DEVELOPMENT OF NEURO-MUSCULAR FUNCTION OF LOWER LIMB IN RUNNING JUMP FOR CHILDREN

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INTRODUCTION

It is an important fact that development of motor performance like running and jumping was occurred greatly during school age. However there are few studies about motor development in running and jumping for children. Quantification of development of nuero-muscular function in running and jumping might offer useful information to make a suitable program to promote motor development for children. The purposes of this study were to compare the kinematics, kinetics and EMG in running jump for several grade children and to clarify the characteristics of development of neuro-muscular function in running and jumping.

METHODS

Twelve children were participated in this study as a subject. After the explanation of the study for subjects and their parents, informed consents were obtained. The subjects performed vertical jump, rebound jump, running and running jump on the force platform until at least five succeeded trials were measured. Kinematics, ground reaction force (GRF) and EMG (gastrocnemius, soleus, tibialis-anterior, biceps femoris, vastus lateralis and rectus femoris) were collected simultaneously during the tasks. Two-dimensional sagittal plane kinematics was recorded with a high-speed video camera at 300Hz. Body makers were placed on toe, ball, heel, ankle, knee, greater trochanter, and shoulder. Automated digitized system was used to obtain coordinate data and the data were smoothed by Butter-worth digital filter (6~30Hz). GRF, joint kinematics, joint torque and power were calculated and normalized with time between touchdown and take-off and the body mass of the subject.

RESULTS AND DISCUSSION

Figure 1 shows the typical joint torque pattern of five trials for the subject A (12 years) and B (9 years) in the take-off phase of running jump. The subject A showed greater maximal value of the ankle torque than the subject B, but there was no significant difference in the knee and hip torques in the take-off phase. Furthermore, standard deviation with five trials was greater in the ankle torque for the subject A and in the knee and hip torque for the subject B.

Figure 2 shows angle-torque relationship at the ankle joint during the take-off phase in the running jump of five trials for the subject A and B. It was shown that slopes of the relationships for the subject A were greater than the subject B and the slops did not change greatly in the five trials for the subject A. The slope is used to evaluate as joint stiffness that may reveal the neuro-muscular function about ankle joint. These results suggest that ankle torque for the subject B could not develop consistently and sufficiently in the take-off phase and the nuero-muscular function of ankle joint may be crucial factor of motor development in jumping exercise.

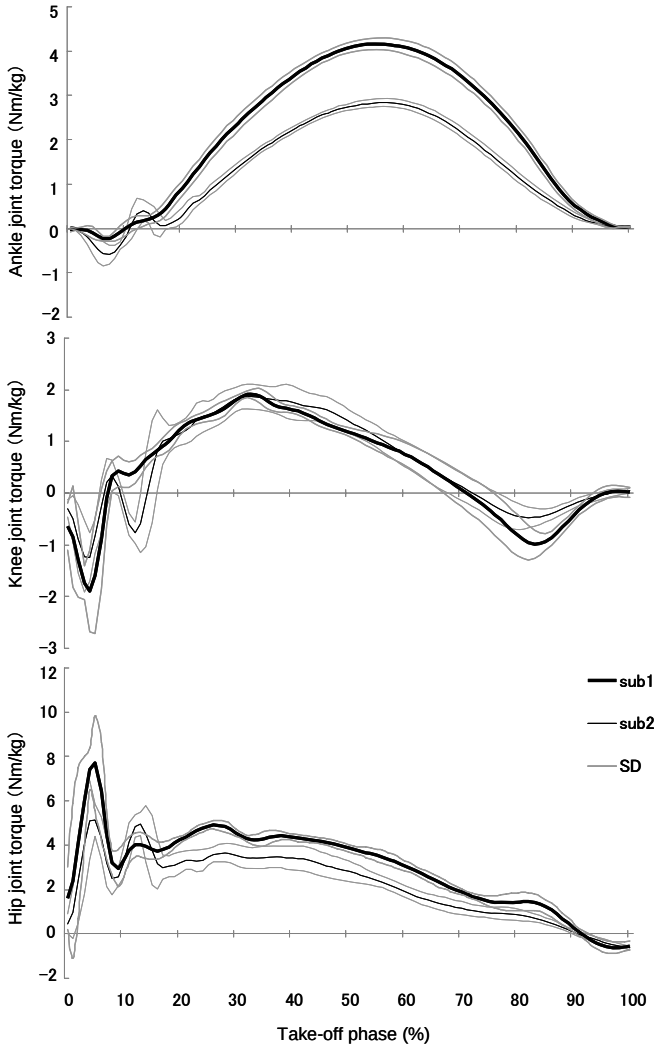

Figure 1: The typical joint torque pattern of five trials for the subject A and B in the take-off phase of running jump.

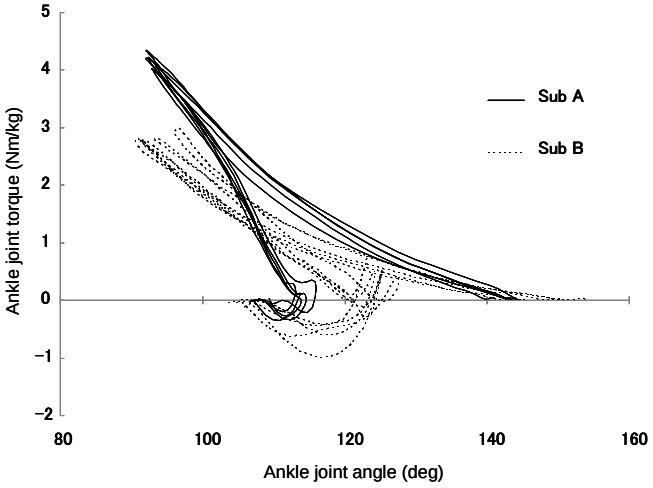

Figure 2: The relationship between ankle torque and joint angle in the take-off phase of running jump of five trials for the subject A and B.