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Isokinetic Assessment of Lower Extremities in Chinese Elite Male Figure Skaters

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Objective Figure skating is a kind of sport that is a unique combination of art and athleticism. In recent years, the increased emphasis on jumping skills has become apparent, the number of quadruple jump in 2018 winter olympic game was 2.2 times in short program and 2.5 times in long program in the top six male figure skating athletes's program choreography compared with the 2014. The demand for more jumping skills has resulted in an increased demand for lower extremity strength, power, and "power endurance" to achieve high-difficulty skills while fatigued. But there are few researches about the strength characteristics of figure skaters. Present research project aimed to analyse the characteristic of lower extremities strength of chinese elite male figure skaters.

Methods 13 nationally ranked male figure skaters volunteered for this study ([M±SD] n=13, height 175.0±5.8 cm, weight 67.9±7.9kg, age 21.5±2.9yrs). The datas were collected from 2009-2013 years. All of the athletes landing by the right leg. The dynamic strength of hip and knee were obtained using a Isomed2000 isokinetic dynamometer system (D&R Ferstl GmbH, Hemau, Germany). Datas were recorded with computer system. Hip strength were tested in the lying position, the testing side thigh was fixed on the adapter, the range of movement was 10-100 degrees. Knee strength were tested in the sitting position, the testing side calf was fixed on the adapter, the range of movement was 10-90 degrees. The other part of body were fix by the aid system. Both test speed used were 60 deg/sec. Used spss19.0 to analyze the datas. Used pair-t test to analyze the differences between left and right. Significance level is $P \leq 0.05$

Results The maximal knee extensor torque of left ($2.82 \pm 0.39 \text{ Nm/kg}$) was lower (L/R: 0.946 ± 0.077) than right ($2.99 \pm 0.39 \text{ Nm/kg}$) ($P=0.024$); the maximal hip extensor torque of left ($5.17 \pm 0.56 \text{ Nm/kg}$) was higher (L/R: 1.079 ± 0.107) than right ($4.81 \pm 0.54 \text{ Nm/kg}$) ($P=0.023$); the maximal hip flexor torque of left ($2.18 \pm 0.30 \text{ Nm/kg}$) was lower (L/R: 0.925 ± 0.105) than right ($2.37 \pm 0.37 \text{ Nm/kg}$) ($P=0.02$). There was no difference between left ($1.64 \pm 0.19 \text{ Nm/kg}$) and right ($1.69 \pm 0.20 \text{ Nm/kg}$) knee flexors. Three athletes had been found imbalance (20% difference between left and right) in hip muscle. The Flex/Ext ratio of left hip (0.423 ± 0.049) was lower than right (0.497 ± 0.078) ($P=0.001$). The Flex/Ext ratio of knee was no difference between left (0.590 ± 0.081) and right (0.568 ± 0.054).

Conclusions The results obtained in this study show that the hip muscle differences were the major difference of chinese elite male figure skaters. Coaches should pay more attention to hip strength training in future.