

AN ELECTROMYOGRAPHIC ANALYSIS OF FOUR METHODS IN SQUAT TRAINING

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[PURPOSE]

The parallel squat is a complex lift involving the ankle, knee, and hip joints. The squat training holds an unparalleled position of eminence in strength training as well as rehabilitation. The squat is generally included in a strength training and rehabilitation program to develop the quadriceps, hamstrings, and triceps surae. Several studies have demonstrated the favorable use of the parallel squat during knee rehabilitation, such as after cruciate ligament reconstructive surgery. In this way the parallel squat is recommended as general training for lower limbs, but little is known about the difference of muscle activity during other methods. The purpose of this study is to compare activity in seven muscles of lower limb when the parallel squat, half squat, full squat and parallel squat on balance discs are performed.

[METHODS]

Five men volunteered participate in this study. At the time of testing, each subject had been regularly engaged in a strength training program, including the parallel squat, half squat, full squat and parallel squat on balance discs. A commercially available surface EMG system (telemetry2400, myovideo, myoreserch: Noraxon, USA) was used activity in seven muscles: adductor longus(AL), vastus medialis(VM), vastus lateralis(VL), rectus femoris(RF), biceps femoris(BF), tibialis anterior(TA), and gastrocnemius(GAS). EMG and video data collection equipment were electronically synchronized. Muscle activity signals were simultaneously sampled(1500Hz). The decent phase was defined at the period between first knee joint flexion and the return to fixed, extended knee position. The ascent phase was defined as the period between maximum knee joint flexion and the return to a fixed, extended knee joint position. The iEMG data were analyzed before 0.8 seconds and after 0.8 seconds from maximum knee joint flexion point. The measurement data was calculated by dividing the parallel squat iEMG data by the iEMG data of each method. The calculated values were expressed in percentage.

[RESULT]

Half-squat:

AL:84.8%, VM:90.3%, VL:90.2%, RF:73.1%, BF:98.8%, TA:78.3%, GAS:110.1%

Full-squat:

AL:65.4%, VM:106.9%, VL:100.2%, RF:166.6%, BF:99.2%, TA:130.4%, GAS:117.1%

Parallel squat on balance discs:

AL:459.1%, VM:91.6%, VL:86.7%, RF:102.3%, BF:101.0%, TA:75.0%, GAS:482.3%

[CONCLUSION]

Each of the four methods in squat training examined iEMG data in this study, the parallel squat, half squat, full squat and parallel squat on balance disc, exhibited significantly greater iEMG values with the AL and GAS on balance disc

compared with the normal parallel squat. However, the values of the VM and VL using balance discs were significantly lower than those of parallel squat. These results indicate that it is necessary to consider the effect of each method in squat when developing a strength and rehabilitation program for the lower leg muscles.

Keywords: Lower limb, Training, Electromyography