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An Analysis of Isokinetic Test of Henan Women's Basketball Players

Lu Liu[1], Sun Yaqin[2], Wei Wei[3*]

[1]Physical Education College, Jiangxi Normal University, China
[2]Sports Science Research Institute of Henan Province, China
[3]School of Physical Education & Sports Science, South China Normal University, 400072, China
**Email: 20185658@m.scnu.edu.cn*

Abstract: *This article uses literature, experimental tests, mathematical statistics and analysis methods, through the measurement of the isokinetic motion of the Henan women's basketball players' knee joints, quantitatively examines and analyzes the athlete's knee flexion and extension exercise strength training level from the perspective of strength quality. Through the comparison between individuals, problems are discovered, suggestions are made, and high-level female basketball players are guided in scientific training.*

Keywords: *women's basketball players; knee joint; isokinetic test*

1. Introduction

The movement of the knee joint is an important part of various technical movements of basketball, and it occupies an important position in the movement of running and jumping. The number of offenses in a basketball game is about 100 times, the number of shots is about 90 times, and the back and forth run is about 3000 meters. The research adopts the experimental method of Biomechanics in Sports to measure the isokinetic motion of the Henan women's basketball players' knee joints, and quantitatively examines and analyzes the strength training level of the athletes' knee flexion and extension movements from the perspective of strength quality. On this basis, discovering problems through comparison between individuals will help determine targeted strength training programs and timely discover possible problems in sports training, and guide and assist athletes in scientific training.

2. Research objects and methods

2.1 Research object

Select 8 outstanding female basketball players from Henan Province. The basic situation is shown in Table 1.

Table 1 Basic situation of athletes

Stature	Weight	Age
182.52±6.75	74.64±9.63	21.12±2.76

2.2 Research methods

2.2.1 Literature data method

The author read and watched a large number of books, videos and literature on knee joint movement in basketball, and consulted relevant experts in a targeted manner, grasped the method and focus of the isokinetic test, and determined the test method.

2.2.2 Experimental test method

This article uses the German ISOMED2000 isokinetic force measurement system. Mainly test the muscle strength of the knee joint flexion and extension movements at 60 °/s, 180 °/s, and 240 °/s angular velocity.

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2.2.3 Experimental steps

The steps and methods of the isokinetic force test are carried out in strict accordance with the ISOMED2000 isokinetic force tester operating method. The joint muscle strength test adopts the gravity correction mode, and the test value excludes the influence of the test part's own weight on the muscle strength. The muscle strength test time is from 8:30 to 12:00, and the indoor temperature is 20℃~23℃.

The subjects should perform adequate preparation activities before the test; on the basis of a detailed understanding of the measurement requirements, perform several pre-experiments on the measurement system to be carried out to experience and master the correct measurement actions, and then conduct the formal test. The subject's muscle exertion during the test requires the fastest possible exertion of its maximum strength.

2.2.4 Mathematical Statistics and Analysis

This article uses mathematical statistics to compare and analyze related data to understand the sports conditions of the tested athletes.

3. Experimental results and analysis

Table 2 Relative peak moments of female basketball players' knee flexion and extension movements

	60 °/s	180 °/s	240 °/s
Left lateral crook (LLC)	1.33±0.12	1.17±0.30	1.11±0.11
Left lateral extension (LLE)	2.06±0.55	1.69±0.29	1.65±0.23
Right lateral crook (RLC)	1.32±0.09	1.06±0.20	1.10±0.22
Right lateral extension (RLE)	1.98±0.54	1.65±0.36	1.59±0.30

Relative peak torque refers to the ratio of the maximum torque to the individual's body weight. Because this indicator excludes the influence of body weight on the torque value, it can better compare the difference in strength between different individuals.

It can be seen from Table 2 that in the test, the various numerical indicators when the angular velocity is 60 °/s are greater than 180 °/s and 240 °/s.

