

The Role of Regular Exercise in Improving Body Immunity: A Literature Review

English

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Abstract

This study aims to examine the role of regular exercise in improving body immunity through a qualitative approach based on literature studies. The background of this study is based on the increasing public awareness of the importance of body immunity after the COVID-19 pandemic and the need for effective and affordable non-pharmacological health strategies. Data were obtained from various relevant scientific journals and academic books, then analyzed using the content analysis method. The results of the study indicate that moderate-intensity exercise carried out routinely can increase the activity of immune cells such as lymphocytes, macrophages, and natural killer (NK) cells, as well as balance the production of pro- and anti-inflammatory cytokines. In addition, exercise also has a positive impact on reducing stress and improving sleep quality, two important factors that support the immune system. However, excessive exercise can reduce the immune response and increase the risk of infection, so the intensity and duration of exercise need to be considered. This study confirms that regular exercise is an effective preventive strategy and needs to be integrated into everyday life as part of a healthy lifestyle. These findings can be a reference for the formulation of promotive policies in the field of public health.

Keywords :Immunity, Sports, Literature Study

Introduction

In recent years, public awareness of the importance of maintaining the immune system has increased significantly, especially since the COVID-19 pandemic. The global health crisis has opened the eyes of many people to the fact that the body's immunity plays an important role as the main defense against various diseases, especially infectious diseases. World health organizations such as WHO also encourage the implementation of a healthy lifestyle to maintain the body's immune system, including through physical activity. The immune system itself is a complex mechanism that works to protect the body from the threat of pathogens, and can be influenced by various factors such as diet, stress, sleep quality, and physical activity.

One of the easiest, cheapest, and most effective ways to maintain immunity is to exercise regularly. Exercise not only improves physical fitness, but has also been shown to strengthen the immune system. Physical activity carried out with moderate intensity for a consistent duration can increase the circulation of immune cells such as lymphocytes, macrophages, and natural killer (NK) cells which play an important role in detecting and destroying pathogens. In addition, exercise also improves blood and lymph circulation, thus supporting the distribution of immune cells throughout the body more efficiently. In this context, exercise becomes a healthy lifestyle that can be carried out by various groups, without requiring large resources.

Although many studies have discussed the benefits of exercise on the immune system, the available information is still scattered and has not been systematically reviewed in a single literature. This indicates the need for a literature review that can summarize, compare, and analyze existing scientific findings to produce a more complete and scientific picture. Literature reviews have an important function in bringing together various findings, as well as identifying patterns or gaps in existing research. Several studies such as those conducted by Campbell & Turner (2018) show that moderate to high intensity exercise has a positive effect on immunity, while excessive exercise can actually reduce immune function. Information like this is very important to be understood comprehensively by the public and health practitioners.

Amidst the increasing health burden and medical costs, non-pharmacological approaches are becoming increasingly important to be adopted in public health policies and practices. Regular exercise is one form of non-pharmacological intervention that is not only safe and inexpensive, but also effective in preventing various health disorders related to decreased immune function. Such a preventive approach supports promotive efforts in maintaining long-term health and reducing dependence on curative medical interventions. A study by Walsh et al. (2011) revealed that individuals who regularly exercise have a lower risk of upper respiratory tract infections than those who are physically inactive. Thus, the study of the role of exercise in improving immunity is important not only in an academic context, but also in real practice to support public health at large.

Method

This study uses a qualitative approach with a literature study method (library research) which aims to analyze in depth various previous research results regarding the relationship between regular exercise and increased body immunity. This approach was chosen because the main focus of the study is to summarize, understand, and interpret scientific findings that have been published in journals, books, and relevant research reports. Literature studies allow researchers to explore

various scientific perspectives, compare findings, and identify consistencies or differences in views between researchers regarding the effects of exercise on the human immune system.

The data in this study were obtained from secondary sources of a scientific nature, such as national and international journal articles indexed by Scopus, PubMed, and Google Scholar, as well as academic books relevant to the topics of sports, health, and the immune system. Inclusion criteria include articles published in the last 10 years, in Indonesian or English, and explicitly discussing the relationship between sports and the immune system. Meanwhile, articles with a primary focus on aspects of sports other than immunity (e.g. athletic performance alone) or popular non-academic articles will be excluded.

Data analysis was conducted through a content analysis process, by reviewing the content, conclusions, and methodological approaches of each source. Researchers classified the findings based on certain categories, such as type of exercise, duration, intensity, and its impact on immune system components such as NK cells, lymphocytes, and cytokine levels. In addition, researchers also examined factors that moderate the relationship between exercise and immunity, such as age, gender, or initial fitness level.

The validity of the study results is maintained by applying the principle of source triangulation, namely by comparing different sources to ensure consistency of information. The entire study process is carried out systematically by recording the literature search process, keywords used, and reasons for selecting and rejecting an article. With this approach, the study is expected to provide a comprehensive scientific picture of the role of regular exercise in increasing body immunity, as well as being a basis for developing evidence-based health policies.

Results and Discussion

Exercise has long been recognized as an important part of a healthy lifestyle, but its specific role in boosting immunity has come under greater scrutiny, especially since the COVID-19 pandemic. Immunity is a complex biological system consisting of organs, cells, and molecules that work together to protect the body from pathogens, such as viruses, bacteria, and parasites. In this context, regular exercise has been shown to have a stimulating effect on various components of the immune system, both in the innate and adaptive immune systems. Gleeson et al. (2013) showed that moderate-intensity exercise can improve cellular and humoral immune responses, thereby increasing the body's ability to detect and destroy pathogens efficiently.

