

Aerobic Exercise in Covid-19 Pandemic For A Better Cardiovascular, Respiration, and Body Immunity System

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ABSTRACT

Coronavirus disease 2019 (COVID-19) pandemic is attacking several characteristics of the population. It has been identified that those at higher risk of exposure to COVID-19 are the elderly, patients with hypertension and/or diabetes mellitus, patients with many risk factors and/or have been diagnosed cardiovascular disease, and patients with respiratory diseases. The effects of aerobic exercise during the COVID-19 pandemic need to be systematically structured so that accurate and valid information is delivered, is the aim of this paper. According to the guidelines, aerobic exercise during the COVID-19 pandemic has many benefits, including to improve the performance of the cardiovascular system, to maintain and enhance the performance of the respiratory system and the immune system. Hence, it will have an impact on the individual quality of life, the quality of life increases, people can live a healthy life even during the COVID-19 pandemic.

Keywords: COVID-19, Aerobic Exercise, Cardiovascular, Respiration, Immune

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BACKGROUND

Since December 2019 Coronavirus disease 2019 (COVID-19) or corona disease has become a global health emergency (Guan et al. 2020; Phelan et al. 2020; WHO, 2020). As of September 3, 2020, positive cases confirmed of COVID-19 were up to 25.884.895, and a mortality rate more than 859.130 in worldwide (WHO, 2020). Whereas in Indonesia, there have been more than 180.646 positive cases confirmed with over 7.616 fatalities and a case fatality rate of 4,6 % (Kemenkes RI, 2020). The COVID-19 pandemic strike particular group criteria based upon information throughout the world. It has been known that people who have a higher risk of COVID-19 exposure are elderly, patients with hypertension and/or diabetes, patients who have risk factors and/or have been diagnosed with cardiovascular disease, and patients with respiratory diseases (David, 2020)

Otherwise, physical activity and exercise are effective in delivering direct goods for most of the chronic diseases stated previously by rejuvenating mental and physical health (Liu et al. 2019; Ozemek et al. 2019; Wang et al. 2019). The physical moderate-intensity exercise is profoundly advised and has health benefits for people without tokens of COVID-19. Though, as mentioned earlier, due to the high risk of spreading between each other or touching contaminated objects, it was suggested for you to do a physical workout in a private place (e.g. at home) with good ventilation and using your equipment (Halabchi et al., 2020). Recommended moderate-intensity physical exercises are aerobics (walking at home), strengthening, stretching, and balance exercises, or a combination of them (Chen *et al.*, 2020). The literature states that aerobic exercise is an effective and safe alternative to improve or maintain fitness and health during the COVID-19 pandemic if it is carried out properly (Chen *et al.*, 2020; Halabchi, Ahmadinejad and Selk-Ghaffari, 2020). Discussions regarding the effects of aerobic exercise during the COVID-19 pandemic need to be systematically structured so that accurate and valid information is delivered. These are the aim of this paper.

Characteristics of Patient and High-Risk Person of COVID-19

The average incubation period of COVID-19 is 4 days (interquartile range, 2 to 7). The mean age of COVID-19 patients was 47 years (interquartile range, 35 years to 58); 0.9% of patients are less than 15 years old. (58.1% of men were more infected with COVID-19 than women (41.9%). Fever symptoms were felt by 43.8% of patients admitted to the hospital and evolved to 88.7% during hospitalization. Another prevalent symptom is coughing (67.8%), nausea or vomiting (5.0%), and diarrhea (3.8%). Among the overall population, at least 23,7% have one accompanying condition (like hypertension and chronic obstructive pulmonary disease). Essentially, the inmates are hospitalizing, suffering from mild and severe infections. Patients with severe infections are older than patients with mild infections (Chen *et al.*, 2020; Guan *et al.*, 2020; Wang *et al.*, 2020).

