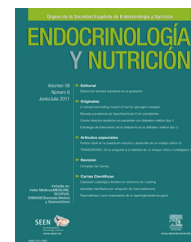


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EDITORIAL

Benefits of exercise in healthy population and impact on disease occurrence[☆]

Beneficios del ejercicio físico en población sana e impacto sobre la aparición de enfermedad

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Physical exercise is defined as any activity that produces body motion due to muscle contraction dependent on energy consumption and which has progressive benefits on the state of health. The effects of exercise on health in both primary and secondary prevention are becoming increasingly better known. A large part of current society has not been able to widely incorporate exercise into daily routine, with a progressive decrease in the amount of time devoted to exercise. There has also been a trend to the abuse of hypercaloric food, while the amount of time devoted to sedentary activities, such as watching TV or using personal computers, is increasing.¹

The literature widely shows the benefits of physical exercise on several indicators of health, including cardiovascular mortality and death for other reasons, as shown in a recent meta-analysis.² Many prospective studies conducted in several countries report the high prevalence of sedentary lifestyles and their association with poor health outcomes. A study showed a risk of premature death attributable to the lack of physical exercise of approximately 9%. This would lead to an approximate calculation of 5.3 million deaths

every year attributable to lack of exercise.³ Overall, one out of every five people worldwide leads a sedentary lifestyle.⁴ Lack of exercise is especially prevalent in some subgroups such as women, elderly subjects, and people with few economic resources.

Despite the increase in sedentary lifestyles, their associated risks for health, and the potential of physical exercise for the prevention of cardiovascular morbidity and mortality, physicians often do not take action to counteract the lack of exercise of their patients. Only 13–34% of primary care patients from developed countries report that they receive from their family physicians advice and recommendations on the physical activity they should perform.⁵

Regular physical exercise causes in the mid or long term a number of adaptations in several systems (musculoskeletal, cardiovascular, respiratory, and metabolic). Exercise has a favorable impact on the development of chronic diseases, including cardiovascular conditions, diabetes mellitus, chronic respiratory insufficiency, chronic renal disease, cognitive impairment, and some cancers, amongst others. In fact, exercise performance in the middle years of life has been associated with a decrease in morbidity and in the risk of developing chronic diseases in the late phases of life.⁶

Overall, routine physical exercise appears to be associated with decreased mortality. This association has been established based on observational studies, as no high-quality, long-term, randomized studies are available on the

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benefits of exercise for the prevention of cardiovascular disease or death in healthy populations. Observational studies with a large number of participants relate the performance of regular exercise to a decreased mortality in most subjects, regardless of sex and age. Data collected support the theory that the benefits achieved could be dose-dependent, i.e. related to the time and intensity of exercise.⁷

Multiple studies show an inverse relationship between regular exercise and the occurrence of coronary disease, cardiovascular adverse events, and cardiovascular death in both primary and secondary prevention.⁸ Data from observational studies also support other benefits for cardiovascular health. Aerobic exercise may modify the lipoprotein profile (LDL decrease, HDL increase, increased tissue lipase activity), body composition, the factors associated with the risk of thrombosis, the long-term control of systolic blood pressure, and the risk of cerebral infarction.⁹

Exercise increases insulin sensitivity and decreases the risk of developing diabetes. In the mid-term, exercise induces muscle changes leading to a more efficient use of energy. Such changes include increases in blood capillaries in muscle, slow twitch fibers, and GLUT-4 cell receptors in muscle cells, with a resultant increase in glucose uptake. The combination of aerobic and anaerobic exercise appears to be the best way of decreasing fat mass and increasing lean mass, and of decreasing insulin resistance. Despite the influence of genetics on the risk of developing diabetes, this may be positively or negatively influenced by environmental factors. This is supported by studies conducted in healthy subjects and in those intolerant to carbohydrates. The incidence of diabetes may decrease in people who perform regular exercise. Other lifestyle changes, particularly as regards diet, also contribute to the prevention of diabetes. In a clinical trial published in 2002, the impact on the prevention of diabetes development was greater in the group in which changes were made in lifestyle, diet, and physical exercise as compared to the group treated with metformin and diet.¹⁰ Similarly, a recent meta-analysis of 10 randomized clinical trials showed the essential role of physical exercise in the prevention of type 2 diabetes mellitus, including brisk walking (RR 0.69, 95% CI: 0.58–0.83).¹¹ The benefit remains after adjusting for the body mass index, which suggests a direct effect of exercise on blood glucose control. Recent data support a synergistic effect in the benefit achieved when regularity is combined with intensity. In addition, regular physical activity such as, for instance, regular brisk walking for at least 2.5 h per week (30 min daily, 5 days a week) may decrease the occurrence of type 2 diabetes by 30%. Similarly, the American College of Sports Medicine and the American Diabetes Association agreed, on December 2010,¹² to adopt the recommendation to perform regular physical exercise in the same terms, and considered that at least moderate sport activity could have additional benefits, provided it was regularly performed. In this regard, a study conducted in healthy subjects showed that continuous low intensity exercise is more beneficial for health than performing intensive exercise for one hour daily.¹³ According to data collected from the study, long walks and standing improve insulin sensitivity and blood lipid levels more than one hour of intensive exercise daily. Three differentiated physical activity patterns were defined. In the first pattern, participants were instructed to remain seated for 14 h daily

without performing any type of exercise, while in the second pattern they had to remain seated for 13 h daily and performed one hour of intensive exercise. In the third pattern, 6 h of sedentary lifestyle were replaced by 4 h walking and 2 h standing. Thus, the simple fact of being active, standing or walking (third pattern), for long time periods significantly improved insulin and lipid levels as compared to the two sedentary regimens.

