Physical Activity during the Pandemic

Afriwardi [1*]
[1]Lecturer in Physiology, FK Unand Padang
Email : *afriwardi@gmail.com

Citation: Afriwardi. Physical Activity during the Pandemic. Conference of Medical Sciences Dies Natalis Faculty of Medicine Universitas Sriwijaya.Vol 2. No 1.2020

ABSTRACT

The spread of Corona virus disease 19 (Covid-19) which has been going on since December 2019 has had a very broad impact on all walks of life. Data quoted from the official website of the World Health Organization (WHO), as of September 25, 2020, reported that there were more than 31,026,758 confirmed cases of Covid-19 worldwide, and more than 755,786 people had died with positive Covid-19 (1). Meanwhile in Indonesia, as monitored by the Kompas.com website, 137,468 confirmed cases of Covid-19 were reported and more than 6,071 people died. The mortality rate is estimated to be 4.416%, of which most cases involve the elderly (> 80%) (2). Seeing the reality on the ground, by not being disciplined in responding to health protocols to prevent Covid-19 transmission, this number will continue to show an increase.

Keyword: COVID 19, physical activity

INTRODUCTION

The spread of *Corona virus disease* 19 (Covid-19) which has been going on since December 2019 has had a very broad impact on all walks of life. Data quoted from the official website of the *World Health Organization* (WHO), as of September 25, 2020, reported that there were more than 31.026.758 confirmed cases of Covid-19 worldwide, and more than 755.786 people had died with positive Covid-19 (1). Meanwhile in Indonesia, as monitored by the Kompas.com website, 137.468 confirmed cases of Covid-19 were reported and more than 6.071 people died. The mortality rate is estimated to be 4.416%, of which most cases involve the elderly (> 80%) (2). Seeing the reality on the ground, by not being disciplined in responding to health protocols to prevent Covid-19 transmission, this number will continue to show an increase.

The process of transmitting Covid 19, which is considered very easy and infectious, has made most countries have declared this situation a health emergency status. This status assignment is of course aimed at overcoming this situation in order to protect a large part of the population. To anticipate the transmission of Covid 19, the government in countries that have confirmed Covid-

19 has implemented health protocols. The strict application of this health protocol is solely to reduce morbidity and mortality due to Covid-19. Efforts to prevent the transmission of Covid-19 by implementing health protocols in the form of warnings not to leave the house, stay away from crowds, maintain a minimum physical distance of 2 meters, wash hands frequently and wear masks.

Experts do not remain silent to seek and try to find a vaccine or antidote against Covid-19. While these efforts are being carried out, of course we cannot remain silent about Covid-19, given that the danger of being infected with Covid-19 in certain groups is getting out of control. Currently, Covid-19 has become a global problem because it has spread to most countries in the world. It seems that some comorbids such as obesity, diabetes, hypertension, old age, stress and others are risk factors associated with the incidence of hospitalization with Covid-19 so that the disease will become more severe and even end in death (3).

Strengthening the body's immunity can be the last bastion in facing the threat of the Covid 19 virus. Strengthening the body's immune system can be done by using pharmacological and non-pharmacological approaches. Pharmacological strengthening of immunity, namely strengthening efforts by providing drugs in the form of vitamins and dietary supplements, one of which is the provision of vitamin D (4). Some evidence suggests that giving vitamin D has been shown to reduce the risk of infection with influenza and Covid-19 viruses. (5) Strengthening the body's immunity through non-pharmacological channels such as physical exercise can be the last bastion of protection against Covid-19, especially in groups that have comorbidities, such as diabetes, hypertension, old age, and so on.

Evidence Based Medicine (EBM) has proven that doing physical exercise according to the rules can increase the body's immune system. Several studies have shown that directly or indirectly, moderate physical exercise can be recommended as a non-pharmacological, cheap, easy and feasible way to avoid being infected with Covid-19 (3) According to Barret B et al, meditation or physical exercise can prevent infection. acute airway (6). However, it can be said that the volume of exercise is not directly proportional to the impact of increasing immunity. But keep in mind, recommending high-intensity exercise needs further

consideration given the depressive effect that strenuous exercise has on the immune system (3).

