Development of a Biomechanistic Fatigue Index for Leg-Extension Training

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Muscle function is dependent on its history. Fatiguing mechanism acts as a determining factor in affecting further muscle behavior. A fatigue determining index is perhaps a useful tool for athlete's function analysis which helps a coach to prescribe individual instructions for different athletes on the basis of their own performance. In this study, we develop a model for fatigue simulation during leg-extension training, using a fatigue index introduced as athlete's power declining factor. Motion of athlete's shank in leg-extension training is considered as a 1-DOF pendulum system oscillation, being controlled by knee extensor-flexor muscles mechanical parameters, i.e., stiffness and damping coefficients. The effect of fatigue on muscle performance is modeled as modification in muscle mechanical parameters and muscle motivating torques while repeating the leg-extension training. Fatiguing determinant factor is expressed by Fatigue Index obtained from training tests data, as diagrams of motion with respect to time. The model is run and different values of Fatigue Indices which corresponded to training tests were evaluated.