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Exercise-Induced Changes in Neurotrophic Factors and Markers of Blood-Brain Barrier Permeability Are Moderated by Weight Status in Multiple Sclerosis

ABSTRACT

Blood-brain barrier (BBB) and neurotrophic factors seemingly have an important role in multiple sclerosis pathology. Physical activity may influence blood-brain barrier function and levels of neurotrophic factors, and such effects might be moderated by body weight status. This study investigated the effect of exercise training on markers of blood-brain barrier permeability and neurotrophic factors as a function of weight status in multiple sclerosis patients. Sixty three persons with relapsing remitting multiple sclerosis who were normal weight (n: 33) or overweight (n: 33) were randomly assigned into groups of exercise (normal weight training, n: 18; overweight training group, n: 18) or no exercise (normal weight control, n: 15; overweight control group, n: 15). The intervention consisted of 8 weeks (3 days per week) of cycling undertaken at 60-70% peak power. Resting blood concentrations of s100 calcium-binding protein B (s100b) and neuron-specific enolase as BBB permeability markers, neurotrophic factors and cytokines (Interleukin-10 and tumor necrosis factor alpha) were evaluated before and after the intervention. There were significant weight, training, and interaction effects on brain-derived neurotrophic factor and platelet-derived growth factor; however, ciliary neurotrophic factor and nerve growth factor did not demonstrate any effect. Brain-derived neurotrophic factor and platelet-derived growth factor were significantly increased from pre-post in normal weight exercise. Significant weight, training, and interaction effects were found for s100b. In detail, s100b was significantly increased from pre-post in normal weight exercise. In contrast, neuron-specific enolase and cytokines did not demonstrate any effect. Generally, Exercise training may alter markers of BBB permeability and neurotrophic factor status in normal weight persons with multiple sclerosis; however, overweight participants may be more resistant to these effects of exercise.

Keywords: Blood-brain barrier, Neurotrophic factors, Cytokine, Exercise, Excess weight, Multiple sclerosis