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A Review on How Exercise Helps Boosting Immunity

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Abstract

Immune system is one of the major systems in the body. This system is very considerable because its function is to protect creatures from infection such as bacteria or viruses which can cause disease. Nowaday, there are a lot of epidemics around the world, so researchers around the world are trying to develop vaccines. Many countries attempt to support them in every way they can. They are providing solutions and developing policies to deal with the problem.

Before the coming of vaccines, many people tried to find ways to protect themselves such as finding some medicine which they believe can increase immune cells, having enough relaxation, or exercising that everyone can do. The topic of this research is to understand what the immune system is and mainly about how exercising relates to the immune system, how it increases the immune cell and result of having exercise in too intent and moderate level.

The report's information comes from reliable literature from websites that assure information in numbers around 8 about the immune system and how this works. This report's data is compiled and summarised from the others. First,The researcher will separate and think about the topic (list before and after) . Second, the researcher searches and looks for the literature that relates to the topic. Third, all literature will be analysed and put in the order of the topic list.

From the result of this study, it can be concluded that exercising not only makes people relax but also makes people more healthy. It can boost and support in many ways by increasing the number of cells in the immune system. Although having exercise induces benefits on the immune system and sleep in patients with chronic primary insomnia, having too intent can cause undesirable effects. In addition, the findings demonstrate that having too much exercise can cause heart disease. People should understand about these before having exercise for getting a good result or more effective.

Keywords: immune system, exercise, boosting immune

Introduction

The immune system is an organisation of cells and molecules with specialised roles in defending against infection or septic. It can be classified to 2 types; the first one is innate immune and the second is acquired immune. Innate immune (indigenous) is the natural responses that occur when some infection such as bacteria, virus etc. breaks into.Another one is acquired immunity, that is the Microorganisms which overcome or circumvent the innate non-specific defence mechanisms or are administered deliberately come up against the host's second line of defence. Acquired immune is also called specific immunity because it tailors its attack to a specific antigen previously encountered. It's special is its ability to learn, adapt, and remember. Immune system can be affected by countless things. For example sleeping (when our bodies produce cytokines which target infection) , relaxation (which can release stress or

decrease blood pressure) and exercising which can support the immune system in many ways such as increasing a number of cells in the immune system. Nowaday there are several epidemics around the world. Many countries try to provide vaccination for their citizens or themself. Before vaccines come, there are many ways to make us save. The immune system in people's bodies can protect people from epidemics. The one way that is cheap and everyone can do is exercising. Exercising not only makes people stronger or relax but also supports the immune system. There is some belief that having exercise at an intent level or too hard will have good health. In fact, having too much exercise can cause stress in the muscle and lead to serious pain. In support of this, There is an experiment which has shown that rapid conversion in training load are better predictors of URI risk than total load alone, going some way to explaining the above mentioned discrepancies where total load or volumes were considered [1].

On the other hand, having not too high not too low is much more effective. Moderate exercise can improve the quality of neuromuscular and exploratory performances. In mammals having moderate exercise may decrease cellular oxidative stress and prevent the decrease of mitochondrial functions. The result of this, It can increase the maximum life span. Moreover, it can reduce risk of heart disease and depression and anxiety symptoms and other mental health symptoms [1]. This literature study's purpose is to find out how exercising affects the immune system. Information which comes from research literature and education, the content will compile and analyse for true data.

Immune System

The titanic and complex system with many functions. This is used to protect humans from viruses or bacteria infection. There are many factors that affect the routine function of the immune system, for example age, gender and eating habits. The system can separate into 2 types being innate immunity and acquired immunity [2].

Innate Immune

Innate immune system is familiar as the first defence of our body, which include anatomic, physiological, and specialised cells. Leukocytes or white blood cells are mainly produced in bone marrow and help to defend the body against infectious disease and strange materials as part of the immune system. The leukocytes circulate through the body and seek out their targets. In this way, the immune system works in a coordinated manner to monitor the body for substances that might cause problems. There are two basic types of leukocytes. First one is the phagocytes which are cells that chew up invading organisms, and the second one is lymphocytes that allow the body to remember and recognize previous invaders [2].

The granulocytes-a type of phagocyte that has small granules visible in the cytoplasm-consist of polymorphonuclear cells (PMN) which are subdivided into three classes; neutrophils, basophils, and eosinophils. The neutrophils are the most abundant white blood cells, they account for 65 to 70% of all leukocytes. When activated, the neutrophils marginate and undergo selection-dependent capture followed by integrin-dependent on adhesion, before transferring into tissues. Leukocytes migrate toward the sites of infection or inflammation, and undergo a process called chemotaxis moving towards certain chemicals in their environment [2].

Acquired Immune

Acquired (adaptive or specific) immunity is not present at birth. It is learned. The learning process starts when a person's immune system encounters foreign invaders and recognizes nonself substances (antigens). Then, the components of acquired immunity learn the best way to attack each antigen and begin to develop a memory for that antigen. Acquired immunity is also called specific immunity because it tailors its attack to a specific antigen previously encountered. It's special is its ability to learn, adapt, and remember. It takes time to develop after first exposure to a new antigen. However afterward, the antigen is remembered, and subsequent responses to that antigen are quicker and more effective than those that happened after the first exposure [2].

