



Autonomic Nervous System: Chapter 13. Exercise and the autonomic nervous system (Handbook of Clinical Neurology)

Qi Fu, Benjamin D. Levine

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The autonomic nervous system plays a crucial role in the cardiovascular response to acute (dynamic) exercise in animals and humans. During exercise, oxygen uptake is a function of the triple-product of heart rate and stroke volume (i.e., cardiac output) and arterial-mixed venous oxygen difference (the Fick principle). The degree to which each of the variables can increase determines maximal oxygen uptake (\dot{V}_{O_2}). Both “central command” and “the exercise pressor reflex” are important in determining the cardiovascular response and the resetting of the arterial baroreflex during exercise to precisely match systemic oxygen delivery with metabolic demand. In general, patients with autonomic disorders have low levels of \dot{V}_{O_2} , indicating reduced physical fitness and exercise capacity. Moreover, the vast majority of the patients have blunted or abnormal cardiovascular response to exercise, especially during maximal exercise. There is now convincing evidence that some of the protective and therapeutic effects of chronic exercise training are related to the impact on the autonomic nervous system. Additionally, training induced improvement in vascular function, blood volume expansion, cardiac remodeling, insulin resistance and renal-adrenal function may also contribute to the protection and treatment of cardiovascular, metabolic and autonomic disorders. Exercise training also improves mental health, helps to prevent depression, and promotes or maintains positive self-esteem. Moderate-intensity exercise at least 30 minutes per day and at least 5 days per week is recommended for the vast majority of people. Supervised exercise training is preferable to maximize function capacity, and may be particularly important for patients with autonomic disorders.

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