

## THE STUDY OF OUTSTANDING HURDLING SPORTSMEN'S ISOKINETIC JOINT ANGLE

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The isokinetic strength test systematic has a lot of functions. This text only tests the joint angles of 15 elites of our country, tight and accurate in the course of testing. After the repeated correction instrument, the athlete does a good job of the abundant warming-up exercise in order to test out the most accurate result, offer the accurate material to coach and scientific research personnel, grasp the joint angle that a qualified player gave play to the biggest muscular strength, find the best training scheme or regularity, raise the sport achievement.

**KEY WORDS:** isokinetic, peak torque, joint angle

### METHODS:

**Research objects:** 15 outstanding hurdles sportsmen who are now on active service in the sports team of Hebei province (7 males, 8 females), including one of international top-notch players (Shi, Dongpeng). The others are all national first grade sportsmen. The athlete's knee joint have no medical history of injuring. The team members basic situation is the following (Table1):

**Table 1 Basic situation of the research objects ( $\bar{x} \pm s$ ).**

	Age (year)	Training year (year)	Height (cm)	Weight (kg)
Male	19.00 $\pm$ 1.91	4.29 $\pm$ 1.70	184.09 $\pm$ 7.09	74.03 $\pm$ 6.72
Female	18.13 $\pm$ 2.17	5.38 $\pm$ 2.33	170.79 $\pm$ 6.83	59.14 $\pm$ 6.68

**Research methods:** The machine using in the test is isokinetic strength test system named kintech made in Australia. Muscle strength of the sportsmen's knee joints was tested. Let athlete make warm-up activity for twenty minutes before testing, strive to be accuracy of datum examined and prevent the muscle from drawing wounded. When being tested, using special bandage to make them regular, knee joint angle fix between 0° and 90° to fix according to regulation under 60°/s, 120°/s, 240°/s, these three kinds of speeds, two sides of the joints were tested in the same time. every group tries doing 2 times by way of adapting to testing, test formally six times again, every group test one minute in the interval. Require the athlete to take every care to finish. In test course each starting point and ending point of athlete should be confirmed, the test results are automatically stored and record by the computer.

**Test indexes:** Flexion and extension of the knee Joint's angle: it is the joint angle when flexion and extension muscle group reach peak torque.

**Statistics treatment:** Dealing with data processing with SPSS 11.0 software, calculate the average and standard deviation, through method of the analysis of variance, and at the same speed adopting pairs T-examin go on remarkable inspection.

### RESULTS AND DISCUSSION:

**Table 2 The joint angle of men's flexion and extension muscle groups reach torque.**

	60°/s	120°/s	240°/s
LEFT EXTENSION AOPT	69.95 $\pm$ 10.00	67.70 $\pm$ 13.03	65.51 $\pm$ 14.52
LEFT FLEXION AOPT	78.82 $\pm$ 13.54	91.68 $\pm$ 6.46	89.28 $\pm$ 11.16
RIGHT EXTENSION AOPT	73.78 $\pm$ 14.64	67.47 $\pm$ 18.66	68.60 $\pm$ 18.93
RIGHT FLEXION AOPT	86.56 $\pm$ 11.74	83.97 $\pm$ 3.42	77.14 $\pm$ 10.27

From the result of Table 2, flexion and extension muscle groups peak torque's joint angle

make T examine form side to side. Left flexion muscle and right flexion muscle  $p$  ( $0.038 < 0.05$ ) has remarkable differences under the testing speed of  $60^\circ/s$ . This display right flexion muscle's strength is better remarkably than left under the testing speed of  $60^\circ/s$ . Left extension muscle and right extension muscle under the testing speed of  $60^\circ/s$ . Left extension muscle's joint angle of peak torque is not remarkable than right. Left flexion muscle and right flexion muscle  $p$  ( $0.01 < 0.05$ ) has remarkable differences under the testing speed of  $120^\circ/s$ . This display left flexion muscle's strength is better remarkably than right under the testing speed of  $120^\circ/s$ . It is opposite for at speed of  $60^\circ/s$  situation. Prove under different speeds, the function that left and right sides flexion the skin give play to is different; left extension muscle and right extension muscle under the testing speed of  $120^\circ/s$   $p$  ( $0.97 > 0.05$ ), left extension muscle's joint angle of peak torque is not remarkable than right.; left flexion muscle and right flexion muscle under the testing speed of  $240^\circ/s$   $p$  ( $0.003 < 0.01$ ) has remarkable differences under the testing speed of  $240^\circ/s$ . Left flexion muscle's strength is better remarkably than right, prove left flexion strength is better than Right; left extension muscle and right extension muscle under the testing speed of  $240^\circ/s$   $p$  ( $0.70 > 0.05$ ) has no a significance difference .

Happen from the above, with increase of speed, left flexion muscle reach peak torque's joint angle is greater than right, prove speed quicker, left flexion muscle participate with heavy chance, coach should strengthen under different speed developing different training of muscle emphatically.

Under the same speed, the contrast study of flexion and extension muscle groups peak torque's joint angle at the same side , under the testing speed of  $60^\circ/s$  left flexion muscle and left extension muscle  $p$  ( $0.20 > 0.05$ ) has not remarkable difference; right flexion muscle and right extension muscle  $p$  ( $0.16 > 0.05$ ) has not remarkable difference. under the testing speed of  $120^\circ/s$  left flexion muscle and left extension muscle  $p$  ( $0.0020 < 0.05$ ) has remarkable difference; left flexion muscle peak torque's joint angle is bigger than left extension muscle; this display the function that left flexion is left extension give play to is bigger; under the testing speed of  $120^\circ/s$  right flexion muscle and right extension muscle  $p$  ( $0.07 > 0.05$ ) has no remarkable difference; under the testing speed of  $240^\circ/s$  left flexion muscle and left extension muscle  $p$  ( $0.043 < 0.05$ ) has remarkable difference, left flexion muscle is bigger than left extension; this display the function that left flexion is left extension give play to is bigger; under the testing speed of  $240^\circ/s$ ; but under the testing speed of  $240^\circ/s$  right flexion muscle and right extension muscle  $p$  ( $0.34 > 0.05$ ) has no remarkable difference.