Our group¹⁴ proposed some time ago that the type of physical exercise providing health benefits in which it was easiest to maintain in the long term was brisk walking for 10–15 min four times daily (1 km each time) and walking up and down four floors of stairs four times daily, the so-called “rule of fours”. In the light of current data, this may represent a “healthy” physical activity pattern.

Regular physical activity has been shown to be effective in preventing obesity, and has been used to treat obesity. As compared to a low-calorie diet alone, diet combined with exercise is associated with a greater fat mass loss and increased fat mass preservation. Both aerobic and muscle strength exercises, when performed together, may lead to weight loss (often slight) and body fat loss, even in the absence of an associated low-calorie diet.

Most epidemiological studies show an inverse relationship between exercise and cancer. Among the multiple factors involved in the risk of developing cancer, special mention should be made of genetic and environmental factors, diet, the intake of toxic substances such as alcohol and tobacco, and exercise. As regards exercise, the greatest evidence appears to be related to the prevention of colon, breast, prostate, endometrium, and pancreatic cancer, and usually shows a moderate effect. Increased body mass index and low physical activity are independent factors for the development of such cancers. A meta-analysis of 21 studies showed a significant 27% reduction in the risk of developing proximal colon cancer (RR 0.74, 95% CI: 0.68–0.80) in patients performing more exercise as compared to those doing less exercise.¹⁵ Similar results were found for distal colon cancer. A review of 64 studies on breast cancer and physical activity also showed an inverse relationship in the risk of developing breast cancer in women who were more active both at work and during leisure time, with a 30–40% decrease in the risk of breast cancer development.¹⁶ In addition, exercise during and after cancer treatment has been associated with improvements in several quality of life parameters.

It appears that exercise could be helpful in both the short and long term in overcoming difficulties in quitting smoking when associated with behavioral therapy, as was shown in a randomized clinical trial.¹⁷ Moreover, the performance of exercise prevents the weight gain often associated with smoking cessation.

Exercise is associated with increased psychological well-being. High exercise levels are related to no or minimal symptoms of anxiety or depression, as has been shown by many clinical studies. Sport has effectively been used in clinical studies to treat panic attacks, generalized anxiety disorder, and social phobia. On the other hand, depression is significantly associated with various chronic conditions such as obesity, diabetes, coronary disease, or chronic renal damage. Exercise has been shown to be effective for the treatment of depression, and also for the prevention of new disease recurrence. Thus, regular physical exercise

should be recommended to people at risk of suffering mood changes.

The positive influence of physical activity on bone metabolism and the prevention of osteoporosis in both men and women is well-known. Physical exercise is associated with increased bone density and strength secondary to the remodeling produced by muscle activity. Postmenopausal women are a group that could especially benefit in terms of bone mass from the regular practice of muscle strength and resistance exercise at both the lumbar spine and femoral levels. In addition, in patients with osteoporosis the practice of exercise is associated with a lower hip fracture rate.

The presence of arthritis increases the risk of invalidity and disability, especially in elderly people. The most common form of arthritis is osteoarthritis, which may cause weakness, stability and joint motion problems, and physical disability. Among the modifiable factors for the development of this condition, the prevention of obesity is a key aspect.

During menopause, vasomotor symptoms such as hot flashes, skin flushing, sweating, and chills commonly occur. These symptoms occur in 50% of women during the first five years. Clinical studies show that women who perform regular exercise have fewer hot flushes and tolerate them better, and that exercise may therefore be helpful in controlling climacteric symptoms.

The benefits of physical exercise outweigh its risks in most people. Musculoskeletal injuries are the most common risk associated with sports practice. Many such injuries are secondary to joint, tendon, bursa, and ligament overexertion. Injuries often occur when sport of moderate intensity is started after a period of inactivity. The potential risks of arrhythmia, sudden death, and myocardial infarction are much less common but of vital importance. The risk of atrial and ventricular arrhythmia may decrease in healthy people who perform regular exercise as the result of increased oxygen supply and a reduction in cardiac sympathetic activity. The risk is increased, however, in people with prior heart disease or a history of arrhythmia. The risk of sudden death during an episode of high intensity physical activity appears to be low (one death per 1.51 million episodes of exercise).¹⁸ Factors which could increase this risk include the presence of coronary disease, arrhythmia (particularly tachycardia and ventricular fibrillation), structural cardiomyopathy, or myocarditis.¹⁹ Other uncommonly associated but markedly significant adverse events include rhabdomyolysis (renal failure, metabolic acidosis, hyperkalemia, compartmental syndrome), bronchospasm in asthma patients, hyperthermia and hypothermia, dehydration, urticaria, and anaphylaxis, as well as hyponatremia associated with exercise, usually in long-distance races.

The question is often posed as to who should undergo evaluation before starting regular sports practice. Those patients at risk of experiencing an acute coronary event should be the greatest concern. A widespread consensus based on large observational studies states that medical evaluation prior to the start of regular physical activity should not be required in asymptomatic patients at low risk of suffering coronary disease. In patients with multiple cardiovascular risk factors such as hypercholesterolemia, hypertension, diabetes, smoking, or a family history of early cardiovascular disease in subjects under 50 years of age, some clinicians regularly perform electrocardiograms,

despite the fact that no conclusive data supporting this practice as a screening method are available.

Finally, there is no single type of physical exercise that may generally be recommended. It is important to find an exercise that meets personal preferences in order to ensure continuity over time. At least 150 min of moderate aerobic exercise or 75 min of high intensity exercise are recommended each week. These goals should be individualized, with progressive increases in duration and intensity, in order to improve long-term adherence. Increasing physical exercise with daily activities should be an achievable health goal.

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