

A CROSS-SECTIONAL STUDY OF KNEE FLEXION SPEED IN CHINESE CHILDREN DURING GROWTH

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INTRODUCTION: In recent years, some research has been done on the relationship between the revolving speed of the adults' knee angles and sports achievements (Sheng, 1992; 1989; 1995). However, there is little information concerning this issue in children. The purpose of this study was to explore the developing regularity of the flexion speed of children's knee angles across age.

METHODS: Subjects. Four hundred and eighty children aged from 7 to 18 were recruited as subjects in the study. Based on age (7-8 years old, 10-11 years old, 13-14 years old and 17-18 years old) and gender (male and female), the subjects were divided into eight groups.

Measurement. The photoelectric timing method was adopted. The measured instrument was SSM-5 millisecond meter of universal numerical type (Time accuracy was 10^{-4} s). The 5MW He-Ne laser instrument was used as the illuminant of the photoelectric door. During the test, the subjects were positioned on the experimental table with an aluminum blade to keep off the light with proper length and D width, fixed on the out side of the subjects' shank. The subjects revolved their knee angles very quickly with their shanks going round the motion axis as the blade kept off the light. When the blade keeping off the light passed the laser beam, it would keep the light from the photoelectric door. Thus the numerical millisecond meter records the time (t) of keeping off the light.

The calculation of the revolving speed. $V = \theta / t = D / ht$ (radian/second). In this formula, h was the distance from the revolving axis to the laser beam.

The treatment of the measured data. All the data were dealt with by computer software SPSS8.0.

RESULTS: Table 1 shows data on the flexion speed of left and right knee in different groups. Table 1 showed that the knee flexion speed between male and female obviously developed across age. However, because of the different growing rate between male and female, there were differences between the growing range and mode of the knee flexion speed. In the group of children aged 7-8, there was no obvious difference in the bending knee speed between male and female due to their similarity in the growing speed ($p < .05$). The obvious difference in the knee flexion speed between male and female was not significant after 10 years of age. Male's growing range was greater than female significantly ($p < .001$), which probably had relevance to the difference in the strength and the development of the speed quality between male and female (People's Sports Publishing House, 1983). In the growing mode, males from aged 10 to 18 years old continued to develop all the time. But there was an unbalanced development in the knee flexion speed of their left knee and right knee (before ages 10~14 years old, the bending knee speed of their left knee was obviously quicker than that of their right knee. After the age of 17, the knee flexion speed of their right knee was obviously quicker than that of left knee ($p < .01$) while the quicker development in female's knee flexion speed wasn't shown until after age 13. There was a balanced development in the bending knee speed of their left knee and right knee ($p < .05$).

Table 1 Knee Flexion Speed across Age

year	7-8		10-11		13-14		17-18	
	left knee	right knee	left knee	right knee	Left knee	right knee	left knee	right knee
male	12.88	11.30	15.45	14.45	18.34	17.82	20.92	23.82
female	12.57	11.35	13.47	12.52	15.97	15.70	17.42	17.44
t	.0518	.0127	6.90	3.48	5.74	4.32	11.09	15.16
sig	0.617	0.902	0.000	0.000	0.000	0.000	0.000	0.000

The different pattern in the development of the knee flexion speed of left knee and right knee between male and female may be caused primarily by the differences in the activity and behavior modes between them. Generally speaking, boys were active while girls were gentle and quiet. However, before boys became adults, at first their bending knee speed developed more slowly and then quickly. As far as the phenomenon was concerned it could not be simply explained that it was caused by the difference in the strength, speed and acting mode between male and female. Probably it had relevance to the growing process of male nervous system. Therefore further research should be undertaken in this area to explain these discrepancies.

CONCLUSION:

1. The knee flexion speed of knee angles developed with the growing age but there was a different developing pattern between male and female.
2. At the age of about 8 years old, there was no obvious difference in the knee flexion speed between male and female ($p>.05$). But after age 10, male's knee flexion speed was obviously quicker than female's at the stage of different ages ($p<.01$).
3. From age 10 to 18, male's knee flexion speed developed consistently while the quickening development in female's bending knee speed wasn't shown until after aged 13 years.
4. The knee flexion speed of male's left knee and right knee developed in an unbalanced way all the time, while the knee flexion speed of female's left and right knee has a balanced development after age 13.

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