

Repair of cardiopulmonary function damage caused by smoking by aerobic exercise

Yutong Dai

Nanjing No13.High School, Nanjing, 210019, China

dailing0611@163.com

Abstract. In modern society, finding ways to manage stress is a major challenge for many individuals. Part of the Chinese adult population turns to smoking as a method to alleviate stress from work, life, and family. However, this behavior has numerous negative effects on the body, leading to a range of health issues. Therefore, I have discussed how to mitigate the negative impacts of smoking. The passage believes that engaging in exercise can effectively alleviate some of the health problems caused by smoking, such as heart disease, bronchitis, and lung cancer. Since the probability for smokers to get bronchitis is 15 times higher than that of people who do not smoke, 3 times for them to experience influenza or pneumonia. Through this article, I hope readers will fully understand the harm smoking poses to individuals, families, and society. Additionally, this paper encourage smokers to reduce their smoking frequency and, for those who have failed to quit smoking multiple times, to consider incorporating exercise as a way to counteract the detrimental effects of smoking on their health.

Keywords: Modern society, Stress management, Smoking, Negative effects, Exercise.

1. Introduction

In modern society, people use cigarettes for various purposes. Almost every smoker knows that smoking is detrimental not only to their health but also to those around them. Despite this awareness, some individuals still use tobacco as a means to relax, while others may use it to initiate new relationships. Currently, data shows that approximately 300 million Chinese individuals are smokers, and quitting is particularly challenging for many due to the long-term nature of their habit and the addictive nature of nicotine.[1] This raises the question of how we can minimize the harm caused by smoking on our bodies, as scientists have confirmed that smoking is harmful to people's health. Tobacco smoking can lead to a range of serious health problems, such as lung cancer, heart disease, and chronic obstructive pulmonary disease (COPD). Smoking not only harms the smoker's own body but also negatively impacts those around them, including pregnant women, infants, and young children. Additionally, smoking incurs various social and economic costs, including medical expenses, productivity losses, and burdens on the public health system and household finances[2]. Efforts to address these issues through public health campaigns, smoking cessation programs, and supportive policies are crucial in reducing the prevalence of smoking and mitigating its widespread effects.

2. The Cardiovascular effects of smoking

Before discussing strategies to minimize the harm caused by smoking, it is important to first consider the potential damage that cigarettes can inflict upon us. When individuals smoke, approximately 7000 different chemical compounds enter the human body, with about 10% of them being known carcinogens. [3] Consequently, cigarettes have a detrimental impact on people's physical health.

Smoking causes vascular dysfunction, such as high blood pressure. Nicotine and other chemicals in cigarettes cause blood vessels to constrict, increasing the burden on the heart and leading to temporary elevations in blood pressure. Over time, this constriction results in inner damage to blood vessels, impairs their normal function, and contributes to sustained high blood pressure. Additionally, smokers are 3 times more likely to experience influenza or pneumonia (OR 2.9, 95% CI 2.7, 3.2) and 15 times more likely to develop bronchitis (OR 15.2, 95% CI 12.8, 18.2), further exacerbating cardiovascular stress.[4]

Smoking also leads to damage to the blood vessels and contributes to arteriosclerosis. [5]The harmful chemicals in cigarettes, such as nicotine, carbon monoxide, and heavy metals, damage the endothelium of blood vessels. [6]This endothelial damage makes the blood vessel walls more susceptible to lipid and cholesterol accumulation. The oxidative stress induced by smoking generates free radicals that oxidize low-density lipoprotein (LDL) into oxidized LDL, a key factor in chronic inflammation of the blood vessel lining.[7] Chronic inflammation promotes fibrosis and calcification of artery walls, worsening arteriosclerosis. The nicotine-induced vasoconstriction increases blood flow pressure and accelerates the damage and hardening of artery walls. [8]Furthermore, smoking could also cause heart disease by increasing blood coagulation factors, making blood more prone to clotting and forming thrombi. These thrombi can block heart vessels, leading to ischemia and even death. [9]In summary, smoking has devastating cardiovascular effects, contributing to vascular dysfunction, arteriosclerosis, and increased risks of severe health issues such as heart disease and respiratory infections. Understanding these risks emphasizes the need for effective prevention and cessation strategies to protect cardiovascular health.

3. Smoking and the respiratory system

In addition, smoking may harm one's respiratory system.[10] For example, prolonged smoking has the potential to irritate the airways. Because of this inflammation, the airways' walls become thicker, narrowing the airways and restricting airflow.[11] Additionally, smoking releases free radicals and other harmful substances that trigger oxidative stress and damage lung cells and tissues. [12]Oxidative stress intensifies the inflammatory response and promotes airway remodeling.

Smoking is a known cause of lung cancer. Numerous studies have demonstrated that non-smokers are 20 times more likely to develop lung cancer compared to smokers. Among the 1,800,000 people diagnosed with lung cancer, approximately 1,600,000 cases (around89 %) are attributed to tobacco smoking.[13] This is due to chemical compounds such as PAHs, nitrosamine, and nicotine.[14] They would influence cell proliferation, apoptosis, and gene expression to facilitate the development of lung cancer. [15]In summary, smoking poses significant risks to respiratory health, leading to airway inflammation and lung cancer. The overwhelming evidence linking smoking to lung cancer highlights the urgent need for public health measures aimed at smoking cessation and the prevention of tobacco use to safeguard lung health.[16]

