

LETTER TO THE EDITOR

Modeling and Analysis of the Relationship between Ecological Air Quality and Outdoor Exercise Duration of the Crowd

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Outdoor exercise has become an important way of exercise in People's Daily life at this stage. Proper exercise plays a positive role in promoting the physical and mental health of human body. However, with the rapid development of urbanization and industrialization, a series of ecological and environmental problems have arisen, especially the deterioration of ecological air quality. Air is one of the basic environmental factors for human survival. Exercise also needs to be carried out in a certain suitable environment, especially outdoor sports. It is also necessary to have good ecological air quality as a guarantee. Otherwise, it will not only affect the exercise effect, but also pose a huge threat to the health of the human body. In this paper, the air quality and air pollution were studied, and the relationship between ecological air quality and outdoor movement time of the crowd was modeled and analyzed, so as to give scientific opinions for outdoor movement of the crowd.

ecological air quality; duration of movement; model design; air pollution

I INTRODUCTION

In recent years, the problem of environmental pollution has become more and more serious, and the resulting health problems have caused widespread concern, especially air pollution and the health damage it brings. There have been some studies on air pollution and human health issues. The results of epidemiological studies have confirmed that human health is closely related to air pollution (Pan BF et al. 2017). Therefore, on the issue of atmospheric environment, effective technical evaluation of air quality is of great significance for protecting the ecology and improving the living environment.

At present, more and more people consciously carry out fitness activities and develop good exercise habits. The concept of "health first" has become popular unconsciously, and the number of people taking part in exercise is increasing, especially those who take part in outdoor sports. However, the quality of the air people breathe during outdoor exercise every day and its influence on the physical health of people participating in sports are also issues that we need to pay attention to (Xv T et al. 2016).

In 2012, the Chinese government promulgated the law of the People's Republic of China on the prevention and control of air pollution and the environmental protection law of the People's Republic of China. This shows that, from the perspective of the country, it pays more attention to the protection of ecological air environment closely related to people, the improvement of people's living environment quality, the whole ecological environment quality and the protection of human health (Zhang NN et al. 2016). With the improvement of people's quality of

life and health awareness, going out for exercise is bound to be one of the important means to improve people's health. People believe that exercise is good for health, but they ignore the role of exercise environment in exercise. Exercising in an environment with good air quality can have a positive impact on people's physical and mental health. However, when people exercise in the environment where air quality is polluted or destroyed, it will inevitably affect the effect of exercise, and may even have a negative impact on the body. People participate in sports, aiming to improve the level of various organs and functions of the body, enhance physical fitness, improve health, and entertain the body and mind (Zhang GM et al. 2016). In order to achieve better sports effects, it is inevitable to attach importance to the sports environment and the ecological air quality related to breathing. Only in this way can outdoor sports achieve better and more perfect results.

Xiaofeng, Shi Fei Wang in the 2019 Issue of the periodical Ekoloji 107 published an article, entitled: "The Analysis of the Influencing Factors of Natural Ecosystem Maintenance on Promoting is suing Aerobic Exercise". This paper aims to improve the popularity and quality of outdoor aerobic exercise, and analyzes the factors that influence the maintenance of natural ecosystem on the promotion of outdoor aerobic exercise. The ecosystem vulnerability function is established through three indexes of natural ecosystem exposure, sensitivity and adaptability. Using this function, natural ecosystems are classified as mildly fragile and mildly fragile. According to the evaluation results of each grade, the evaluation model of natural ecosystem was constructed. On this basis, the effect of outdoor aerobic exercise on the change of human physiological indexes was studied, and the effect of maintaining natural ecosystem on promoting outdoor aerobic exercise was verified through the change of human physiological indexes. On the basis of this reference, this paper considers the influence of ecological air quality on the outdoor exercise duration of the crowd, and designs a model of the relationship between ecological air quality and the outdoor exercise duration of the crowd, aiming to better grasp the opportunity of physical exercise and carry out healthy and effective exercise to improve people's health quality.

