BIOMECHANICAL CHARACTERISTICS OF HIP AND KNEE JOINT MUSCLE IN GRECO-ROMAN STYLE WRESTLERS

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INTRODUCTION: Strength is the basis to wrestlers to master wresting techniques and develop their skills. Strength training is one of the important factors in wrestlers training. With the development of new technique, studying method has changed a lot. We can combine muscle strength with motion analysis in studying strength training. By the Biomechanics analysis results reflected by the indexes, such as angle, angular velocity, isokinetic torque, etc, we can learn more characteristics of muscle working in sports, Based on these data, we evaluated ten Greco-Roman style wrestlers' lower limb strength and draw some conclusion about strength training.

METHODS: Ten Greco-Roman style wrestlers were filmed. Two video recorders operated at 50 fps (exposure time 1/1000 s) were set symmetrically to record the wrestler's hold-lift techniques. Use AIJIE Video analyses system to digitize the video records and get kinematics parameter of subjects' movement. Use the DLT method to do 3-D space reconstruction from 2-D image. All digitized coordinates were digitally filtered using a low-pass digital filter with a 10 HZ cutoff. In this study, we chose hold-lift technique as the typical phase, because most of the lower-limb works of Greco-Roman style wrestling are in this phase. Hip and knee joint strength were tested by MREAC isokinetic testing and analyses system. Testing speed are 60 degree/second and 240 degree/second.

RESULTS: the parameters of isokinetics test include relative peak torque (RPT), hamstring/quadriceps ratio (H/Q) and degree at peak torque (DAP). Motion analysis parameters involve joint movement angle range (AR), joint angle velocity (AV), and the synchronization of hip and knee joint angle. 1) The Extension RPT of hip and knee are more stronger than everyman, especially the fast action. The flexion RPT of slow action are relatively weak. 2) H/Q ratio are low, this is chiefly resulted from the high extension torque. It's consistent with the wrestling character. 3) The DAP are mostly in the actual joint movement angle range. 4) The maximum AV of knee joint in hold-lift went beyond 500 °/s; hip joint is also over 240°/s. 5) Good action show more synchronization of hip and knee joint angle.

CONCLUSION: 1) High extension RPT is a special character of Greco-Roman style wrestling. 2) Flexion torque of knee joint should be confirmed to increase H/Q, for lower H/Q may cause knee injured. 3) It should be paid more attention to high-speed strength training of wrestlers lower-limb. Joint angular velocity 400~500°/s is recommended. 4) The synchronization of hip and knee joint is a good parameter to evaluate hold-lift technique.

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