MUSCLE ACTIVITIES OF THE SUPPORT LEG DURING SIDE JUMP TEST FOR SPEED SKATERS

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INTRODUCTION: Speed skaters often use side jump training on the ground to strengthen lower limb muscles and simulate speed skating motion. However, there were few studies on muscular loading in the side jump. The purpose of this study was to identify muscle activities of the support leg during the side jump test for speed skaters.

METHOD: Ten male speed skaters performed the repeated side jump test at maximal effort on a force platform. Two synchronized high-speed video cameras were used to record their motions using DLT method. The three-dimensional joint torque of the support leg was calculated by the inverse dynamics approach. A musculoskeletal leg model was developed by using SIMM (MusculoGraphics, Inc., Evanston, IL). The optimization algorithm was formulated to determine the activation for each muscle so that the objective function, that was to minimize activation cubed, was minimized and the net joint torques of all muscles were constrained to match those calculated by the inverse dynamics approach. Subsequently, the muscle torque was estimated from the "optimized" activation. The activation and torque of all subjects were normalized to the time from foot contact to toe-off, and subsequently averaged.

RESULTS AND DISCUSSION: The activations of the gluteus maximus and gluteus medius averaged from foot contact to toe-off were larger than those of the other muscle groups of the support leg (Fig. 1). On the other hand, net joint torque was large not only in hip and knee extensions which were important for vertical jump but also in hip abduction. The gluteus maximus and gluteus medius contributed to the hip abduction torque as well as the extension torque. These results revealed that the hip extension and abduction torques by the glutei were augmented during the side jump.

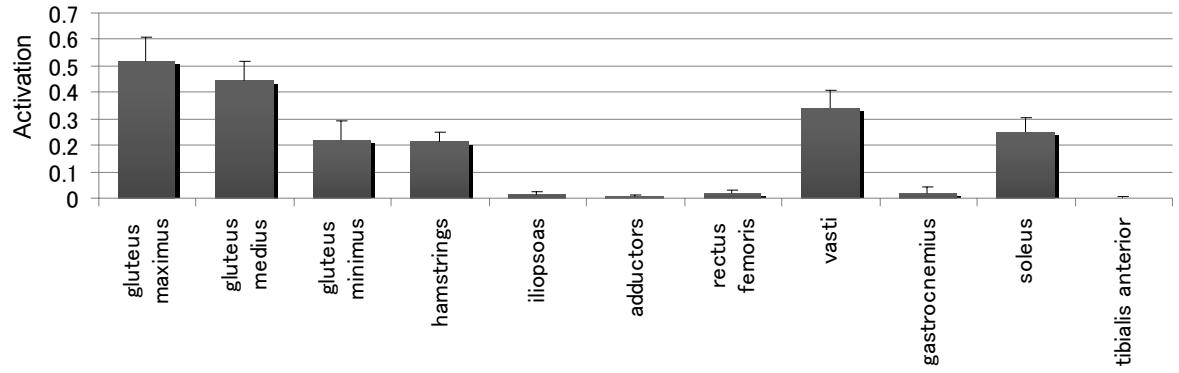

Figure 1 Activation of major muscle groups of the support leg averaged from foot contact to toe-off during side jump.

CONCLUSION: Many coaches and researchers pointed out that the glutei were one of the most important muscle groups for speed skaters. This study suggested that the side jump would be one of the training methods for speed skaters to augment the hip joint torque by the glutei.