II IDEA DESCRIPTION

The research on the relationship between ecological air quality and exercise is of great significance. It is well known that the atmosphere is necessary for the survival of all living things on earth. However, with the rapid development of industry, rapid increase of urban population and rapid growth of energy and fuel use in recent years, the atmospheric environmental quality in many urban areas is gradually deteriorating. Air quality pollution not only poses a threat to human's living environment, but also seriously affects human physical and mental health (Pan BF and Li LN 2016). In China, urbanization has gradually become the inevitable result of economic development, and the occurrence of urbanization itself has no objection to the role played by China's modernization process, because the benefits brought about by the occurrence of urbanization are so obvious. The main problem lies in how to coordinate the relationship between the development of urbanization and the living environment of human beings. The rapid development of urban economy brought by urbanization and the unrestrained expansion of urban resources and energy will inevitably endanger the natural environment where people live. Therefore, how to coordinate the relationship between urban development and human survival environment, and how to create a good natural environment for people's life and development have become major issues that must be addressed under the current social status in China (Chi XD2016).

Nowadays, more and more people have joined the sports team without hesitation in order to improve their health and quality of life. Movement way, the method should follow certain scientific nature and rationality, if correct, not only can achieve strong body, resist disease, the body senescence etc. , and at the same time can make the movement more good mental state, so that the movement is in a better state to the normal life, study and work. Sports need to be played in an appropriate environment. And the environment is the material basis for the survival of human beings

and all kinds of organisms. Organisms have certain tolerance threshold for the bearing capacity of their environment. As long as the bearing range exists in the threshold range, the life activities of human beings and all kinds of organisms can be continued. In other words, if the human environment is polluted and abnormal environmental rhythm is caused, this abnormal environmental rhythm will cause certain interference and hindrance to the human life rhythm originally inherent, thus breaking the original natural rhythm and causing the disorder of human life rhythm (Wang ZQ and Wang Z2017). Therefore, the research on the relationship between the environment and sports is of scientific and practical significance.

The grade of ecological air quality is to make the public have a more intuitive understanding of the pollution situation. It is calculated according to the concentration of ecological air pollutants. The concentration of various air pollutants to be detected is expressed in an intuitive numerical form, and the quality of ecological air is graded according to the value. These indicators can effectively and intuitively describe the quality of the ecological air environment, and control and manage air pollution according to its status, or know that people choose to travel and exercise rationally.

Generally, the ecological air quality level is divided into six levels. The lower the level value is, the better the ecological air quality is, and the less harmful it will be to human health. The level of ecological air quality is introduced below.

The calculation method of ecological air pollution index is as follows:

$$I = \frac{I_h}{C_h} \times C \quad (1)$$

Where, I_h is the limit of ecological air pollution index, C_h is the limit of pollutant concentration, and C is the comprehensive concentration of pollutants.

- (1) When the pollution index is between 0 and 50 and the ecological air quality is level 1, the air quality is excellent and harmless to health. You can take part in more outdoor activities or physical exercise.
- (2) When the pollution index is between 51 and 100 and the ecological air quality is level 2, the air quality is good and outdoor activities can be carried out normally.
- (3) When the pollution index is between 101-150, and the ecological air quality is level 3, the ecological air is slightly polluted. People who are sensitive to pollutants, such as the elderly or children, patients with respiratory diseases or heart diseases, should try to reduce outdoor activities, which has little impact on healthy people.
- (4) When the pollution index is between 151-200, and when the ecological air quality is level 4, there is moderate air quality pollution, which will pose a health threat to everyone, especially to people with respiratory diseases and skin sensitivity.
- (5) When the pollution index is between 201-300 and the ecological air quality level is level 5, the air quality is severely polluted, which will cause serious harm to the health of living things. Therefore, outdoor activities should be reduced and indoor activities should be kept as far as possible.
- (6) When the pollution index is 301, and the ecological air quality is level 6, the air quality is seriously polluted, which will cause serious harm to everyone's health. All people should stay indoors and try to avoid outdoor activities.

The modeling process of the relationship between ecological air quality and outdoor exercise duration of the crowd is given below.