Increasing aerobic capacity through physical exercise can have a direct effect on the activity of the immune system. It has been shown that aerobic exercise significantly improves immune system function over a short period of time and that sometimes an increase in immunity can occur with just one training session. The effect of increased aerobic capacity on enhancing immune function can primarily be generated through four mechanisms (7): **Figure 1**

1. Physical exercise can increase the level and function of T lymphocytes, *neutrophils*, *macrophages* and monocytes, which are important elements in the body's defense against infection.
2. Physical exercise can increase the level of immunoglobulins (IgA, IgM, IgG), especially IgA because of its vital role in fighting lung infections.
3. Physical exercise can affect levels of C-reactive protein (CRP), through a slight increase in the short term to fight lung infections and in the long run can inhibit the decline in lung function [7,8,9].
4. Physical exercise is proven to reduce levels of anxiety and depression, through the production of endorphins during physical exercise, so that immunity becomes stronger by rebalancing the T-helper-1 / T-helper-2 ratio.

Increasing your aerobic capacity can significantly improve your mood. This may be attributed to the effect of aerobic exercise on reducing stress hormones, such as corticosteroid and catecholamines, which can rebalance the T helper-1 / T helper-2 relationship. It has been shown that the relationship between exercise duration and mood variation is nonlinear and just doing 10 to 30 minutes of aerobic exercise is sufficient to improve mood. Hogan et al. [10] have shown that cycling for 15 minutes has a positive effect on both young and old people with anxiety disorders.

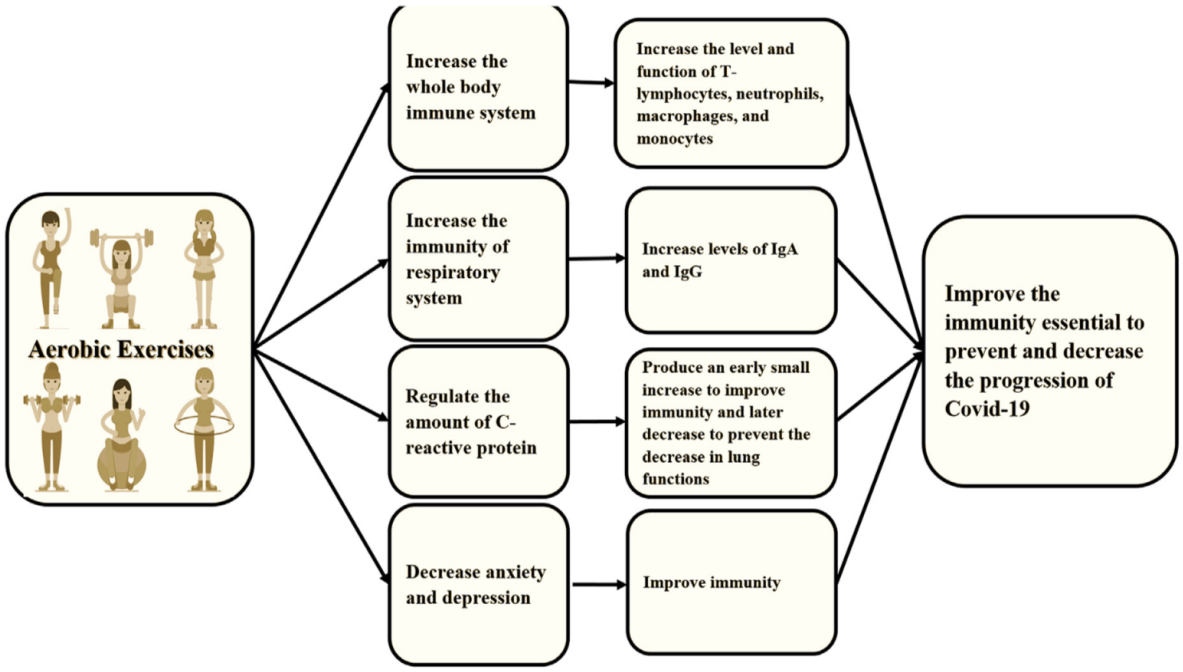

Figure 1. Effects of aerobic exercise on the immune system. (7)

Increasing aerobic capacity through physical exercise, in addition to increasing immunity in general, some researchers have shown that increasing aerobic capacity can also play a role as an effort to prevent and cure infections and respiratory disorders. Aerobic physical exercise can prevent or treat pneumonia and acute respiratory distress syndrome (SGPA). The effect of increased aerobic capacity on improving lung function and preventing lung damage can be explained by four mechanisms (7): **Figure 2**