According to the American College of Sports Medicine, people who have a high risk of coronavirus exposure are:

- The elderly (aged 65 years and above);
- People with chronic diseases (diabetes, heart and lung disease);
- People with compromised immune systems (such as cancer patients, HIV).

These people are required to limit their activities outside the house, must avoid the fitness center altogether, and continue to workout at home or in the nearest neighbors (ACSM, 2020).

Physical Exercise

Physical exercise is an exercise that is done regularly, structured, and repeated to a certain part of the body so it can grow physical health. Reaching a physical healthiness will allow the body to do certain work without significant fatigue (ACSM, 2020; Haga et al., 2018). Exercises develop healthy components such as increased heart endurance, muscular strength, muscular endurance, and flexibility (Sbardelotto et al., 2018). Furthermore, it would gain your agility, coordination of motion, balance, power, reaction time, and speed (ACSM, 2018).

Aerobic Exercise

Aerobic exercise is an activity that practices large muscle groups, can be sustained continuously and rhythmically (Wahid *et al.*, 2016). As the name implies, some muscle groups are active because they rely on aerobic metabolism to extract energy in the form of Adenosine Triphosphate (ATP) from amino acids, carbohydrates, and fatty acids. Examples of aerobic exercise are cycling, dancing, climbing, long-distance running, swimming, and walking. Those activities build aerobic capability, which is the capacity that illustrates the ability of the cardiorespiratory system to provide oxygen and the skeletal muscle system in employing oxygen (ACSM, 2018).

Effects of Physical Exercise on the Cardiovascular System

Somebody with high levels of physical activity has a lower prevalence and lower mortality rates for the incidence of cardiovascular disease. Aerobic exercise has a systemic impact on the body and a local impact on the heart as shown in figure 1 (Mann and Rosenzweig, 2012).



Figure 1. Aerobic Exercise on the Cardiac and Systemic Effects

Physical exercise has been done not only as an action to keeping a healthy lifestyle but also as an important and reliable non-pharmacological prescription for the prevention and treatment of cardiovascular disease (Thompson and Baggish, 2015). Aerobic physical exercise enhances heart function than anaerobic physical exercise (Flora, 2017).

Physical exercise has a positive impact on circadian rhythms. It is crucial to holding the benefit results of the time, duration, and type of sport-related to circadian rhythms. It becomes a reference in determining the optimal routine exercise program to maintain circadian harmony and the hormonal implications that result in heart rate and blood pressure so it can help to reduce the risk of cardiovascular disease (Hower et al., 2018). Physical

exercise advances cardiorespiratory fitness, thereby changing the patient's prognosis with metabolic and cardiovascular disease because individuals who have a high level of activity or in other words, do physical exercise regularly, the cardiorespiratory fitness level is also high (Harber et al., 2017). This is associated with a reduced prevalence of many risk factors such as cardiovascular disease and coronary heart disease, including hypertension, obesity, metabolic syndrome, and type 2 diabetes mellitus. (Harber et al., 2017; Lavie et al., 2019).

Effects of Physical Exercise on Respiration System

The respiratory system increases with the escalating intensity of exercises such as muscular endurance training or high-intensity aerobic exercise. This allows more air to move in and out of the lungs hence growing gas exchange. In physical exercise, the lung inflates its ability to evolve, so it concedes more amount of air to move in and out (Mazzeo and Liccardo, 2019).

Physical exercise also increases the strength of the breathing muscles, diaphragm, and intercostal muscles. This allows for bigger expansion of the chest cavity so that more capillaries form in the lungs. The new capillaries produced more blood to run in and out of the lungs by increasing oxygen absorption because there is a greater surface area for blood to bind to hemoglobin (Mazzeo and Liccardo, 2019).

Physical exercise raises the number of alveoli so that oxygen exchange and carbon dioxide increases when the gradient between each becomes larger. It occurs because more oxygen is used in the tissues and more carbon dioxide is produced by a greater difference/gradient between blood and tissue. Aerobic exercise tends to boost the efficiency of body tissues in absorbing oxygen and removing carbon dioxide (Mazzeo and Liccardo, 2019).

