

Exercise Training: A Hero that Can Fight two Pandemics at Once

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On March 11th, 2020, the World Health Organization (WHO) declared that the new COVID-19 outbreak was a public health emergency of pandemic proportions. At that time, there were more than 118,000 infected patients in 114 countries and 4,291 people had lost their lives. While daily statistics show increases in the number of deceased and infected people, and despite all the efforts of scientists all over the world, governments and healthcare professionals are facing the challenge of taking decisions driven on data that is new, incomplete or even unavailable.¹⁻³

To prevent virus spreading, some governments put major cities in lockdown and others promoted social distancing, banning public events and shutting down public places, including parks and beaches. Gyms and other training facilities were also closed, leaving people with no secure place to exercise. At first glance, it may seem that there is no other option, but to stay home without exercising. Nevertheless, not exercising is not the only choice for people practicing social isolation. It is, in fact, a very unhealthy choice that should not be considered.

The sedentarism pandemic

The WHO recommends that adults aged 18 years and older should accumulate at least 150 minutes of moderate-intensity aerobic activity, 75 minutes of vigorous-intensity aerobic activity, or a combination of both per week.⁴ People who do not meet these

requirements are considered sedentary. The health benefits of physical exercise include lower risks of cardiovascular disease, hypertension, diabetes, obesity, dementia and breast and colon cancer.⁵⁻⁹ Despite all these benefits, sedentarism is a pandemic, affecting 27.5% of people globally.¹⁰

Sedentarism increases the risk of the world's major non-communicable diseases. I-Min Lee et al.,¹¹ estimated that physical inactivity is responsible for 6% of the burden of coronary artery disease, 7% of type 2 diabetes, 10% of breast cancer and colon cancers. Thus, inactivity is considered responsible for 9% of premature mortality, globally. Actually, sedentarism kills more people annually than the COVID-19 infection.

Comorbidities and prognosis in patients with COVID-19

Yang et al.,¹² described that, in Chinese patients infected with COVID-19, hypertension was the most prevalent comorbidity (17 ± 7%), followed by diabetes (8 ± 6%) and cardiovascular diseases (5 ± 4%). Another meta-analysis confirmed that these comorbidities were associated with poor prognosis. Data about exercise habits in patients infected by COVID-19 is yet not available. Nevertheless, it is clear that these comorbidities would be less prevalent if minimal WHO's exercise requirements were globally met.⁴

Exercise training can help fight viral infections

Exercise training is considered effective in primary prevention and in the treatment of most chronic diseases,^{11,13-16} especially the most prevalent ones, that confers worst prognosis in COVID infections. Thus, physical training itself may prevent deaths during this pandemic.

Keywords

COVID-19; Coronavirus, Communicable Diseases, Emerging; Pandemics; Exercise; Motor Activity/methods; Comorbidity; Social Isolation; Breathing Exercises/methods.

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Physical training is also known to improve immune response. Despite the concerns of some athletes about the side effects of vaccination, high exercise intensity and frequency enhance vaccine-responses in elite athletes.¹⁷ This is also true in older people where immunoglobulins concentrations after vaccinations are greater in cardiovascular-trained individuals than in control ones.¹⁷⁻²²

Despite the promising effects of exercise training on the immune system, exercise stress may be associated with an increased risk for upper respiratory tract infection.²³ Acute bouts of heavy exercise and chronic intensive exercise, as usually performed by long-distance runners, compromise host defenses and increase the incidence of upper respiratory tract infections.^{24,25} In athletes under heavy training both innate and acquired immunity are often observed to decrease, typically 15-25%.²⁶

It is true that exercise can modulate many immune system components, altering the susceptibility to infections, which means that exercise training may increase or reduce the susceptibility to infections. Although it may seem paradoxical, this assertive is true, and quite straightforward. A large study²⁷ about the Hong Kong flu outbreak in 1998 concluded that mild to moderate exercise, performed three to five times per week reduced the risk of mortality, while people who did not exercise or who exercised too much were at greatest risk of death. Thus, the missing piece of the survival puzzle during pandemic is not exercise itself, but its detailed prescription.