1 Aerobic exercise can act as a prophylactic against bacteria and fungi, thereby increasing the immunity of the respiratory system.
2 Aerobic exercise can play a role in maintaining normal elasticity of lung tissue as well as increasing the strength and endurance of the respiratory muscles which in turn will increase ventilation. Physical exercise can restore elasticity to lung tissue and increase the strength and endurance of the respiratory muscles. In addition, physical exercise also raises lung complaints so that ventilation capacity will increase.
3 Physical exercise plays a role in producing antioxidants to reduce free radical production and oxidative damage. Aerobic physical exercise stimulates the

formation of antioxidants to limit the production of free radicals and oxidative stress. Free radicals, such as reactive oxygen species (ROS), are produced through normal cellular functions and are considered part of the normal physiological processes of all living things. Free radicals have beneficial and toxic effects. When the levels of free radicals are greatly increased and cannot be handled gradually, they accumulate in the body creating a phenomenon known as "oxidative stress". Oxidative stress is considered a trigger for pathological conditions, it is considered to be the starting point for the onset of several diseases, including lung infections. Light aerobic exercise can assist in processing this accumulation of free radicals by increasing the efficiency of serum oxide dismutase (SOD) so as to prevent the initiation of lung infections and diseases such as pneumonia and ARDS. Increased aerobic capacity can increase the body and lungs' resistance to oxidative stress which causes an increase in the body's resistance to oxidative reactions by increasing the function of the mitochondria which allows better oxygenation to the body tissues and lungs.

4 The role of physical exercise in reducing cough and clearing the respiratory tract through increasing pulmonary immunity and producing autonomic modulation. Recently Leite et al. [11] conducted a study to investigate the effects of 12 weeks of light aerobic exercise on the autonomic nervous system and cough in patients with COPD. They found that light aerobic exercise decreased cough and heart rate. The effect of increasing aerobic capacity on decreased heart rate may be of benefit in reducing the dyspnea seen in Covid-19 patients. Thus, light aerobic exercise can produce a more significant effect on reducing cough and shortness of breath, which is commonly seen in patients with Covid-19, than breathing exercises because it affects the parasympathetic system more, causing a central decrease in these two symptoms.

