Average
Pre test	66.66±1.55	63.53±0.46	59.99±0.73	63.36±2.88
Post test	65.66±1.63	62.99±0.73	59.56±0.66	62.77±2.73
P value	0..16*	0.049*	0.027*	0.000**

It can be seen from Table 10 that in comparison of two 17-turn run tests, average score of whole team increased by 0.62 seconds. The energy system training movements are highly repetitive, and athletes only need to complete it with all their strength each time. Red zone training (ATP-CP) uses a 1:5 ratio of training to interval for training, with 10 seconds of rapid use of battle rope, 50 seconds of rest or 10 seconds of rapid high leg raises, and 50 seconds of rest. During training, a team of 16 people is divided into 3 groups, and 3 battle ropes can be used to alternate training, saving time and ensuring training intensity. Yellow zone (glycolysis) training uses a 1:2 ratio of training to interval, using one minute of brisk running or one minute of burpees followed by two minutes of jogging to improve anaerobic capacity.

6 CONCLUSION

After functional training, average score of men's basketball team in FMS test increased from 14.38 to 17.69. The explosive power, agility, speed, strength, endurance, ankle joint, thoracic spine, shoulder joint flexibility and knee joint, The stability of core has been improved, reducing probability of sports injuries. The chest and hip circumferences of defenders, forwards, and centers have increased. In terms of physical function, resting heart rate has decreased, which means that degree of exercise is increased. Aerobic With enhancement of ability, stroke volume of heart increases, maximum heart rate, average heart rate, resting heart rate, immediate heart rate, and heart rate 1 min after exercise all show varying degrees of decline, which is of great theoretical significance for scientific training to improve level of college basketball.

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