Exercise and Immune System

The effects of exercise on the immune system beginning from showing that individuals engaged in regular exercise of a moderate intensity reported fewer symptoms associated with upper respiratory tract infections (URTI) compared to sedentary peers. In contrast, those engaged in frequent high-volume

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exercise training appeared to be at a greater risk of infection than a person who remained sedentary. Studies concerned with the effects of exercise on the immune system have focused on the impact of acute bouts of exercise as well as the chronic effects of exercise training. While athletes have been the focus in many of these studies,There still interest in how exercise training can improve immune function in the elderly and in patients. In this chapter, we describe the effects of acute and chronic exercise on immune responses and briefly discuss their potential health and clinical implications [2].

The Effect of Acute Exercise and Circulating on Immune Cell

A single bout of exercise has a profound effect on the total number and composition of circulating leukocytes. It is not strange. There are experiments that copy leukocyte count to increase two- to three fold after even brief (order of minutes) dynamic exercise, whereas prolonged endurance exercise may cause the leukocyte count to increase up to fivefold. Though increased number of leukocyte are revealing of infection and inflammation, the exercise (induced leukocytosis) is known as a transient phenomenon, with normal leukocyte and leukocyte subtypes counts typically returning to pre exercise levels within 6–24 hours after exercise cessation. The predominant cells mobilised with exercise are neutrophils and lymphocytes with a smaller contribution which is made from monocytes. During the early stages of exercise recovery (around 30–60 minutes of exercise discontinuation), a rapid dwindling in the blood lymphocyte count (lymphocytopenia) occurs concomitantly with a sustained neutrophilia (elevated blood neutrophil count) . The exercise-induced lymphocytopenia is believed by some for having potential clinical ramifications by leaving individuals vulnerable to illness during exercise recovery (termed the “open-window” hypothesis). In response to endurance-based exercise in particular,the blood lymphocyte count may reach clinically low levels (<1.0 10 9 /l) by falling 30–50% below pre exercise values and may remain diminished up to 6 hour later.While exercise evokes a general leukocytosis, the response across the major leukocyte subtypes is not uniform [3].

In another point of view, it was told in the same way.It show that all method of permutations and combinations of exercise intensity, duration, and mode have been reported (by using personal wide variety of fitness rank as well as training histories) . From these show that after exercise a number of white blood cell increases. In contrast after the exercising,some characteristic lessen not only a number of white blood cell(Lymphocyte) but also monocytes, while numbers of neutrophils still increase until peak at several hours. In short-duration or moderate-intensity exercise may cause perturbations to circulating cell numbers for 60 min [4].

Beneficial Effects with Moderate Exercise

Observational and experimental studies have investigated the proposed greater resistance to pathogens with moderately active lifestyles. Animal investigations have illustrated that brief bouts of moderate physical activity (20–30 min treadmill running) compared to inactivity early or immediately following vaccination with pathogens leads to decreased mortality and morbidity from infection. Early exercise training studies of older and chunky humans also demonstrated that 12–15 weeks of moderate exercise (30 min walking at 60%–75% of maximal oxygen uptake) resulted in lower incidence or duration of self-reported URTI compared to sedentary individuals. These effects have been supported by several longitudinal studies of the wider general population (ages 18–85 years) where a storage averagely active lifestyle leads to lower self-reported or laboratory confirmed URI/URTI episodes [6].

In addition, The report called “Beneficial effects of moderate exercise on mice ageing: survival, behaviour, oxidative stress, and mitochondrial electron transfer” shows that moderate exercise can increase median and maximum life span. Moreover moderate exercise can improve the quality of neuromuscular and exploratory performances.In mammals having moderate exercise may increase life span by a decrease in cellular oxidative stress and preventing the decrease of mitochondrial functions [5].

Effects with Strenuous Training in Athletes

Although patterns vary between sports, a review suggested that athletes incline to report URTI either during the high-intensity and tapering period prior to

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competition (e.g., swimming, team sports) or in the period following competition (e.g., long distance running). It has long been hypothesised that a J-shaped relationship (A non-linear relationship between two variables that is described by a curve that initially falls, but then rises to become higher than the starting point)exists between exercise workload and susceptibility to URTI. This suggests that an individual involved in regular moderate exercise is less likely to contract URTI compared to a sedentary individual but prolonged high-intensity exercise or periods of strenuous exercise training are related to an average risk of URTI. The J-shaped model initially led to findings of increased self-reporting of URTI in the 1–2 week period following participation in competitive endurance races [6].

Further support for an adverse effect of prolonged or strenuous exercise on susceptibility to URTI has come from animal studies. Prolonged exercise has been shown to increase morbidity and death of mice inoculated with respiratory viruses or following this type of exertion compared to resting and pretty exercised mice. In addition to acute exertion, equine studies have also demonstrated that intensified periods (5–28 days) of exercise training prior to or following inoculation with influenza leads to greater severity of infection in not only vaccinated but also unvaccinated horses. Generalising these results to the human in vivo environment is suspicious and approaches (i.e., pathogen challenge) because of human volunteers who do have considerable ethical constraints. Although not investigated in an exercise context, pathogen challenge studies in humans have demonstrated lower resistance to URTI due to other life stressors (e.g., psychological stress, sleep disturbance) . Moreover the potential exposure to these stressors in a training and competition environment, the relevance of these findings to athletes is emphasised by the impact of transient modulation in host resistance to URTI by a stressor [6].