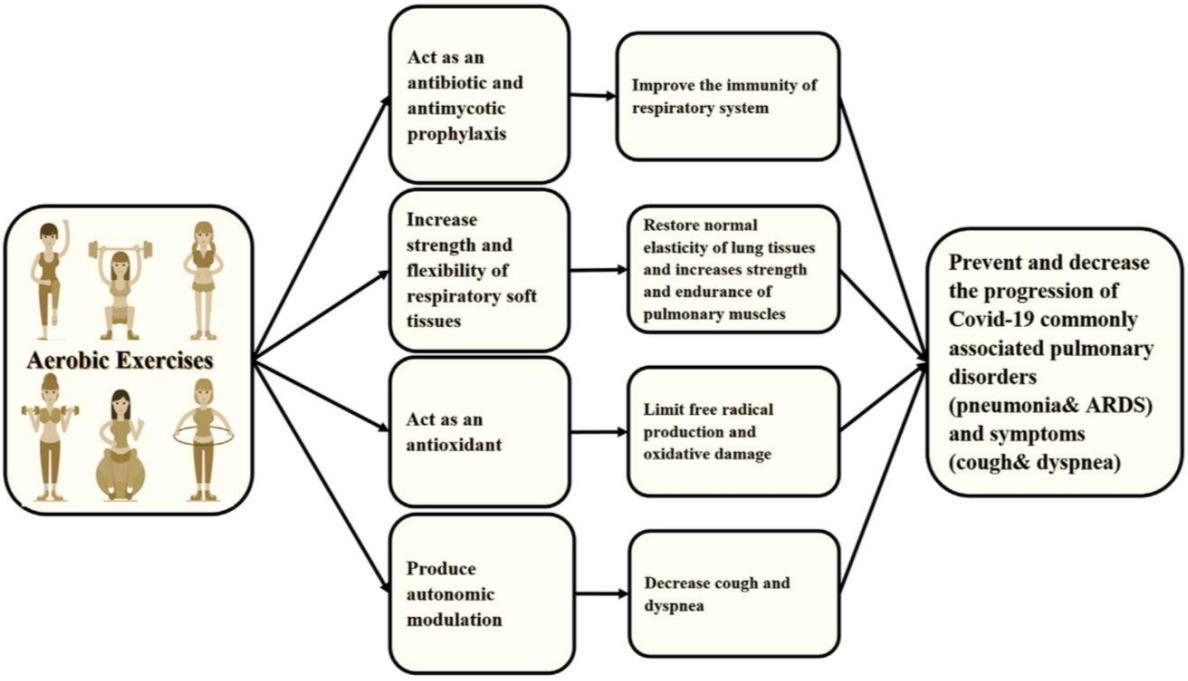

Figure 2. Effects of aerobic physical exercise on the respiratory system. (7)

Physical exercise that aims to strengthen the body's immunity during a pandemic as long as it is carried out according to the rules in the form of, good, correct, orderly, measurable, and progressive will not cause problems. The implementation of preventive health protocols to prevent the transmission of Covid-19 in general only interferes with one point of the five principles of physical exercise, namely the correct rules, while good, regular, measurable, and progressive rules do not meet any obstacles or obstacles.

Good physical exercise

Good physical exercise refers to the type, procedure and timing of exercising. The importance of paying attention to the three aspects above, is none other than to produce more optimal benefits from physical exercise activities. These three aspects become one unit which is carried out simultaneously, meaning that the three components have almost the same contribution in generating benefits from physical exercise (12).

Good physical exercise activities should be done in a good manner. A good physical exercise code is physical exercise that is done in a sequence of warm-ups, core movements and ending with a cool down. This procedure provides an adequate proportion of the time for each of these periods. The period before the core movement is called the warm-up period. Warm up before the core exercise lasts for 5 - 10 minutes. The warm-up phase allows the muscles to prepare to accept the workload during the core training. Warming up can be done by walking or running at a slow pace until there is an increase in pulse or marked by the start of sweating (12).

The core movement starts after the warm-up period is over. The core movement can only be done after the warm-up period is completely perfect. The optimal warm-up period can be characterized by an increase in body temperature and an increase in pulse rate. After warming up the muscles feel more flexible and do not hurt with pulling. Furthermore, the joint space is in the maximum area and most importantly there are no obstacles (12).

After doing core movements for 30 - 45 minutes according to physical ability and the purpose of physical exercise, the physical exercise is closed by cooling down. Cooling is done to return the condition or pulse back to the state before doing the exercise. Cooling is necessary to provide opportunities for the muscles and cardiovascular system to mobilize metabolic products (12).

When should you do physical exercise? A good time for physical exercise is to take time in an environment that is not too extreme. Physical exercise carried out in an extreme environment will certainly be at risk of injury. Physical exercise when the sun is above your head or during the day will certainly disrupt the process of removing body heat. Physical exercise is good to do in the afternoon or in the morning, at which time the environmental conditions are optimal. Physical exercise during the Covid-19 pandemic is recommended in the morning, besides the air is still fresh, the body will simultaneously be exposed to morning sunlight which is needed in calcium metabolism (12).

Correct physical exercise

In order to get more optimal benefits of physical exercise, the implementation of physical exercise should be done properly. The correct physical exercise activity refers to the movements performed while doing sports and the use of equipment during physical exercise. Movement in physical exercise is a series of physical activities carried out in activities during physical exercise, especially in core movements. Physical exercise movements that are carried out randomly, such as movements that do not stimulate all joint motion, are of course useless. Conversely, excessive movement in the form of excessive force can actually cause injury. It is necessary to arrange and select the correct type of movement when doing physical exercise in order to reduce the unwanted effects of doing physical exercise (12).

The correct sports activities have been aimed at the movements and series of movements performed during exercise. However, during the Covid-19 pandemic, the correct rules will certainly be added to refer to health protocols in preventing Covid-19 transmission. *Physical distancing*, as the main action in preventing the transmission of Covid-19, really needs to be a concern, because outdoor activities can be carried out safely, if everyone wants to comply. *Walking, biking, hiking, and jogging* allow a person to get fresh air without close contact with other people. It is important to underline that, in order to prevent the effects of aerodynamic motion, the action to keep the distance is four times the distance when doing a brisk walk (4 meters) and if running the distance can be even further up to 5 meters. In addition, for someone to run, don't follow the person in front (3). The use of a mask during training is very necessary to ensure health protocols for the prevention of Covid-19 transmission. Air flow resistance becomes an obstacle during strenuous exercise. (13)

The use of masks, which is one of the health protocols in preventing the transmission of Covid-19, will directly impact the air ventilation process in the airways. Physical resistance by a mask that is attached directly will interfere with the flow of air through the upper respiratory tract, especially the nose and mouth. Chandrasekaran B and Fernandes S (13) reported that there was a decrease in oxygen saturation with hemoglobin. A decrease in oxygen saturation and

accompanied by an increase in blood CO_2 levels will have an impact on reduced oxygen perfusion in some organs.