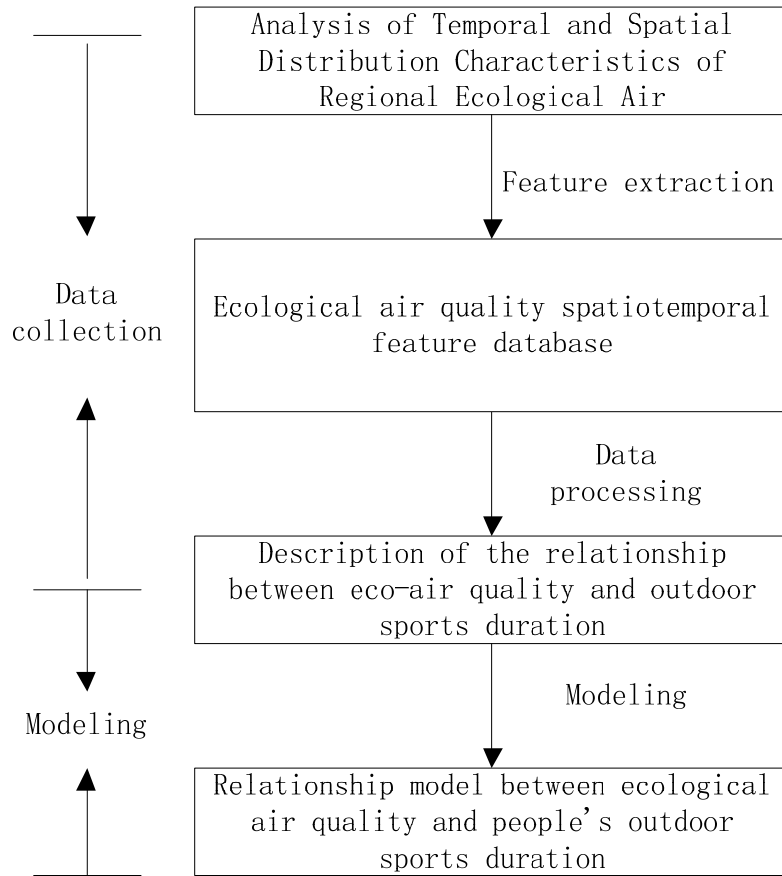


Fig.1 Schematic diagram of the modeling process of the relationship between ecological air quality and the length of outdoor sports

In the modeling process, in order to unify the dimension and order of magnitude of different values and facilitate the calculation and comparison between different indexes, the original data must be standardized, and the data standardization needs to be completed by formula (2).

$$X = \frac{X_0}{S} \times I \quad (2)$$

In formula (2), X is the pollution factor value in the standardized ecological air, X_0 is the pollution factor detection value in the ecological air, and S is the standard value of the pollution factor in the standard sequence.

The fuzzy relation matrix \mathbf{R} is determined by the standardized data calculated by formula (2), and the pollution factor value in the ecological air and the outdoor exercise duration of the crowd are calculated, and the result \mathbf{A} is obtained, as shown in formula (3). The relationship between the ecological air quality and the outdoor exercise duration of the crowd can be judged through \mathbf{A} . Where T is the outdoor sports time of the crowd.

$$\mathbf{A} = \mathbf{R} \times \frac{I}{T} \quad (3)$$

In summary, the modeling analysis of the relationship between ecological air quality and the duration of outdoor sports is completed.

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References

- Chi XD (2016) Heavy fog weather environment under the influence of exercise cardiopulmonary function to the human body. *Science Technology and Engineering* 16 (32):191-195.
- Pan BF, Li LN (2016) Comparison of the calculating method and classifying program of air quality index among some countries. *Environmental Monitoring in China* 32 (1):13-17.
- Pan BF, Zheng HH, Wang S (2017) Comparison on the indicating methods of air pollutant concentration in ambient air quality assessment among some different countries. *Environmental Monitoring in China* 33 (6):33-37.
- Wang ZQ, Wang Z (2017) The hardware design of indoor air quality testing system based on STM32. *Electronic Design Engineering* 25 (9):108-112.
- Xv T, Wang ZY, Zhang B, et al. (2016) Spatial-temporal variations of air quality indexes in key environmental protection cities of China. *Chinese Journal of Public Health* 32 (8):1027-1031.
- Zhang GM, Wang FF, Zhou ZQ (2016) Design of WiFi-based real-time monitoring system for air quality. *Modern Electronics Technique* 39 (8):76-79.
- Zhang NN, Wu SZ, Wan J, et al. (2016) National air resources assessment and its impact on air quality. *Acta Scientiae Circumstantiae* 36 (6):2223-2230.

