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A MODEL FOR CONTROLLING AND QUANTIFYING VOLITIONAL MUSCLE PERFORMANCE OF RAT PLANTAR FLEXORS IN VIVOShastri, V¹; Wirth, O¹; Cutlip, R G.¹**Author Information**¹National Institute for Occupational Safety and Health (NIOSH), Morgantown, WV, USA

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An in vivo animal model was developed to study the effects of volitional eccentric, concentric, and isometric muscle actions and varying work-rest cycles on muscle performance, behavior, and histological and biochemical response. Using a custom-designed apparatus that was attached to a standard operant chamber, rats were operantly conditioned with food rewards to perform a voluntary lifting task to generate controlled movement of the plantar flexors. An opening in the front panel of the operant chamber allowed the rat to enter a Plexiglas tube that was mounted vertically to restrict the movement of the rat. A load cell was embedded in a platform at the bottom of the tube to measure the dynamic force exerted by the plantar flexors. Inside the tube, a neck ring was supported by a yoke that moved along two vertical shafts via linear bearings. A displacement transducer (LVDT) was attached to the weight pans to measure the range of motion of the lift, and allowed determinations of velocity and acceleration of the lifting motion. The apparatus allowed the rat to enter the tube through the opening, insert its neck into the ring, and lift the ring assembly. In this way, eccentric and concentric muscle contractions were produced. In some cases, weights were placed on pans attached to the ring assembly to vary the load. In other cases, movement of the yoke was locked at different heights such that multi-positional isometric performance could be studied. The entire process was computer automated, and vertical displacement, time during each lift, and dynamic forces exerted during each lift were sampled at 100 Hz via a computer-controlled data acquisition system. This model allows skeletal muscle performance to be studied longitudinally and in a controlled biomechanical environment. This model also is well suited to study the effect of chronic volitional muscle actions and work-rest cycles on behavioral and physiological outcomes.

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