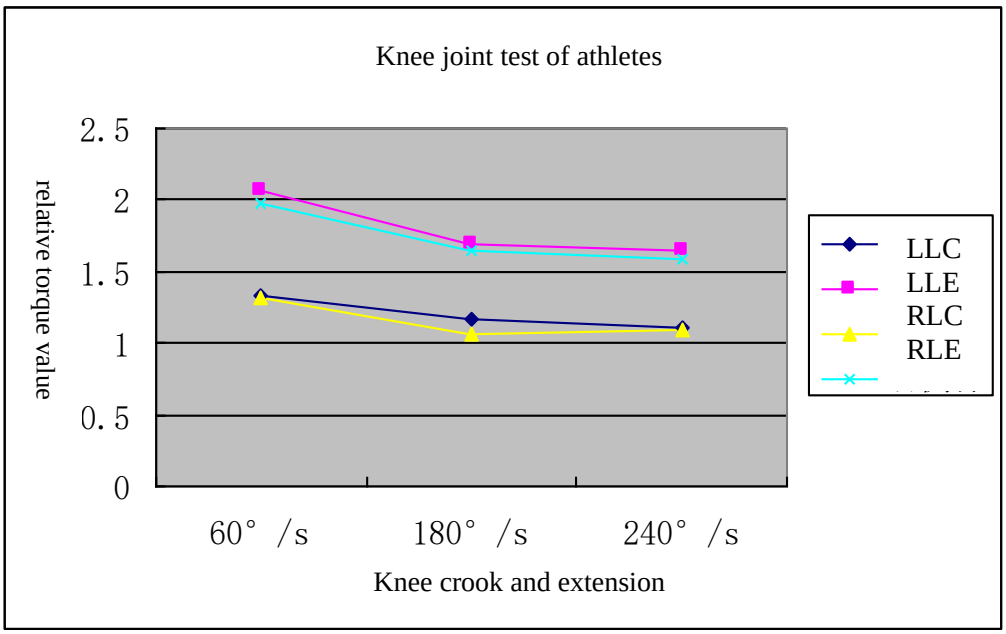

Figure 1 Female basketball players' knee flexion and extension relative peak moments

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When the angular velocity is 180 °/s, the relative peak torque of the left and right extensors and the left flexor are greater than 240 °/s, while the relative peak torque of the right flexor is less than 240 °/s. However, the relative peak torque values at 180 °/s and 240 °/s are relatively close.

According to the general situation of the current related research, as the angular velocity increases, the value of the relative peak torque shows a gradually decreasing trend; usually the test angular velocity below 60 °/s is listed as the low-speed range, and the test angular velocity is higher than 180 °/ The test angular velocity of s is listed as the high-speed range. According to the foreign isokinetic test standards, 120 °/s is used as the boundary, less than 120 °/s is the test maximum strength quality, and greater than 120 °/s is the test speed strength quality.

In this test, 60 °/s reflects the maximum strength of the knee joint movement, 240 °/s can reflect the muscle speed and strength quality, and the 180 °/s intervention between the two can better reflect the muscle explosive quality.

It can be seen from the experimental results that during high-speed centripetal contraction, more fast-twitch fibers are involved, while slow-twitch fibers are slower to mobilize, so larger mobilization relative to smaller peak torque values cannot be obtained. When low-speed concentric contraction, more motor units are recruited, and most of the muscle fibers are fully mobilized to participate in the contraction process, so the relative peak torque value is larger; as the muscle contraction speed increases, the knee joint movement needs to overcome the muscle contraction element and connective The viscosity of the tissue, and the continuous rapid combination and separation of the cross bridge also lose part of the muscle strength, so that the relative peak torque of the muscle decreases with the acceleration of the movement speed.

When the angular velocity is increased from 180 °/s to 240 °/s, the numerical change of the relative peak torque may be related to the characteristics of the project and the speed commonly used in training.

Table 3 Summary Table of Relative Peak Torque of Female Basketball Players' Knee Joint Flexion and Extension Movements

Athlete number	60 °/s				180 °/s				240 °/s			
	Left		Right		Left		Right		Left		Right	
	Crook	extend	Crook	extend	Crook	extend	Crook	extend	Crook	extend	Crook	extend
1	1.27	1.73	1.28	2.74	1.1	1.94	1.33	2.21	1.2	1.89	1.32	2.07
2	1.4	2.21	1.43	1.22	1.9	1.68	0.97	1.29	1.17	1.75	1.36	1.49
3	1.17	2.14	1.13	2.14	0.99	1.63	1.08	1.67	1.02	1.66	0.95	1.69
4	1.23	1.42	1.33	1.83	1.05	1.18	0.68	1.42	0.98	1.26	0.84	1.33
5	1.31	3.04	1.37	2.23	0.95	2.05	1.1	1.79	0.99	1.81	1.07	1.64
6	1.28	2.07	1.4	2.36	1.08	1.65	1.26	2.06	1.23	1.56	1.31	1.87
7	1.56	2.49	1.33	2.16	1.17	1.94	0.93	1.62	1.06	1.89	0.82	1.52
8	1.41	1.4	1.27	1.19	1.13	1.41	1.11	1.16	1.23	1.4	1.09	1.13