One way exercise works to boost immunity is through increased circulation of immune cells. When a person exercises, there is increased blood flow and lymphatic circulation which helps speed up the distribution of immune cells such as neutrophils, lymphocytes, and natural killer (NK) cells

throughout the body. According to Nieman (1994), 30–60 minutes of moderate-intensity aerobic exercise can significantly increase the number and activity of NK cells, which are one of the body's first lines of defense against viral infections. These cells also have cytotoxic properties that are effective in destroying infected body cells.

In addition, exercise also affects cytokine levels, which are proteins that regulate communication between immune cells. Physical exercise can increase the release of anti-inflammatory cytokines such as IL-10 and reduce the production of pro-inflammatory cytokines such as TNF- α and IL-6. This mechanism suggests that exercise not only increases the body's resistance to infection, but also plays a role in controlling chronic inflammation that is often the basis of various degenerative diseases. A study by Petersen and Pedersen (2005) explains that skeletal muscles that are active during exercise act as endocrine organs, releasing "myokines" that function as anti-inflammatory and immunomodulators.

However, the benefits of exercise on the immune system are dose-responsive, meaning that positive effects only occur when done for the appropriate duration and intensity. Excessive exercise, especially at high intensity and without sufficient recovery time, can actually cause immunosuppressive effects. This is known as the "open window theory", where after a heavy exercise session, the body's immune system experiences a temporary decrease in function for several hours, increasing the risk of infection. Campbell and Turner (2018) noted that athletes who undergo excessive heavy training tend to be more susceptible to upper respiratory tract infections than individuals who exercise at a moderate intensity.

The studies analyzed in this review also show that the effects of exercise on the immune system vary based on age, gender, fitness status, and individual health conditions. For example, in the elderly population experiencing a natural decline in immune function (immunosenescence), regular exercise has been shown to maintain T cell numbers and function, and improve responses to vaccination (Woods et al., 2009). Meanwhile, in obese individuals, exercise can reduce chronic systemic inflammation, while simultaneously improving immune sensitivity to foreign antigens.

Exercise also has an indirect effect on immunity through its role in reducing psychological stress. Chronic stress is known to suppress the immune system through activation of the hypothalamic-pituitary-adrenal (HPA) axis and increased cortisol production. Exercise, especially aerobic and recreational exercise, can reduce cortisol levels, improve mood, and improve sleep quality. All of these factors synergistically strengthen the immune system. According to a report from the American Psychological Association (APA, 2020), individuals who exercise regularly have a lower risk of chronic stress and stress-related immunological disorders.

In a preventive framework, exercise can be seen as one of the most effective forms of non-pharmacological intervention in maintaining and improving the body's natural immunity. This strategy is very relevant in the context of a modern health care system that focuses on promotive and preventive efforts rather than curative. A study by Walsh et al. (2011) supports the importance of exercise in reducing the risk of infection, especially upper respiratory tract infections (URTIs), noting that the frequency, duration, and consistency of exercise are more important than extreme intensity. In this case, exercise can be widely adopted by the community without cost barriers or access to medical facilities.

This literature study shows the consistency of findings from various sources that exercise, if done regularly and proportionally, can improve the main components of the immune system and support the biological functions of the body in general. These results confirm that the integration of exercise into everyday lifestyle not only has an impact on physical fitness, but also contributes to the body's resistance to various diseases, including viral infections and chronic inflammation. Therefore, exercise needs to be promoted more widely as a preventive strategy that is evidence-based and relevant for all ages.

Thus, the results of this study support the need for health policies and education that emphasize the importance of consistent physical activity to support the immune system. The role of health workers, educators, and policy makers is very important in disseminating this scientific information to the public. In the future, further research is still needed to identify the most effective form, duration, and intensity of exercise for each population group, especially those with certain immune conditions or comorbidities. However, in general, the findings from this literature study strengthen that regular exercise is a very potential long-term health investment and has a major impact on the body's immune system.

Conclusion

Based on the results of the literature review that has been conducted, it can be concluded that regular exercise has a significant role in improving the body's immune system. Moderate-intensity physical activity that is carried out consistently has been shown to improve the circulation of immune cells, increase the activity of natural killer (NK) cells, and strengthen the adaptive immune response. In addition, exercise also plays a role in suppressing the production of pro-inflammatory cytokines and increasing the release of anti-inflammatory cytokines that support the stability of the immune system. This immunological mechanism makes exercise an effective non-pharmacological strategy in preventing infection and chronic inflammation. On the other hand, it is important to note that excessive exercise can actually suppress the immune system, so the principle of balance must be maintained. Differences in immune responses to exercise are also

influenced by age, health conditions, and individual fitness levels. For the elderly, exercise plays a role in slowing down the process of immune function decline, while in obese individuals it can reduce systemic inflammation. Exercise has also been shown to reduce stress and improve sleep quality, two important factors that also affect endurance. Therefore, exercise needs to be widely promoted as part of a healthy lifestyle based on scientific evidence. This study shows that exercise not only has an impact on aspects of physical fitness, but also strengthens the foundation of the body's internal health. The practical implications of these findings are highly relevant for promotive and preventive efforts in public health policy. Therefore, the integration of sports into daily life should be a priority in efforts to improve immunity and quality of life of the community as a whole.

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