Exercise prescription during the COVID pandemic

Physicians learn how to prescribe various drugs. Although exercise is beneficial for the treatment of several diseases, exercise prescription is not taught to medicine students or residents.^{28,29} As any other medication, exercise training needs the right dosing to achieve the desired effects. The American College of Sports Medicine has introduced the FITT-VP principle as a mnemonic with all the points that must be described in exercise prescription: Frequency, Intensity, Type, Time, Volume and Progression.⁶

Social restrictions, correctly imposed during the COVID-19 pandemic, is certainly disrupting routine daily activities of people globally.³⁰ Still, there are exercises that can be safely done at home. Considering the previous discussion on the minimal training volume⁴ for health,

recommended by the WHO, and the embedded risks of immunity reduction due to high intensity training, the following principles can guide home-based exercise while at social isolation.

First do no harm

This principle of the Hippocratic Oath applies here. Exercise has its risks, which are not easily gathered remotely. Before starting exercising by themselves, patients must be sure that all questions in the PAR-Q questionnaire³¹⁻³³ are negative. In addition, it is not recommended to exercise if the patient is experiencing flu symptoms, sore throat, body aches, shortness of breath, fatigue cough or fever. Patients with any positive answer to the PAR-Q questionnaire or presenting any of these symptoms should seek medical advice before start exercising.

Frequency

Guidelines suggest that sedentary people start with aerobic exercise 3 to 5 times per week and that resistance training is done 2 to 3 times per week. Flexibility and mobility exercises can be done on most days.

Intensity

During the pandemics, one should not engage in high intensity exercise. That being said, it is important to know how to evaluate exercise intensity. There are various ways to do that, but some, such as anaerobic threshold, maximal oxygen volume uptake and real maximal heart rate, require exercise tests not available during the pandemic. Although the maximum heart rate calculation (Maximum heart rate=220 -age) presents errors,³⁴ it is probably the most feasible way to analyze one's maximal heart rate when maximal exercise tests cannot be done.

During light intensity exercise, heart rate is kept below 45% of maximum heart rate. The heart rate during moderate intensity exercise is kept between 64 and 76% of maximum heart rate. Thus, during the pandemic, exercise heart rate should not be higher than 77% of maximum heart rate (vigorous exercise).

Resistance exercise prescription usually considers percentages of repetition maximum for each exercise.^{6,35} As repetition maximum tests uses equipment that are not available at home, some adaptations need to be done. Strength exercises that

only requires body weight, as pushups, sit-ups and lunges can be done. Resistance bands are also good options. If more resistance is needed, books, food packages and other objects can all be used as weights for training.

Time

Exercise duration depends on individual aerobic capacity, but sets of 30 to 50 minutes are recommended.

Type

Multicomponent exercise programs including aerobic, resistance, flexibility and balance training exercises are recommended⁴.

Volume

Guidelines recommend at least 150 minutes of aerobic exercise and two resistance training sessions per week. My personal view, considering the risks of immune depletion related to high volume training, is that people who used to exercise before the pandemic should try to keep the same training volume. People who were sedentary should try to adhere to the minimal requirements.

Progression

It is time to keep fit, not to pursue increases in fitness.

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Conclusion

Government measures that restrict people at home during the COVID-19 pandemic do not need to encourage the wider spread of the sedentarism pandemic. Exercise can fight both public health problems, as long as it is adequately prescribed. Maintaining regular physical activity at home is pivotal for healthy living during and after the COVID-19 global crisis.

Author contributions

Conception and design of the research: Castro RRT. Acquisition of data: Castro RRT. Analysis and interpretation of the data: Castro RRT. Writing of the manuscript: Castro RRT, Silveira Neto JG, Castro RRT. Critical revision of the manuscript for intellectual content: Castro RRT, Silveira Neto JG, Castro RRT.

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