Exercise helps fight COVID-19, especially in patients who have fallen on a mechanical ventilation. A COVID-19 patient on a mechanical ventilation has a stronger diaphragmatic muscle if he routinely does aerobic exercise than those who don't. Therefore, it is predicted that trained people that develop COVID-19 and require ventilator support will benefit from the exercise-induced preconditioning of the diaphragm. Specifically, aerobic exercise develop numerous biochemical alterations in diaphragm muscle producing in a characteristic that is shielded toward certain objection including prolonged mechanical ventilation (Powers, Bomkamp and Ozdemir, 2020; Woods *et al.*, 2020).

Effects of Physical Exercise on the Immune System

Physical exercise alleviates the immune system from many sides, yet the main mechanism is the mobilization and redistribution of lymphocytes. There is a catecholamine-mediated particular recruitment of those lymphocyte subtypes that are adequate of tissue migration, and their characteristic show they are provoked and 'looking for a fight' (e.g. to admit and kill murder virus-infected cells). Lymphocytes are assembled as an effect of exercise, especially in dynamic exercises and have cardiorespiratory weights (like running, cycling, or rowing) (Simpson and Katsanis, 2020).

Exercise also detaches many cytokines from the skeletal muscle (i.e. myokines) that can assist support immune competency. Muscle-derived IL-6 has been represent to proper immune cell handling towards areas of infection, while IL-7 can excite T cell output from

the thymus and IL-15 help out defend T-cell and NK-cell homeostasis in the periphery, all of which labor to enhance the host immune defense (Duggal et al., 2019).

Physical Exercises Guidelines during the COVID-19 Pandemic

The American Colleges of Schools Medicine gives suggestions to society, juvenile or adult, that regular physical activity is crucial compared to just sitting most of the time. The immune function will get better by doing moderate-intensity physical exercise. Moreover, it can reduce feelings of stress and anxiety caused by the COVID-19 pandemic (ACSM, 2020).

Table 1. Physical Exercise on Pandemic Period COVID-19 (ACSM, 2020).

Aerobic Exercise		Strength Training	
Indoor activities	Outdoor activities (with restrictions suggested by local government)	Use an application from devices	Exercise independently (without devices)
<ul style="list-style-type: none"> -Turn on music and take a brisk walk around the house or going up and down stairs for 10-15 minutes. - Dance with your favorite music - Jump rope (if the joints are within normal limits). -Exercise using a video guide. -Use fitness equipment if available. 	<ul style="list-style-type: none"> -Walking or jogging around the neighborhood with a distance range of 6 feet from the others. -Spending time outside can improve immune function and do not forget to wash your hands when you go home. -Cycling. -Gardening. -Playing <i>games</i> / physical activity with family members. 	<ul style="list-style-type: none"> -Downloading strength training applications in each device, such as "<i>The 7-Minute Workout</i>" (no equipment needed). -Recording your strength training in video format. - Doing yoga, breathing and deep concentration can also reduce anxiety. 	<ul style="list-style-type: none"> -Simple muscular strength exercises around the house, such as: squatting or sitting up straight from a chair, push-ups sticking to walls, tables, floors, even stairs.
<p>Note: A moderate-intensity aerobic exercise with a total of 150-300 minutes per week with muscular strength training 2 times per week (starting gradually in 2, 5, 10 or 20 minutes based on individual abilities and calculate it the total in every minute).</p>			

CONCLUSION

Staying active during the COVID-19 pandemic is necessary for every individual. Active movement according to the American College of Sport Medicine is aerobic exercise equipped with strength training in accordance with the environmental conditions in which each person lives. Aerobic exercise has benefits in improving the performance of the cardiovascular, respiratory and immune systems so that it can prevent individuals from contracting COVID-19 and its comorbidities and minimizing the degree of disease severity if infected with COVID-19.

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