Under the different speed, left flexion under the testing speed of  $60^\circ/s$  and  $120^\circ/s$   $p$  ( $0.01 < 0.05$ ), joint angle of reaching peak torque has remarkable difference. with increase of speed, left flexion reach peak porque joint angle increase; Left  $60^\circ/s$  and left  $240^\circ/s$  left flexion muscle peak torque's joint angle  $p$  ( $0.015 < 0.05$ ) has remarkable difference, left  $240^\circ/s$  peak torque's joint angle is greater than left  $60^\circ/s$ .

Left flexion muscle reach peak torque's joint angle with increase of speed has the trend of increasing at the same time for man, prove left flexion muscle have better endurance, prove left flexion muscle have heavier scopes of activities, it is very beneficial to increase the stride. Right flexion muscle reach peak torque's joint angle with increase of speed has the trend of reducing at the same time for man, prove right flexion muscle have narrow scopes of activities, but with increase of speed, scopes of activities will increase again.

**Table 3 The joint angle of women's flexion and extension muscle groups reach torque.**

	$60^\circ/s$	$120^\circ/s$	$240^\circ/s$
LEFT EXTENSION AOPT	$77.97 \pm 7.31$	$77.86 \pm 8.57$	$70.53 \pm 13.71$
LEFT FLEXION AOPT	$72.08 \pm 12.19$	$86.90 \pm 8.64$	$94.83 \pm 5.60$
RIGHT EXTENSION AOPT	$85.70 \pm 11.06$	$86.92 \pm 7.90$	$79.40 \pm 11.56$
RIGHT FLEXION AOPT	$84.87 \pm 11.06$	$95.78 \pm 14.53$	$100.75 \pm 13.96$

From the result of Table 3, under the same speed, flexion and extension muscle groups peak torque's joint angle make T examine form side to side. Left flexion and right flexion reach peak

torque's joint angle under the testing speed of 60°/s has remarkable difference. right flexion reach peak torque's joint angle is bigger than left; left extension and right extension reach peak torque's joint angle under the testing speed of 60°/s  $p$  ( $0.003 < 0.05$ ) has remarkable difference. Right extension reach peak torque's joint angle is bigger than left. left flexion and right flexion reach peak torque's joint angle under the testing speed of 120°/s  $p$  ( $0.127 > 0.05$ ) has not remarkable difference; left extension and right extension reach peak torque's joint angle under the testing speed of 120°/s  $p$  ( $0.021 < 0.05$ ) has remarkable difference; right extension reach peak torque's joint angle is bigger than left. Left flexion and right flexion reach peak torque's joint angle under the testing speed of 240°/s  $p$  ( $0.241 > 0.05$ ) has not remarkable difference; left flexion and right flexion reach peak torque's joint angle  $p$  ( $0.241 > 0.05$ ) has not remarkable difference.

Under the different speed, left flexion reach peak torque's joint angle under the testing speed of 60°/s, 120°/s, 240°/s  $p$  ( $0.13 < 0.05$ ) has remarkable difference, with increasing of speed, left flexion reach peak torque's joint angle will also increase; it displays speed quicker, left flexion muscle do work abundantly, the greater the strength given play to is. left extension reach peak torque's joint angle under the testing speed of 60°/s, 120°/s, 240°/s  $p$  ( $0.83 > 0.05$ ) has not remarkable difference; right flexion reach peak torque's joint angle under the testing speed of 60°/s, 120°/s  $p$  ( $0.067 > 0.05$ ) has not remarkable difference, right flexion reach peak torque's joint angle under the testing speed of 60°/s, 240°/s  $p$  ( $0.023 < 0.05$ ) has remarkable difference, right flexion reach peak torque's joint angle under the testing speed of 240°/s is bigger than 60°/s, right flexion under the testing speed of 120°/s and 240°/s  $p$  ( $0.215 > 0.05$ ) has not remarkable difference; right extension reach peak torque's joint angle under the testing speed of 60°/s, 120°/s, 240°/s  $p$  ( $0.5 > 0.05$ ) has not remarkable difference with the increasing of speed.

From Table 2 and Table 3, men and women under the same speed, flexion and extension muscle groups peak torque's joint angle make T examine form side to side. Under the testing speed of 60°/s, left flexion and right flexion  $p$  ( $0.001 < 0.01$ ) has remarkable difference; it appears the trend of gradually increasing; left extension and right extension  $p$  ( $0.022 < 0.05$ ) has remarkable difference; it appears the trend of gradually increasing, but under the testing speed of 120°/s, 240°/s ( $p > 0.05$ ) has not remarkable difference.

**CONCLUSION:** Understand different speed and the same speed reach peak torque's joint angle change, it is convenient for coach and athlete to find most heavy tension suiting the joint angle, under the testing speed of 60°/s, men and women left flexion reaching peak torque's joint angle are smaller than right flexion reaching peak torque's joint angle, and left extension reaching peak torque's joint angle are smaller than right extension; men and women right flexion reaching peak torque's joint angle are greater than left flexion reaching peak torque's joint angle, under the testing speed of 60°/s, men flexion and extension reaching peak torque's joint angle are not remarkable difference, women right extension reaching peak torque's joint angle are bigger than left. Under the testing speed of 240°/s, men and women left flexion reaching peak torque's joint angle are bigger than right, but left extension and right extension are not remarkable difference.

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