Kinetic limitations of maximal sprinting speed

A.E. Chapman and G.E. Caldwell
Department of Kinesiology, Simon Fraser University, Burnaby, B.C., Canada V4A 1S6

Received 26 August, 1982. Available online 19 March, 2004

Abstract

One runner was filmed when sprinting at a variety of speeds on a treadmill and a variety of kinetic and kinematic variables was calculated during leg recovery. Peak total leg energy increased at lower speeds but changed little between penultimate and maximal speed. Consequently successful completion of recovery occurred at high speeds by delaying the reduction of total leg energy prior to foot strike. The extent of this delay appeared to be limiting between penultimate and maximal speed, and eccentric muscle moment at the knee appears to be the factor which limits this delay. This necessitated spending more time in the airborne phase of recovery and resulted in a modification of the relationship between stride length and stride frequency at high speeds. The fixed proportion of energy removed from the recovery leg at all speeds during contra-lateral stance was related to the action of two-joint muscles.