Physical exercise using a tight face mask induces a hypoxic environment due to hypercapnia [exchange of oxygen (O_2) and carbon dioxide (CO_2) inadequate. This acidic environment at both the alveolar and vascular levels causes many physiological changes when exercising with face masks: 1) Metabolic shift; 2) Cardiorespiratory stress; 3) Changes in the excretory system; 4) Immune mechanism; 5) Brain and nervous system. **Figure 3**, explains the changes that may occur when doing physical exercise using a tight mask.

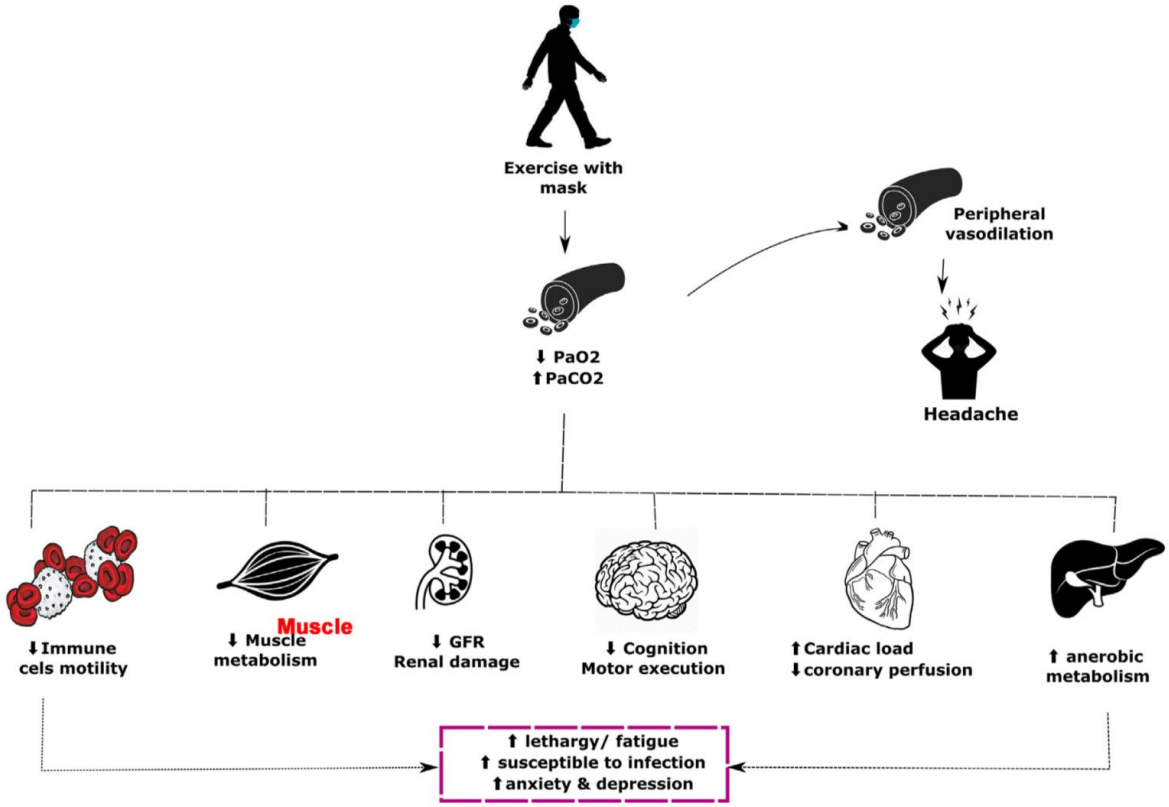

Figure 3. Pathophysiology of changes that occur when physical exercise using tight masks (13)