Last but not least there remains more uncertainty than evidence based facts regarding the notion that high volumes of training are associated with an increase in the incidence of URI. The suggestion is inconsistent findings may be related to whether participants within studies are considered “elite” or “highly trained”. There is a researcher who suggests that a prerequisite to achieving elite athlete status is an immune system which can withstand the strenuous nature of either training or competition like susceptibility to infections is incompatible with elite performance. For this reason,that researcher proposed an S-shaped rather than a J-shaped curve to include elite training which is associated with a lower risk of infection compared to high exercise workload. However, it is highly likely that professions athletes will have considerable support (financial, medical, sports science, and nutrition, etc.) and their support team will be implement preventive and treatment strategies to reduce the risk and limit of the URI effects and this may also contribute to better management of other stressors. It could be,so rather than being naturally able to withstand strenuous training and infections, it is simply that they are better supported, compared to counterparts who lack such support mechanisms, to reduce controllable risk factors [6].

Someone suggests that most athletes may not journal URI or suffer from an increased risk if they avoid periods of overreaching or overtraining. It like an increase in URI may only be attributed to affiliation in acute prolonged exertion (e.g. marathon, ultra-marathon) or more importantly whenever athletes are exposed to a greater strain of training through exceeding individual training thresholds coupled with inadequate recuperation or other stress in life (for example sleep disturbance). On the other hand, training load or volume alone does not give full information on the level of stress that an athlete -as well as their immune system- is under. Indeed, the distributed or periodized in way training is of key importance also. In support of this, There is an experiment which has shown that rapid conversion in training load (i.e. increasing too quickly) are better predictors of URI risk than total load alone, going some way to explaining the above mentioned discrepancies where total load or volumes were considered [6].

Environmental Stress in the Body When Exercising Too Much

During regular training and competition, many athletes experience exertional hyperthermia, dehydration, peripheral cooling and moderate altitude or hypoxia. Environmental stress exposed to athletes outside of training. For example, during long-haul air travel (common for elite athletes), hypobaric-hypoxia

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in the aircraft cabin exposes athletes to altitudes equivalent to 1800–2400 m. A few athletes also experience more extreme thermal stress such as exertional heat illness casualties and hypothermic casualties (for example, open water swimmers), and high altitude (up to 5000 m) is experienced in athletes participating in adventure races or intermittent hypoxic training. Sports performance typically decreases in hot, cold and high-altitude environments, although there are notable exceptions such as improved sprint and jump performance at altitude and the improved durability exercise performance in cool environments. They will be impaired because exercising in extreme environments increases demands on the central nervous system, cardiovascular system and on metabolism. The body's response to the challenge of exercise, thermal stress or hypoxia is initiated and coordinated by the central nervous system and the effector limbs of the hypothalamic–pituitary–adrenal axis and sympathetic adrenal–medullary axis that produce the immunoregulatory hormones, such as cortisol, adrenaline and noradrenaline. So it is easy to understand why in the late 1990s one of the pioneers of this field hypothesised that exercise in adverse environments, with stereotyped stress hormone responses over and above that seen during exercise in propitious conditions, can cause greater disruption to immune function and host defence [7].

Flynn et al. is the name of the account from Medicine LibreText says that stress in the context of exercise, means an exertion above the normal. The stress quite results in a vary in each person and depends on a person's level of fitness. He says that Physical stress(such as jogging) can increase stress on the regulatory system and sweating for temperature regulation. As a result, more stress should be applied to the system to stimulate improvements, this is also known as the overload principle. Last but not least, he guidelines for a beginning weightlifter should squats with 10 repetitions at 150 pounds. After 2 weeks of lifting this weight, the lifter thinks that the 150 pounds feels so easy during the lift and afterwards causes less fatigue. The lifter can add 20 pounds, then continues with the new established stress of 170 pounds. He/She should continue to get stronger until his/her maximum capacity has been reached, or the stress stays the same, at which point the lifter's strength will simply plateau. This same principle can be applied, gaining not only muscular strength, but also flexibility, muscular endurance, and cardiorespiratory endurance [8].

Conclusion

Immune system is a complex and enormous system used to prevent humans from getting sick, viruses or bacteria infection. They can separate from the innate and acquired immune system. This system can be supported from exercising in many ways. For example in circulating leukocytes, dynamic exercise can increase the number of leukocytes. Addition to Moderate exercise such as jogging for 20-30 minutes. In addition, moderate exercise may increase life span by decreasing oxidative stress. Though exercising is good for health ,this can cause bad effects too. Having exercise, exertional hyperthermia, dehydration, peripheral cooling and moderate altitude or hypoxia can cause environmental stress in the body. This can lead to many diseases such as exertional heat illness casualties and hypothermic casualties.

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