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Effect of Endurance Training on Central/Peripheral Fatigue and Postural Control Following High Intensity Dynamic Exercise

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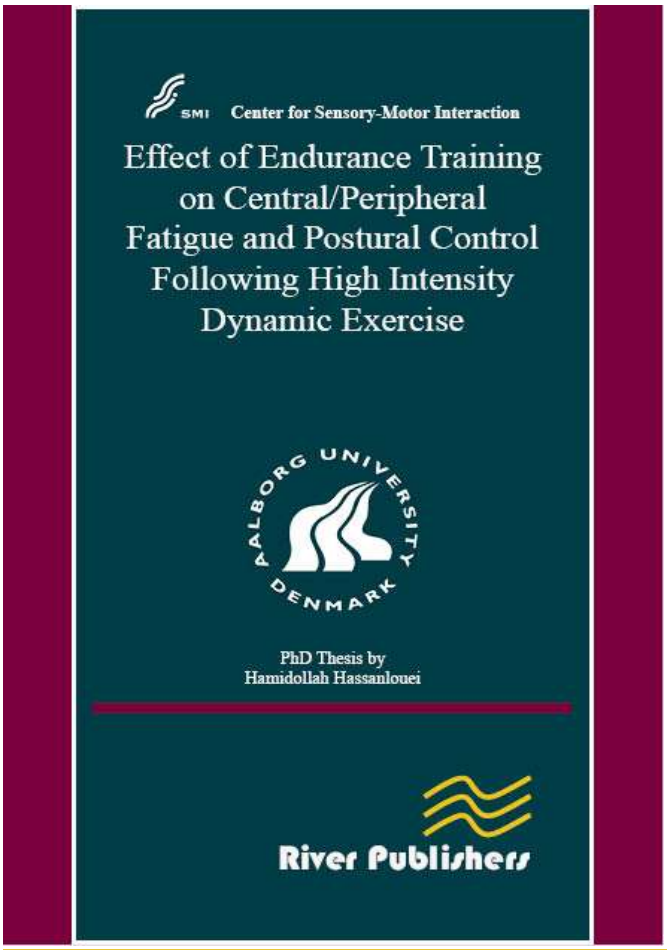
The objective of this thesis was to investigate the effect of musculoskeletal fatigue on postural control and the effect of an endurance training intervention on central and peripheral components of fatigue. The muscles around the knee play an important role in explosive and powerful performance of the leg during daily life and sporting activities. However, fatigue- induced impairments in muscle function may reduce the ability of the muscles around the knee to stabilize the knee joint. This may expose structures of the knee to abnormal loading during exercise. Training has been extensively shown to lead to resistance to fatigue however the effects of endurance training on postural control as well as central and peripheral components of exercise induced fatigue is unknown.

In this thesis, four studies were performed. First, the effects of eccentric exercise and delayed onset muscle soreness of the knee muscle on postural control were investigated in healthy subjects. In this study muscle activation around the knee were examined. In a second study, the effects of dynamic fatiguing exercise on postural control were investigated and muscle activation responses following high intensity dynamic exercise were investigated. In third study, the effects of 6 weeks progressive endurance training on postural control following fatiguing exercise were examined. In the fourth and final study, the effects of training on central and peripheral components of fatigue following high intensity dynamic exercise were investigated.

The results showed lower electromyography (EMG) amplitude and delayed EMG onset following skeletal muscle fatigue induced by eccentric and dynamic exercise. However, following 6 weeks endurance training subjects increased their resistance to fatigue, i.e., were able to sustain a high power output, showed increased knee maximum muscle force and smaller decrement in force following exercise, and a smaller reduction in muscle fiber conduction velocity during a sustained contraction. Moreover following training, subjects improved postural stability during unexpected perturbations in the presence of fatigue. Training induced adaptations were shown to occur at both peripheral and central components of the nervous system.

This thesis provided insight into the contribution of fatigue components to the regulation of balance after unexpected perturbations. Moreover, it was shown how endurance training affected resistance to fatigue and improved balance regulation in the fatigued state. These findings will assist in the development of specific training programs to improve resistance to fatigue and allow for an improved stability regulation following unexpected perturbations.



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