4. Passive smoking

To Pregnant Women, it is well-established that both active and passive smoking negatively impact the health of pregnant women. [17] For instance, research shows that maintaining normal blood pressure can be particularly challenging for pregnant women exposed to passive smoke, who are at a threefold increased risk of hypertension. Furthermore, incorporating regular aerobic exercise has been found beneficial in enhancing the cardiorespiratory health of pregnant women who are affected by secondhand smoke. Studies indicate that consistent aerobic activities can contribute to lower blood pressure and improved heart health among these women. To Infants the harmful effects of passive smoking on infants are significant, particularly concerning their respiratory health. [18] Exposure to secondhand smoke in

infancy has been linked to a higher likelihood of developing respiratory infections such as asthma and bronchitis. [19] This increased risk highlights the critical need for protective measures against passive smoke exposure. To Juveniles, for adolescents, passive smoking poses risks to cardiorespiratory function, potentially leading to early indicators of cardiovascular issues. Research suggests that regular participation in aerobic exercise improve the cardiorespiratory health of young people exposed to secondhand smoke, helping to alleviate some of the negative impacts. What is more, since puberty is a special period for every juveniles, it would be easier for them to try smoking since they think smoking is cool and someone misguide them that the smoking could help them feel stressed out, and they were luckily have so much stress in a study at the same time they would probably imitate the adult to smoke and form a bad habit. [20] To conclude, secondhand smoke presents significant health hazards to at-risk groups, including expectant mothers, newborns, and young adults. The detrimental impact on cardiovascular and respiratory health underscores the critical necessity for protective strategies and actions, such as encouraging aerobic physical activity, to alleviate these dangers and promote healthier living habits[21].

5. Smoking and the community

The cost of smoking to the whole society is various, including medical and productivity. As the passage mentioned, smoking causes a serious problem in the respiratory system and cardiovascular systems. The cost of the diseases which caused by the smoking like COPD and lung cancer, is pretty high at the same time.

Smoking is a leading cause of preventable diseases, contributing significantly to the burden on public health systems. The effects of smoking extend beyond individual health, imposing substantial costs on society, particularly through increased medical expenses and productivity losses.

The treatment of smoking-related diseases, such as Chronic Obstructive Pulmonary Disease (COPD) and lung cancer, often necessitates extensive medical interventions. Patients with COPD may require frequent hospitalizations and long-term oxygen therapy, while lung cancer treatments frequently involve costly chemotherapy and radiation therapies. Based on recent projections, the aggregate direct healthcare expenses linked to these ailments can total billions of dollars each year.[22]. Furthermore, smoking-related illnesses necessitate ongoing preventive care, including routine screenings for lung cancer and regular cardiovascular health check-ups. These additional healthcare services not only elevate expenditures for individuals but also impose a considerable financial burden on healthcare systems overall.

The economic impact of smoking extends beyond direct healthcare costs, significantly affecting workforce productivity. Smokers exhibit higher rates of absenteeism due to smoking-related health issues. Frequent absences disrupt workflow and place added strain on coworkers, ultimately impairing overall organizational productivity [23]. In addition to absenteeism, smokers often experience presenteeism—diminished performance while at work due to health complications, fatigue, or the need for frequent smoke breaks. This phenomenon can reduce efficiency and output, further exacerbating economic losses. Long-term health effects of smoking can also precipitate early retirement or disability, diminishing the available workforce and increasing reliance on social support systems.

The financial burden of smoking extends to the broader economy. Rising costs associated with the treatment of smoking-related diseases often result in increased health insurance premiums. Insurers typically pass these costs onto policyholders, affecting smokers and non-smokers alike [24] Moreover, families grappling with the consequences of smoking-related illnesses frequently face significant economic strain, which can lead to a reduced quality of life. High medical bills may hinder families' abilities to invest in essential areas such as education and housing, perpetuating cycles of financial hardship.

In summary, the societal costs of smoking are extensive and multifaceted, affecting not only individual health but also the economic stability and well-being of communities. Addressing these costs through effective public health initiatives, such as smoking cessation programs and community support for healthier lifestyles, is crucial for improving public health outcomes and reducing economic burdens.

6. Solution and aerobic exercise

However, according to predictions, aerobic exercise is believed to be able to minimize the damage. Aerobic exercise can be defined as physical activity that increases the heart rate and breathing rate while engaging large muscle groups.[25] Typical forms of aerobic exercise include swimming, running, cycling and, so on.

While aerobic exercise can effectively improve cardiovascular health, research has demonstrated that it can also reduce heart pressure, enhance blood lipid levels, and improve cardiopulmonary function and vascular health [26].

What is more, the research shows that most of the substances are exchanged and absorbed in the alveoli. Aerobic exercise can improve the ventilation function of the alveoli and enhance the exchange of oxygen and carbon dioxide, thus improving lung function. [27]

A research paper also explained that clinical trials have shown that regular aerobic exercise can help alleviate heart failure which is one of the most common heart diseases [28] . At the same time, the research also showed that aerobic exercise can reduce airway inflammation and improve lung function. While this may not completely reverse all the damage caused by smoking, it can significantly ease symptoms and enhance quality of life. [29]

7. Conclusion

Quitting smoking is the most effective way for people to achieve a healthier life for no doubt since it significantly reduce the risk of numerous health issues, including respiratory disease and cardiovascular problems. However, there is still a long way to go for people who want to quit smoke and the journey will not be that easy. Many individuals experience anxiety and depression as they have negative withdrawal symptoms associated with nicotine dependence. These feeling can arise not only from the physical withdrawal but also from the significant lifestyle changes that quitting entails. In light of these challenges, engaging in aerobic exercise emerges as a valuable tool for those who have recently quit smoking. Moreover, incorporating aerobic exercise into one's routine provides a constructive outlet for stress, fosters a sense of accomplishment, and encourages social interaction through group activities. Therefore, even though the psychological hurdles associated with quitting smoking are significant, integrating aerobic exercise can greatly benefit individuals as they work towards a smoke-free life. In summary, while the path to quitting smoking may be challenging, prioritizing physical activity can play a crucial role in supporting both mental and physical health during this transformative journey.

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