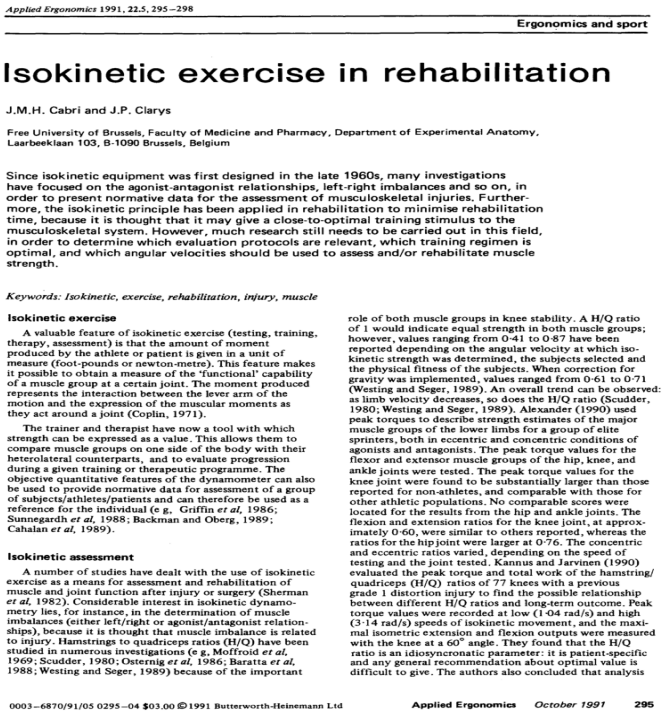
Isokinetic Exercise And Assessment



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Isokinetic exercise in rehabilitation

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Since isokinetic equipment was first designed in the late 1960s, many investigations have focused on the agonist-antagonist relationships, left-right imbalances and so on, in order to present normative data for the assessment of musculoskeletal injuries. Furthermore, the isokinetic principle has been applied in rehabilitation to minimise rehabilitation time, because it is thought that it may give a close-to-optimal training stimulus to the musculoskeletal system. However, much research still needs to be carried out in this field, in order to determine which evaluation protocols are relevant, which training regimen is optimal, and which angular velocities should be used to assess and/or rehabilitate muscle strength.

Keywords: Isokinetic, exercise, rehabilitation, injury, muscle

Isokinetic exercise

A valuable feature of isokinetic exercise (testing, training, therapy, assessment) is that the amount of moment produced by the athlete or patient is given in a unit of measure (foot-pounds or newton-metre). This feature makes it possible to obtain a measure of the 'functional' capability of a muscle group at a certain joint. The moment produced represents the interaction between the lever arm of the motion and the expression of the muscular moments as they act around a joint (Coplin, 1971).

The trainer and therapist have now a tool with which strength can be expressed as a value. This allows them to compare muscle groups on one side of the body with their heterolateral counterparts, and to evaluate progression during a given training or therapeutic programme. The objective quantitative features of the dynamometer can also be used to provide normative data for assessment of a group of subjects/athletes/patients and can therefore be used as a reference for the individual (e g, Griffin *et al*, 1986; Sunnegardh *et al*, 1988; Backman and Oberg, 1989; Cahalan *et al*, 1989).

Isokinetic assessment

A number of studies have dealt with the use of isokinetic exercise as a means for assessment and rehabilitation of muscle and joint function after injury or surgery (Sherman *et al*, 1982). Considerable interest in isokinetic dynamometry lies, for instance, in the determination of muscle imbalances (either left/right or agonist/antagonist relationships), because it is thought that muscle imbalance is related to injury. Hamstrings to quadriceps ratios (H/Q) have been studied in numerous investigations (e g, Moffroid *et al*, 1969; Scudder, 1980; Osternig *et al*, 1986; Baratta *et al*, 1988; Westing and Seger, 1989) because of the important role of both muscle groups in knee stability. A H/Q ratio of 1 would indicate equal strength in both muscle groups; however, values ranging from 0·41 to 0·87 have been reported depending on the angular velocity at which isokinetic strength was determined, the subjects selected and the physical fitness of the subjects. When correction for gravity was implemented, values ranged from 0·61 to 0·71 (Westing and Seger, 1989). An overall trend can be observed: as limb velocity decreases, so does the H/Q ratio (Scudder, 1980; Westing and Seger, 1989). Alexander (1990) used peak torques to describe strength estimates of the major muscle groups of the lower limbs for a group of elite sprinters, both in eccentric and concentric conditions of agonists and antagonists. The peak torque values for the flexor and extensor muscle groups of the hip, knee, and ankle joints were tested. The peak torque values for the knee joint were found to be substantially larger than those reported for non-athletes, and comparable with those for other athletic populations. No comparable scores were located for the results from the hip and ankle joints. The flexion and extension ratios for the knee joint, at approximately 0·60, were similar to others reported, whereas the ratios for the hip joint were larger at 0·76. The concentric and eccentric ratios varied, depending on the speed of testing and the joint tested. Kannus and Jarvinen (1990) evaluated the peak torque and total work of the hamstring/quadriceps (H/Q) ratios of 77 knees with a previous grade 1 distortion injury to find the possible relationship between different H/Q ratios and long-term outcome. Peak torque values were recorded at low (1·04 rad/s) and high (3·14 rad/s) speeds of isokinetic movement, and the maximal isometric extension and flexion outputs were measured with the knee at a 60° angle. They found that the H/Q ratio is an idiosyncronatic parameter: it is patient-specific and any general recommendation about optimal value is difficult to give. The authors also concluded that analysis

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