



Exercise: the undervalued and less-used medicine

Ejercicio: la medicina menos valorada y utilizada

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We have witnessed in the current era of significant advances in both clinical research, therapeutics, and biotechnology, a considerable increase in global life expectancy, which according to the WHO/PAHO, went from 66.8 years in 2000 to 75.5 in 2022.¹ Mexico is no exception, with an increase in life expectancy from 71 in 1990 to 74.4 years in 2022.² However, the leading causes of death remain unchanged. In this regard, cardiovascular diseases have occupied the top lethal positions for decades, constituting significant public health problems and originating enormous socioeconomic costs in Mexico, as it happens worldwide.³⁻⁵ In our country, heart disease is and has been the first general cause of mortality, except in the worst years of the COVID-19 pandemic, when this disease competed with heart disease for the first place as a cause of death. However, with the significant decrease in cases and diseases of this viral infection last year, heart disease has the undisputed first place in the general mortality table in all ages and genders.⁶

Among the main factors causing an increase in mortality from all causes and a range of cardiovascular diseases, stand out both the sedentary lifestyle and physical inactivity,⁷ which despite their relevance in public health and their wide daily use, they are still used interchangeably in the wrong way, as are other terms, such as exercise. This fact reveals the remarkable lack of knowledge in general and the little diffusion on the subject, even among cardiologists.

A sedentary lifestyle or sedentary behavior is defined as the predominance in the daily life of actions in wakefulness with an energy

expenditure of ≤ 1.5 METs when sitting, reclining, or lying down. Physical activity is any body movement produced by skeletal muscle that causes energy expenditure. A physically inactive person performs less than 150 minutes of moderate-intensity activity per week or equivalent.⁷ A MET (metabolic equivalent of task) is the amount of oxygen consumed while the individual is sitting at rest (about 3.5 milliliters of oxygen per kilogram of body weight per minute). A MET represents the intensity of the activity carried out and allows the estimation of the physical functional capacity of a person since it expresses energy expenditure during the physical effort.⁸

On the other hand, it should be noted that exercise is a particular form of physical activity that is planned, structured, and repetitive, with an intermediate or final end, and that requires the obtaining or maintaining of physical aptitude («fitness») and cardiopulmonary, musculoskeletal, and general health.⁹ Functional capacity, also called exercise tolerance (or colloquially named «physical condition»), is defined by the WHO as a measure of the ability of the body to function efficiently and effectively in occupational and recreational activities, being physiologically defined by the maximal oxygen consumption (VO_2 max), that is, the product of cardiac output and the arteriovenous oxygen difference ($Q * cA-cVO_2$).¹⁰ The VO_2 max is the limiting capacity of the body to absorb, distribute and use oxygen. This gas is indispensable in the aerobic mitochondrial generation of ATP in the performance of physical activity for more than 4-5 minutes.¹¹⁻¹³

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START OF THE IDEA OF EXERCISE AS TREATMENT

Physical exercise has been utilized since ancient times for maintaining or attaining health. Historical references can be found in the old Chinese civilization (2500 BC), as well as in ancient Greek and Roman cultures, where the concept of exercise was part of the ideas of Plato (427-327 BC), Hippocrates (460-370 BC), and Galen (129-210 AC). In prominent city-states such as Sparta, exercise was considered a valuable cultural, social, religious, and political asset. Therefore, physical exercise was part of general education in that society from early ages and throughout life.¹⁴ In modern times, this idea has evolved to the point that, nowadays, exercise is considered a therapeutic intervention. Like any other therapy, its prescription must be tailored for each person, according to everyone's characteristics and clinical condition, to obtain optimal response and benefits. Depending on the therapeutic goal, each component of the exercise session (described with the acronym «FITT»: frequency, intensity, time, and type) must be considered. Of course, as in any other therapeutic or preventive intervention, adherence and permanence are of greater relevance. Moreover, a well-structured exercise plan's preventive and curative effects can be attained with minimal or no additional cost and potential savings on future healthcare.

HOW SHOULD EXERCISE BE PRESCRIBED?

The basic principles of exercise prescription have been described using the «FITT» concept (frequency, intensity, time, and type).

- I. Frequency. It is recommended that exercise be carried out on most days (minimum three per week), with a goal of at least 150 min/week to preserve health, although it is variable if there is already some pathology.
- II. Intensity. It is critical to achieving better aerobic fitness and has the most significant impact on risk factors. It is usually expressed in kcal/min or METs.
- III. Time. The intensity of the exercise is inversely related to the time. The training frequency

and duration provide the total expenditure energy (minimum recommendation equals 1,000 kcal/week or 10 MET/h/week).

- IV. Type. There are broadly three types of exercise: dynamic, wrongly known as «aerobics» (because there are examples of a pure dynamic exercise, like the 100 hundred meters run in which the runner spends principally the scarce ATP molecules created by the phosphagen system and the anaerobic glycolytic path), the static type (or «strength»), and the combination of both («resistance»).
- V. Mode. Continuous moderate exercise (MCE) is the most evaluated, although high-intensity (HIIT) interval training programs have been proposed in recent years.⁹

Generally, when a therapeutic product promises many benefits for a wide range of pathologies with minimal risk, it is not a panacea but quackery. Exercise is the only therapeutic and preventive intervention that has proven this claim with scientific facts.