The changes in oxygen saturation that occur in the blood during physical exercise using a tight mask can be seen by looking at the Bohr oxyhemoglobin dissociation curve in Figure 4. The curve shows an extreme right-sided shift with increased carbon dioxide ($PaCO_2$) and insufficient oxygen availability (PaO_2) . The

red dotted line shows the right shift of the curve due to the unmasked exercise (↑ $PaCO_2$, PH and temperature). The purple dotted line shows extreme curve shifts during masked practice (↑↑↑↑ $PaCO_2$, PH and temperature). (13)

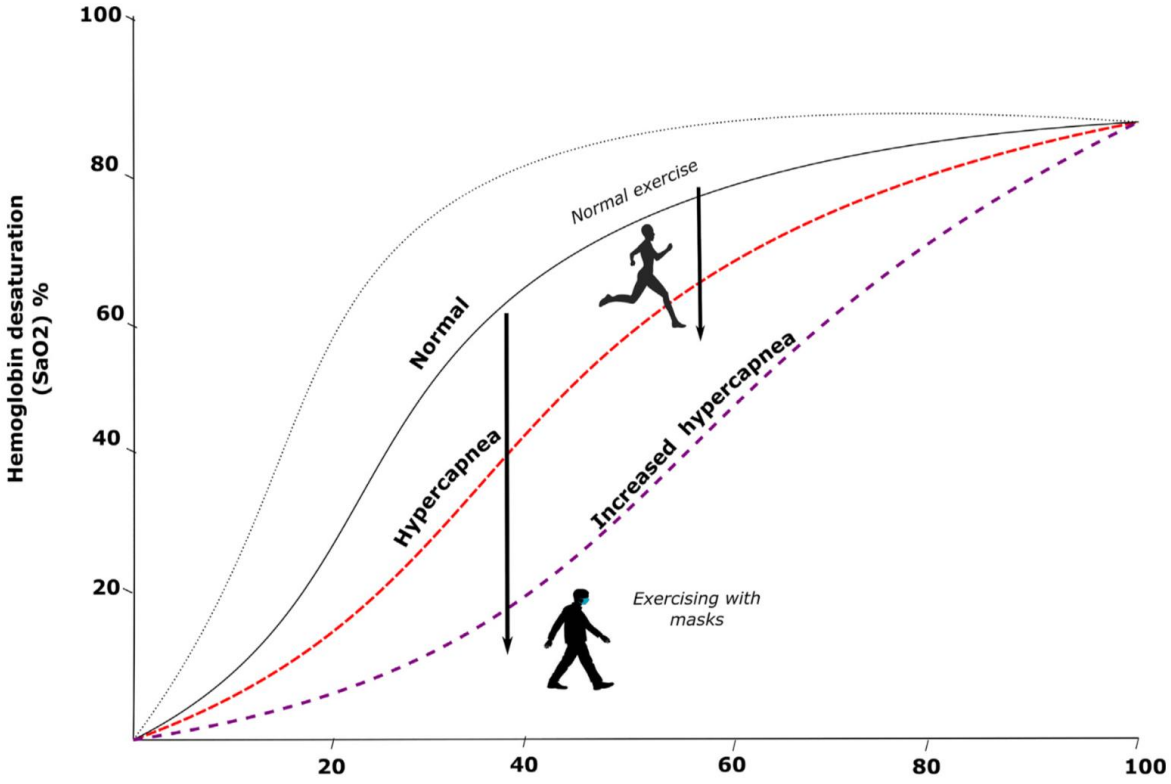

Figure 4. Bohr's Oxyhemoglobin Dissociation Curve (13)

Responding to changes in the pathophysiology of wearing masks during physical exercise during the Covid-19 pandemic, and on the other hand strengthening the immune system through physical exercise is undeniable, it is deemed necessary to address this situation by paying attention to the study of the above phenomena. There are two key words, MEDIUM aerobic physical exercise that can increase body immunity, use of tight masks during HEAVY physical exercise which has the potential to interfere with oxygen perfusion to the tissues. The use of masks during physical exercise is considered safe if:

1. Physical exercise is done with light to moderate volume.

2. Remove the mask intermittently by ensuring the position is at least 2 meters away from other people
3. If you wish to do strenuous physical exercise, make sure you are in a large open room with a minimum distance of 2 meters from other participants
4. Do physical exercise at home or in the room using a variety of safe, simple, and easy exercise media, such as weight training using household appliances, such as tables, chairs, mineral bottles, etc.
5. And the most important thing is to carry out physical training according to the rules (GOOD, TRUE, ORGANIZED, MEASURED, AND PROGRESSIVE)
6. Combating physical exercise or full body contact sports as long as there is a positive PCR examination result in the group, physical exercise is not allowed (14).