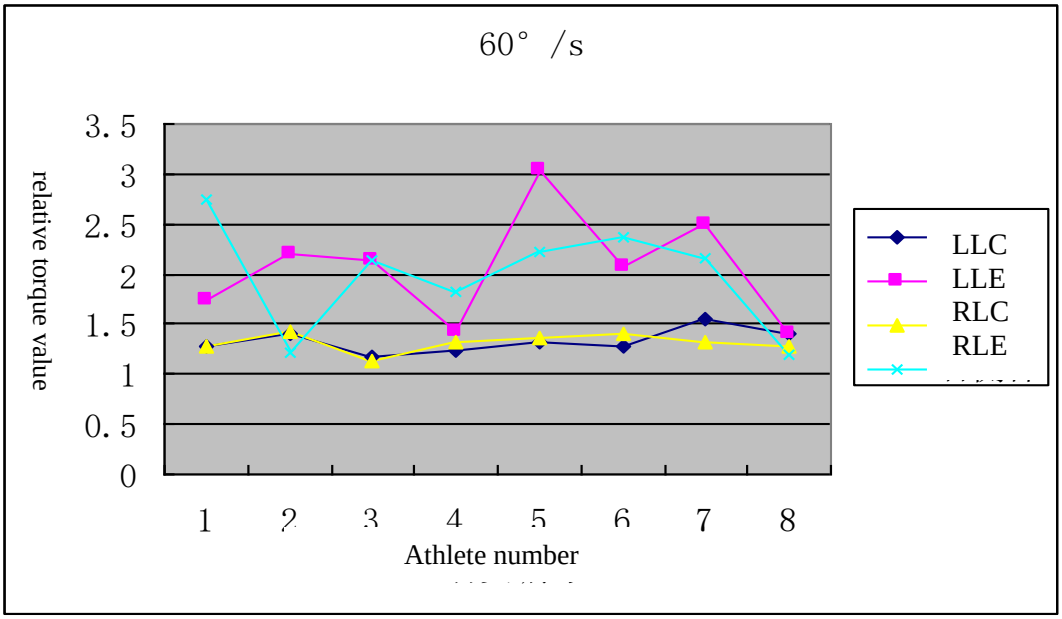

Figure 2 The value of each athlete's knee joint when the angular velocity is 60 °/s

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It can be seen from Figure 2 that the values of all players participating in the test can be compared. When the angular velocity is 60 °s, the maximum value of the relative peak torque of the left flexor is 1.56, the minimum is 1.17, the maximum value of the relative peak torque of the left extensor is 3.04, the minimum is 1.4, and the relative peak of the right flexor is The maximum torque is 1.43, the minimum is 1.13, the maximum relative peak torque of the right extensor is 2.74, and the minimum is 1.19.

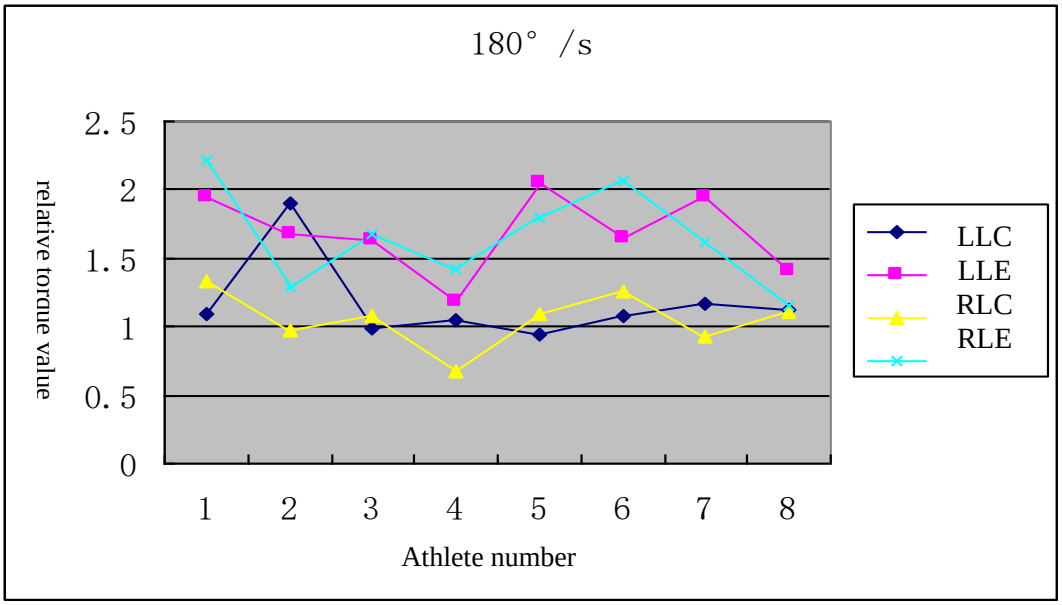

Figure 3 The relative torque value of each athlete's knee joint when the angular velocity is 180 °s

It can be seen from Figure 3 that the values of all players participating in the test can be compared. When the angular velocity is 180 °s, the maximum value of the relative peak torque of the left flexor is 1.9, the minimum is 0.95, the maximum value of the relative peak torque of the left extensor is 2.05, the minimum is 1.18, and the relative peak of the right flexor The maximum torque is 1.33, the minimum is 0.68, the maximum relative peak torque of the right extensor is 2.21, and the minimum is 1.16.

