

EXERCISE AND NON-COMMUNICABLE DISEASE

Associate Prof Daniela Lucini,
Exercise Medicine,
University of Milan,
Italy.
Email: daniela.lucini@unimi.it

The concept of a beneficial relationship between exercise and health is as old as the writings of Hypocrites (5th century BC). Eons of interest and scientific investigations eventually followed through, and the role of regular exercise in determining health grew of importance and nowadays exercise is considered a real therapy for non-communicable diseases and the best way (together with healthy nutrition, stop smoking and stress management) to prevent them and to foster wellbeing at any age. Cardiorespiratory fitness may be, in fact, considered the best quantitative predictor of all-cause mortality and cardiovascular events and to improve fitness is now one of the main goals of clinical practice.

On the other hand it is difficult to change patient's lifestyle: simple counseling about healthy behavior, in particular aiming to reduce sedentariness and to increase physical exercise, yields limited or no results. Conversely structured approaches based on cognitive behavioral strategies, careful patient assessment, traditional disease management, prescription of exercise, healthy nutrition and smoking cessation, have been shown to be most effective.

The mechanisms underlying the relationship between regular physical exercise and health are numerous and new evidences suggesting new benefits are constantly emerging. Regular exercise, particularly aerobic exercise (although recent data suggest an important role also of the resistance modality), acts through many pathways which affect cardiovascular risk factors. On the other hand, it is associated with a better and longer life beyond what can be explained only with improvement of cardiovascular health. Many studies show that the benefits of regular exercise remained significant even after adjustment for the most common cardiovascular risk factors and could not be explained by genetic factors. Of particular interest is the relationship between exercise and autonomic nervous system.

Several non-communicable diseases, such as ischemic heart disease, hypertension, heart failure, diabetes, obesity, functional syndromes and even cancer, are characterized, per se, by an impairment of autonomic control of the circulation, particularly by sympathetic over-activity and decreased vagal drive.

Acute exercise enhances sympathetic activity and thus might increase the risk of cardiac events on short term basis, particularly in those patients with known heart disease. This is one of the reasons why an accurate patient assessment and tailored exercise prescription is necessary, giving particular attention to define modality and intensity of exercise. Conversely aerobic training is associated with an improvement of autonomic control of the circulation as suggested by an increase of baroreflex sensitivity and of indices of vagal activity.

The study of autonomic nervous system (ANS) in a clinical setting is performed by spectral analysis of cardiovascular (heart period or systolic arterial pressure) variabilities. This non-invasive, non-intrusive methodology furnishes markers of prevalent vagal activity, of prevalent sympathetic activity, or of baroreflex sensitivity.

Many papers in recent literature report, for instance, that cardiac patients after rehabilitation show an improvement of markers of vagal activity and baroreflex sensitivity; hypertensive patients show a reduction of blood pressure levels and an increased vagal control after aerobic exercise training; patients with diabetes (both type I and II) or obese subjects present a betterment of autonomic nervous system profile after aerobic training. Moreover cardiorespiratory fitness ($VO_2\text{max}$) correlates significantly with markers of vagal control both in patients and in athletes. Heart rate variability shows a potentially important role in sport applications: not only athletes present a different (characterized by prevalent vagal control) autonomic profile as compared to untrained subjects, but also different sport disciplines present different ANS profiles and different training levels (in the same athlete) present different ANS control. For instance moving from routine training level to maximal training, close to competition, there is a conversion from vagal to sympathetic predominance.

In conclusion, exercise represents an important strategy in the clinical management/prevention of non-communicable diseases, particularly when part of a more complex lifestyle change program which comprises also healthy nutrition, stop smoking and stress management. Exercise training, particularly aerobic, positively interferes with many physio-pathological mechanisms, in particular with autonomic control of the circulation (a control mechanism that is already altered in many non-communicable diseases). The non-invasive assessment of ANS control may be a new technique permitting to easily monitor the beneficial effect of exercise in patients or the effect of different training levels in athletes.