In addition to paying attention to the correctness of movement in physical exercise and the use of masks above, it is also necessary to pay attention to the truth in choosing the physical exercise equipment to use. The trifles often go unnoticed. For example the selection of shoes. Shoes for jogging or running are used for basketball games. The risk of ankle injury is very large, because jogging or running shoes are not prepared to withstand the horizontal load that the ankle will accept. Shoes for running do not provide enough support for the stability of the ankle joint. Meanwhile, for basketball, shoes are prioritized which can support joint stability. The stability of the ankle joint is a top priority in suppressing injuries in basketball.

Measurable physical exercise

The human body system has limitations in accepting physical loads. The limitations of the body's physiological system require the need to measure the extent to which physical exercise can be done. Determination of this measure aims to determine how many good portions of exercise are given to improve health status. The size of the portion of physical exercise needs to be known in order to

ensure the initial physical exercise dose and the addition of subsequent physical exercise load (12).

The physical training load is very subjective and individual, however the physical training that is carried out must be known in size or measure. Determination of the dose or size of physical exercise is not difficult and can use simple equipment. Several simple method parameters can be used to determine sport size. Among them (12):

1. Use the pulse. Sports activities can directly increase cardiovascular work. Increased pulse automatically can be a benchmark in assessing the increase in the intensity of the exercise being carried out. Some sports experts still recommend using a formula issued by the WHO (World Health Organization) regarding the determination of the maximum pulse by:

   220 - Age. Some experts are trying to develop other methods of using a basal pulse.

2. Using the mileage. Physical trainers just need to know the distance that can be covered. The distance traveled can be used as a starting point for starting physical exercise.
3. Using the time spent. Sports players can also use the time spent on one physical exercise.
4. The combination of distance with time. The combination is simple but produces a fairly good intensity prediction. The intensity of training using this method is somewhat more flexible, because the two variables can be changed according to the wishes of the physical trainer.

The use of some of the above parameters in daily practice is a measure in assessing the impact of the exercise done. The most commonly used parameter is the increase in pulse rate which is known when doing exercises. This increase in pulse rate can be used as a benchmark in assessing the intensity of the exercise being done. An increase in pulse rate is equivalent to an increase in the intensity

of physical exercise performed. The greater the intensity of the exercise done, the greater the increase in pulse rate. (12)

Regular physical exercise

Zhu W who interviewed a sports physiologist, Woods WA, emphasized the importance of regular exercise (15). Regular physical exercise will bring benefits to improving physical fitness. The components of physical fitness can adapt if the body's functional systems are stimulated sequentially at least within 48 hours. This means that a stimulation to the body's functioning system, say that the cardiovascular system will experience an adaptation that can last less than 48 hours, after which it needs to be given more stimulation, so that there will be an increase in the cardivascular function. (12)

Exercise is said to be regular if it is done regularly in a week at least 3 times. The spread of exercise time should be evenly distributed throughout the week. This means that the three sports that are not carried out on Saturdays and Sundays but should change the day. Uneven sports load in one week can make the body's functional system get an excessive load at the end of the week, which in fact is not very beneficial for the body. Exercising regularly once a week or once a month, especially once a year, will not bring benefits to physical fitness. (12)

Physical exercise must be progressive

The physical training load given to participants needs to be increased gradually. The body system will adapt to the load given regularly and for a certain period of time. The adaptation event makes the initial load given will become meaningless as training time passes. At that time, it is necessary to increase the training load so that the load given remains slightly above physical ability. It is hoped that the increase in the load gradually reaches the maximum point, so that the maximum level of fitness is obtained. (12)

A continuous load between the first and subsequent loads is required to ensure that the process of increasing response to the load persists. It is recommended that if you use excess loads aimed at the stimulation of physical exercise, it must be given with a load greater than your physiological ability, or in other words, the load must be above the threshold of stimulation, thus causing an adaptation process as an effect of training. Giving one physical training session will cause a process of fatigue9. Then it will be followed by a restoration process, which is the body's attempt to return to its pre-physical condition. Then it will continue with the adaptation of the body. In the end there will be another decline because there is no more stimulation. (12)

