

Physical Exercise and Drug Use on Cognitive Enhancement

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Abstract

Cognitive enhancement is a technical means to expand and improve the cognitive ability of healthy individuals and people with cognitive impairments. At the same time, there are more and more ways for people to intervene in individual cognitive functions. This article mainly analyzes related research and discusses the pros and cons of people using traditional physical exercises and taking specific cognitive drugs to improve their cognitive abilities. The conclusions drawn indicate that regular exercise may be more effective in improving cognition than taking cognitive enhancement drugs for healthy people for non-treatment purposes. For people suffering from cognitive dysfunction, it is also very beneficial to take appropriate exercises while taking the correct medication according to the doctor's instructions.

Keywords

Cognitive Enhancement; Physical Exercise; Drugs; Health risks.

1. Introduction

Cognitive ability is the most significant psychological condition for people to successfully complete a series of social behaviors such as reasoning or processing information. However, some people's cognitive functions may be inherently defective, and may gradually decline with age. Therefore, most people are trying to improve their cognitive abilities in different ways. In the process of enhancing cognition, the ways people use are likely to have different positive effects or side effects on themselves. In this regard, scholars from various countries have carried out a series of studies on the ways of human cognition enhancement. However, most of these studies are limited to the analysis of a single method, and few can combine multiple cognitive enhancement methods as a comparison. This paper will be divided into two parts. The first part is to show the benefits of physical exercise for healthy individuals who want to enhance cognition and people with cognitive aging. Secondly, discuss the different effects that people in different situations have after taking cognitive enhancement drugs. After analyzing and comparing the two methods, this paper can get a more effective way to improve people's cognitive ability, which provides reference significance for healthy people seeking cognitive enhancement and people with cognitive impairment for the purpose of treatment.

2. Physical Exercise

2.1. Physical Exercise Can Help the Growth of the Nervous System

Physical exercise is a universal activity, which has a positive effect on the growth of neurons and the nervous system involved in learning and memory, which has been fully proven in some animal studies [1]. Widenfalk and Thorén developed an animal model to examine the effects of exercise on the brain, especially whether exercise can regulate BDNF (Brain-Derived Neurotrophic Factor). The results of the experiment showed that after 2-7 nights of exercise, compared with the control group, the BDNF value level in the hippocampus used as an experimental animal increased by 20% [2]. In other words, animals that have exercised can show better cognitive status. Mandolesi et al also found that after conducting a special exercise

training study on rodents, intense exercise can increase the proliferation rate of neurons in the hippocampus and neocortex, and then induce the release of BDNF [3]. Similarly, the enhancement of cognitive ability by physical exercise has also been confirmed in human studies [3]. After comparison, the volume of gray matter in the frontal lobe and hippocampus of people who exercised increased, thereby improving memory, concentration, and execution efficiency. Therefore, before performing tasks that depend on the executive functions or basic processing of the brain, it is beneficial to take appropriate exercise. Physical exercise should be regarded as a healthy and effective strategy to support people to enhance their cognitive function.

2.2. Physical Exercise Can Delay Cognitive Decline

In addition, physical exercise may affect the molecular mechanisms of the brain, which will help delay the decline of human cognitive function. Some experts conducted a 5-year clinical evaluation of 4,615 adults aged 65 and above, and the results showed that regular physical exercise has a great opportunity to reduce the risk of cognitive impairment and dementia [4]. Furthermore, Flöel et al performed a memory test on 75 elderly people and scanned the brain using MRI. After evaluating the physical exercise level of 75 elderly people, the researchers found that the level of a neurotrophin G-CSF (a protein that slows down cell death) in the brains of elderly people who exercise regularly is increasing, which indicates that exercise can reduce the risk of loss of cognitive function due to brain atrophy [5].

2.3. Disadvantages of Physical Exercise

However, Broe et al believe that physical exercise (running or walking) does not have close relationship with dementia or behavioral risk [6]. On the contrary, people may be injured accidentally during exercise. Mandolesi et al also mentioned that if people choose different exercise methods, the cognitive enhancement effect will be different [3]. For example, choose aerobic exercises like jogging and swimming or anaerobic exercises like weightlifting. At the same time, this enhancement effect is also related to the intensity, frequency, and duration of the exercise. Therefore, if individuals want to achieve the purpose of improving cognitive ability through physical exercise, they should adhere to the correct exercise regularly.

2.4. Summary

Physical exercise has positive biological and psychological effects. On the one hand, it can enhance the cognitive function of healthy humans and animals. On the other hand, it also plays an important role in resisting normal and pathological cognitive decline. However, low-frequency and short-duration exercises usually have little impact on cognitive function. Therefore, people who want to enhance cognition still need to incorporate physical exercise into their daily routines.