EXERCISE IN HEALTHY SUBJECTS

There is strong evidence of the contribution of regular physical activity to the prevention of various pathologies, even at an early age, and the inverse relationship between a good functional capacity and population mortality and morbidity. Some proven preventive benefits are:

- a) Children and adolescents: improvement of bone health and weight (children from 3 to 5 years old). A better cognitive function, less risk of depression (6 to 13 years), and better cardiopulmonary and muscular fitness (6-17 years). It also prevents dangerous behavioral decisions related to tobacco smoking, alcohol abuse, the consumption of an unhealthy diet, or violence, promoting in this way healthier social environments.^{10,15,16}
- b) In adults: exercise decreases mortality from all causes and cardiovascular disease, reduces the probability of suffering cardiovascular events, including stroke and myocardial infarction, and lowers the

risk of hypertension, diabetes, dyslipidemia, and a variety of cancers in several organs (bladder, breast, colon, endometrium, esophagus, kidney, lung, and stomach). Furthermore, it improves mental health (cognitive functions and sleep, reducing the risk of anxiety, depression, and dementia). In addition, exercise contributes to weight loss and prevents weight recovery, resulting in a better overall quality of life.

- c) Special groups: in pregnant women, exercise lowers the risk of gaining excess weight and developing gestational diabetes and postpartum depression. In the elderly, exercise lowers the risk of injuries from falls, reduces osteoporosis, and promotes healthy aging.^{10,13,15}

EXERCISE IN ILLNESS

In various chronic medical conditions, exercise has also shown its usefulness. Regular physical activity controls cardiovascular risk factors, such as diabetes mellitus, dyslipidemia, obesity, and high blood pressure.¹⁷ In heart failure, especially the variety with «reduced ejection fraction (HFrEF)», exercise diminishes the number of hospitalizations and mortality and enhances the quality of life.¹⁸ Additionally, exercise abates numerous clinical outcomes in an extended range of disparate diseases, such as rheumatic conditions (systemic lupus erythematosus,¹⁹⁻²¹ spondyloarthritis,²² osteoarthritis, rheumatoid arthritis, psoriatic arthritis, systemic sclerosis disease, and gout¹⁹). Furthermore, it benefits mental conditions such as depression,²³ stress, anxiety,²⁴ schizophrenia, other forms of dementia, and neurodegenerative diseases such as Parkinson's disease and multiple sclerosis.²⁰ The benefits of exercise extend to different malignant entities, both solid tumors and those of blood origin, during or after therapy and even in advanced stages, to the point that exercise has also been proposed as adjuvant therapy to chemotherapy and radiotherapy.²⁵⁻²⁷ Likewise, the advantages of exercise extend to musculoskeletal and pulmonary disorders, such as lower back pain and osteoporosis^{20,27-29} chronic obstructive pulmonary disease, asthma, and cystic fibrosis, among others.

EXERCISE RISKS

The frequency of serious complications reported during a stress test is minor and less reported in modern times since they can be prevented and because the test's contraindications and the patient's previous stratification have played an essential role in reducing the inherent risk. One of the most extended studies in this regard, carried out by Gibbons et al. for ten years, included more than 70,000 treadmills up to maximal effort tests, which reported only six severe complications, including one death, with a rate of 0.8 complications per 10,000 tests.³⁰ On the other hand, in a recent prospective study conducted from 2002 to 2013 with patients between 35 and 65 years old who presented sudden death, only 5% (63 cases) occurred during sports activities (incidence of 21.7 per 1 million per year).³¹ In recent years there has been developed a new training modality called «HIIT» (an acronym for high-intensity interval training) that has shown some benefits over the traditional mode MICT (moderate-intensity continuous training). However, it has been observed that the frequency of acute cardiac events is six times higher than with a moderate workload. Nevertheless, as the intensity of the prescription is essential in the training of high-performance athletes,³² a previous complete clinical assessment is indispensable.

IMPORTANCE OF EXERCISE ON PUBLIC HEALTH

Current evidence indicates that physical inactivity represents a severe threat to general and cardiovascular health. In contrast, even moderate-to-vigorous physical activity considerably impacts the prevention of several potentially lethal or disabling pathologies. Although evidence signals that better preventive benefits are attained with full compliance with international expert recommendations, even a modest exercise can abate cardiovascular morbidity and mortality to some degree.⁵

WHAT CAN BE DONE?

It is essential to broaden the investigations, mainly those focused on the adequate

prescription in each pathology, since better tailoring the prescription according to the different kinds of patients. Furthermore, as health personnel, we also should recognize all the benefits of exercise, so it should be considered an established form of therapy. At the same time, health personnel must promote, educate, and make timely referrals to specialists in the field, and have to preach by example, as it is known that words can move, but the example can convince. Unfortunately, according to ENSANUT, more than half of the Mexican population of both genders are sedentary.³³ There is no doubt that this trait contributes not only to the dissemination of the epidemic of obesity that ravages our nation but, more seriously, to the continuous increment of atherosclerotic diseases, the first cause of general mortality among us in current days.

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