Excess load can be done by manipulating the intensity, duration and frequency of training. Adaptation will also occur and depends on the repetition of the exercise. Giving the following training sessions, should be given at the peak of adaptation so that it will have an impact on the fatigue period that is not too deep. The final effect will be an increase in fitness for sports players. Meanwhile, if the next exercise is given too infrequently, where the condition of the body has returned to the position before the first exercise, then the process that occurs is only repetition. Conversely, if the next load is given with a very short grace period it will cause significant fatigue. The adaptation process does not occur, because the next stimulation of the organ system has not yet recovered after receiving physical exercise (12)

Increase in sports load can be done gradually. There are two kinds of stages known in increasing sports load. First on a daily basis and the second on a weekly basis. Among the stages of the training, each one has advantages and disadvantages. (12)

CONCLUSION

1. Physical exercise according to the rules will increase the body's immune system which of course will be able to fortify itself against the Covid-19 attack.

2. Doing physical exercise according to the rules which include good, correct, regular, measurable, and progressive requirements for getting prime body immunity.
3. The final key, efforts to strengthen the body's immunity are only part of the effort to protect against the Covid-19 pandemic, but safety will certainly be achieved by strengthening faith and piety to the creator, Allah Almighty.

REFERENCES

1. World Health Organization, https://covid19.who.int/ . Diunduh : 25 September 2020 : 14.45
2. Kompas.com, https://www.kompas.com/. Diunduh : 25 September 2020 : 15.05
3. Ahmadabad SR and Hosseini F. Exercise against SARS-CoV-2 (COVID-19): Does workout intensity matter? (A mini review of some T indirect evidence related to obesity). Obesity Medicine 19. 2020
4. Ebadi M and Loza AJM, Perspective: improving vitamin D status in the management of COVID-19. European Journal of Clinical Nutrition, 2020.74:856–859
5. Grant WB, Lahore H, McDonnell SL, Baggerly CA , French CB[3] , Aliano JL and Bhattoa HJ.Evidence that Vitamin D Supplementation Could Reduce Risk of Influenza and COVID-19 Infections and Deaths. Nutrients 2020, 12, 988
6. Barrett B, Hayney MS, Muller D, Rakel D, Ward A , Chidi N, et al. Meditation or Exercise for Preventing Acute Respiratory Infection: A Randomized Controlled Trial. Ann Fam Med 2012;10:337-346.
7. Mohamed AA and Alawna M. Role of increasing the aerobic capacity on improving the function of immune and respiratory systems in patients with coronavirus (COVID- 19): A review. Diabetes & Metabolic Syndrome: Clinical Research & Reviews 14 (2020) 489-496
8. Gonçalves CAM, Dantas PMS, dos Santos IK, et al. Effect of acute and chronic aerobic exercise on immunological markers: a systematic review. Front Physiol 2020;10(January):1-11.
9. Lippi G, Banfi G, Montagnana M, Salvagno GL, Schena F, Guidi GC. Acute variation of leucocytes counts following a half-marathon run. Int J Lab Hematol 2010;32(1 PART.2):117-21.
10. Hogan CL, Mata J, Carstensen LL. Exercise holds immediate benefits for affect and cognition in younger and older adults 2013;28(2):587-94.

11. Leite MR, Ramos EMC, Kalva-Filho CA, et al. Effects of 12 weeks of aerobic training on autonomic modulation, mucociliary clearance, and aerobic parameters in patients with COPD. Int J COPD 2015;10(1):2549-57.
12. Afriwardi. Ilmu Kedokteran Olahraga, Penerbit Buku Kedokteran EGC, 2009
13. Chandrasekaran B and Fernandes S. Exercise with facemask; Are we handling a devil's sword?" – A physiological hypothesis. Medical Hypotheses 144 2020.
14. Pinto AJ, Dunstan DW, Owen N, Bonfa E, and Gualano B. Combating physical inactivity during the COVID-19 pandemic. Rheumatology volume 16 | July 2020
15. ReisGonçalvesCT,ReisGonçalvesCG,deAlmeidaFM,etal.Protectiveeffects of aerobic exercise on acute lung injury induced by LPS in mice. Crit Care 2012;16(5):R199.