

EFFECTS OF MOVEMENT RANGE ON PEAK TORQUE DURING ISOKINETIC KNEE FLEXION AND EXTENSION

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INTRODUCTION: The knee joint is one of the biggest and most complex joints of the body. Optimal function of the knee joint is closely related with the physical performance and the outcome of sporting activity. Consequently, there have been many studies related to the muscles of the knee joint. The majority of these have focused on 90° range of knee movement, and the same start-angle and end-angle. However, during normal exertion and in sports, different actions require a different range of movement of the knee joint. In addition, the muscular force and velocity are also different. Therefore, in this paper, the biomechanical characteristics of knee muscles in different ranges were studied.

METHODS: The subjects selected for this study were physically active males (n=34). All of them volunteered to participate in the study and informed consent was provided. All subjects were right-leg dominant and had asymptomatic knee function, with no previous history of strength training or involvement in competitive sports that emphasized muscular strength or power.

Subjects were instructed as to the purpose of the test and given time to familiarize themselves with the test equipment. Upon completion of the introduction to the study, the subject began a series of warm-up exercises. Each exercise lasted for ten minutes and hamstrings, quadriceps and low back were stretched.

In order to standardize the experiments and localize the muscle actions, subjects were tested in the sitting position with stabilizing straps placed around the chest, thigh and over the shoulder. The knee flexion/extension attachments were used as indicated in the Cybex-6000 manual. Each subject was given four to six submaximal trial repetitions and one to two maximal trial repetitions before testing. Each subject was allowed a brief rest (less than two minutes) prior to testing. Nine ranges (80°-120°, 80°-135°, 80°-150°, 80°-165°, 80°-180°, 90°-180°, 105°-180°, 120°-180°, 135°-180°) were used for the study. In each range, the extension and flexion muscle actions were accomplished at constant angular velocities in the following order: 60°/s, 180°/s, 300°/s. Three trial repetitions were allowed at each angular velocity. The torque curves produced during muscle actions were recorded and the peak torque (PT) was subsequently calculated.

RESULTS: In the present study, the results showed that as the movement ranges increased, the peak torque (PT) of knee flexors and extensors also displayed an increasing pattern. Total work (TW) and average power (AP) of knee flexion and extension were also shown to increase with the increasing movement ranges. It was found that in each movement range, the peak torque decreased with the increasing of angular velocity.

REFERENCES:

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