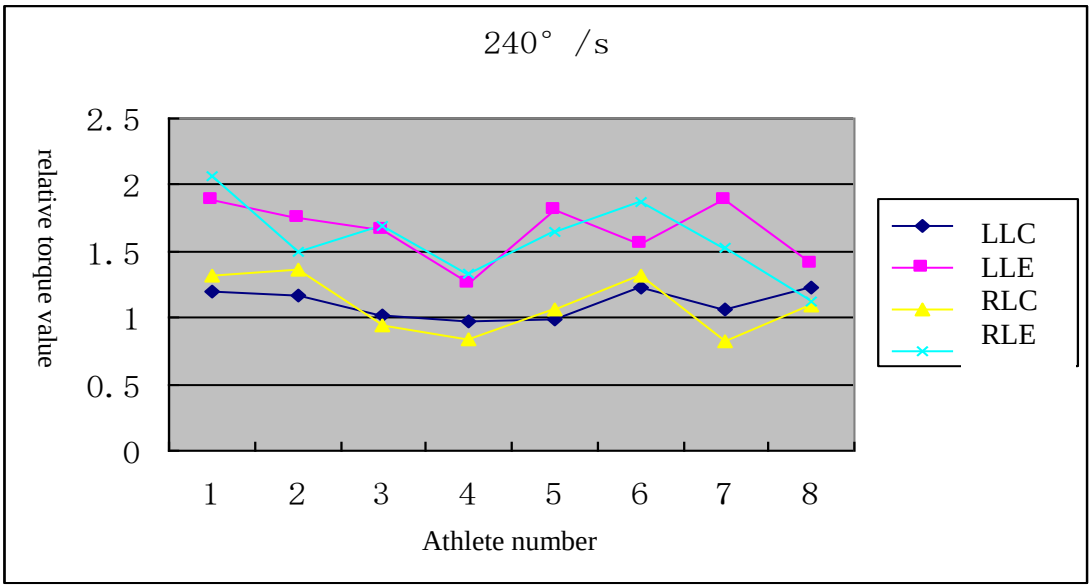

Figure 4 The relative torque value of each athlete's knee joint when the angular velocity is 240 °s

It can be seen from Figure 4 that the values of all players participating in the test can be compared. When the angular velocity is 240 °s, the maximum value of the relative peak torque of the left flexor is 1.23, the minimum is 0.98, the maximum value of the relative peak torque of the left extensor is 1.89, the minimum is 1.26, and the relative peak of the right flexor is 1.89 The maximum torque is 1.36, the minimum is 0.82, the maximum relative peak torque of the right extensor is 2.07, and the minimum is 1.18.

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The results show that, according to the basic characteristics of basketball technology, the main factors are knee-sliding, offensive, defensive, braking, jumping and layup. These actions require the knee to be flexed, extended and twisted in a half-flexion position (30 °angle), and this angle of the knee is precisely its physical weakness, because the upper and lower levers of the knee are longer, and the knees are inside, outside and crossed in half flexion. The ligaments are in a relatively loose state and cannot protect the stability of the knee. At this time, the stability of the joint is all maintained by the muscles around the joint.

4. Conclusions and recommendations

4.1 Conclusion

As the isokinetic speed increases, the muscle torque of the female basketball player's knee joint gradually decreases. The relative peak torque values at 180 °/s and 240 °/s are relatively close, suggesting that the speed quality of the athlete's strength training is at a certain level. To a certain extent, it is affected by the body structure and the fine structure of muscles. When the angular velocity is 180 °/s, when the relative peak torque of the left and right extensors is greater than 240 °/s, the possible reason is that the ratio of flexion and extension muscles of the human body is about 2:3. After long-term special training, athletes are in the situation of high-speed exercise. Down, relative to the flexor torque, the extensor torque has been significantly strengthened.

4.2 Suggestions

From the perspective of the development trend of modern basketball, the position technology among athletes in various positions is becoming increasingly blurred, which puts forward higher requirements on the flexibility of the athletes' foot movement, the range of movement and the technology, and it is necessary to increase the strength and flexibility of the athlete's ankle joint. Increase the speed of movement and expand the range of movement.

Isokinetic exercise is an unnatural exercise. In this case, the obtained muscle torque changes lack specificity and effectiveness for the effect of muscle movement in actual competition and training. On the basis of this research, according to the experimental torque curve, the difference between the peak moments of the left and right muscle groups with the same name, the habitual side and the position in basketball tactics, etc. are analyzed. In the usual training process, it is necessary to strengthen comprehensive training, avoid a single training method, and pay attention to the athlete's excessive fatigue state to help the athlete maintain a strong physical state.

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