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EXERKINES AS MEDIATORS OF HEALTH BENEFITS INDUCED BY PHYSICAL EXERCISE

TIME COURSE OF PLASMA BRAIN-DERIVED NEUROTROPHIC FACTOR RELEASE FOLLOWING SINGLE AND MULTIPLE SESSIONS OF INTERVAL CYCLING IN HEALTHY MEN

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Brain-Derived Neurotrophic Factor (BDNF) is a key molecule regulating several cellular processes involved in the maintenance of normal brain function [1], including synaptic plasticity, neuroregeneration, and neuroprotection. Reduced levels of this neurotrophin have been associated with neurodegenerative, neurological, and cardiovascular diseases [2]. BDNF is expressed in neuronal cells, including glutamatergic neurons, glial cells, and microglia [1], as well as in non-neuronal tissue, such as heart, thymus, liver, spleen, skeletal muscle, in immune system cells and in platelets [2]. It has been demonstrated that physical exercise may enhance BDNF expression, promoting neurogenesis and improving brain function [1]. Circulating BDNF levels and cognitive function decline with age, therefore regular exercise may represent a non-pharmacological strategy to support cognitive health in aging [3]. Although the role of physical exercise in increasing BDNF levels has been recognized over the past two decades, and its kinetics have been studied after a single bout of exercise, no studies have investigated the time course of plasma BDNF release over multiple weeks of aerobic training. Therefore, the aim of the study was to investigate plasma BDNF release in response to an interval cycling training program, both after a single bout of exercise and following a 6-week training period (14 sessions). Nine non-sedentary male participants (age 39 ± 11 years, VO2 peak 50.6±5.8 mL•Kg-1•min-1) were recruited and completed a 6-week training protocol consisting of 4x5-min cycling at 60% peak power output (PPO) – as determined during an incremental test to exhaustion – interspersed with 3-min recovery at 40% PPO. Blood samples were collected at baseline and at three time points – 15 minutes, 24 hours and 48 hours – after both the first training session (S1) and last session (S14). Plasma BDNF concentration was measured using an ELISA assay. A non-parametric Friedman test revealed no significant changes in BDNF levels after the first training session (S1). Following 14 training sessions (S14), BDNF levels significantly increased ($p < 0.001$) from baseline (1.8 ± 0.1 ng/mL), peaking 15 minutes post-exercise (3.2 ± 0.2 ng/mL) and remaining elevated at 48 hours (2.8 ± 0.1 ng/mL). Using the Wilcoxon test, no significant changes in baseline concentrations were observed when comparing the first (S1) and last sessions (S14). However, significant differences ($p < 0.05$) were found between S1 and S14 at 15 minutes (S1: 2.1± 0.1 vs. S14: 3.2 ± 0.2 ng/mL), 24 hours (S1: 2.4 ± 0.2 vs. S14: 2.8 ± 0.2 ng/mL), and 48 hours post-exercise (S1: 2.0 ± 0.2 vs. S14: 2.8 ± 0.1 ng/mL). Our findings show that several weeks of interval cycling training resulted in a greater BDNF release than a single bout of exercise. However, given the limited sample size and substantial inter-individual variability, further studies are required to confirm whether regular aerobic exercise, performed over time, can increase BDNF levels, which would position physical activity as a promising, low-cost, and accessible intervention to enhance cognitive performance [3].

Keywords: *plasma BDNF, aerobic exercise, interval cycling, kinetics, training.*