However, due to many reasons, some people may not like or do not have enough time for physical exercise, so they hope to improve their cognitive ability through some easier and more relaxed ways. Next, we will talk about how drugs function as a cognitive enhancement and what adverse effects and benefits it will bring to us. We will focus more on the adverse effects.

3. Cognitive Enhancement Drugs

Advances in neuroscience and biotechnology have provided unlimited possibilities for humans to enhance their functions. Gradually, using drugs to enhance cognitive ability has received widespread attention. Cognitive enhancement drugs are widely used for medical purposes, and patients rely on these cognitive enhancers to seek treatment for various diseases. In addition, some healthy individuals also want to take drugs that can improve cognitive ability to meet their own different needs. However, these used tablets are likely to have adverse effects on individuals. Therefore, in this essay, we will further explain these effects.

3.1. Taking Illegal Cognitive Enhancement Drugs Can Lead to Unfair Social Phenomena

People who are not sick taking cognitive enhancement drugs may be seen as malpractice in some cases [7]. For example, if athletes participating in sports competitions use doping, which will be judged as a violation of the game rules, they will be directly required to withdraw. This prohibition is mainly because the physical performance improvement caused by drugs is a cheating behavior in sports competitions. Besides, a considerable number of trades of cognitive stimulants among students in American universities, the primary purpose is that they attend to obtain higher grades by taking drugs for some personal reasons, and then to gain an advantage among other students [8]. This is illegal in the United States. Furthermore, this method is not fair for other competitors who want to achieve excellent results on their own.

3.2. Mistake of Cognitive Drugs May Have Side Effects on the Human Body

There are potential health risks for healthy people taking cognitive-enhancing drugs, such as fatal arrhythmia, addiction and so on [9]. Specifically, one of the reasons for these risks is that cognitive enhancement drugs have side effects, but it is still uncertain if all these drugs will cause side effects or not. Wezenberg found in a double-blind trial that almost six out of ten healthy people taking cognitive enhancement drugs suffer from headaches. This symptom is also outlined in the relevant medical instructions, but the effectiveness of the drug for healthy users is unclear [10]. Similarly, Franke also proposed that the prevalence of healthy people using enhancement drugs fluctuated from less than 1% to more than 20%, which further shows that the effects of cognitive enhancement drugs on healthy people are variable [11]. Another reason is that these drugs are taken in an incorrect way. In other words, people ignore the medication guide of prescription labels or even drug abuse, which leads to unpredictable negative effects for physical health, thus any positive effects of drugs on overall performance are offset. Therefore, individuals should thoroughly evaluate the impact before taking these drugs and try to avoid costs far exceeding the benefits they bring.

3.3. Benefits of Taking Cognitive Enhancement Drugs

It is undeniable that cognitive-enhancing drugs widely used in medical treatment do help patients with their illnesses. For instance, Ritalin and Adderall, which are often written in prescriptions, can enhance the executive functions of patients and most healthy people, thus improving their concentration, memory, and responsiveness [8]. Also, drugs can enhance the cognitive ability of individuals without this disease to a certain extent. Hoffman mentioned that in order to study mathematics better, a mathematician Graham habitually took a type of drug that could improve his memory and other abilities for better working efficiency, but he is worried that this behavior of taking drugs may damage his health. After stopping the drug for a month, he found that he was not actually addicted, but due to the lack of the drug's help, his research progress was almost stagnant [12].

However, it must be emphasized that both healthy individuals and patients must strictly follow the prescription when using cognitive enhancement drugs. If they overuse or fail to comply with the medication label, it may threaten your health. On the other hand, the whole process including pharmaceutical production, clinical trials and drugs launch should be strictly monitored. Otherwise, when users purchase counterfeit or unqualified drugs, there is a great probability of causing pharmaceutical market disruption.

3.4. Summary

Therefore, the following conclusions can be drawn through the analysis of drugs' effect on cognitive enhancement. On the one hand, cognitive enhancement drugs can be encouraged to be used in the treatment of diseases. On the other hand, when people's goal is to win in a fierce game or want to take some shortcuts in the game, the use of these drugs needs to be very

cautious. In addition, some drugs can restore good cognitive function for patients with severe dementia, these treated patients may think these drugs are safe enough; on the contrary, for healthy people aiming to enhance their cognitive ability, taking these drugs are likely to cause severe medical accidents, which are unacceptable for them.

4. Conclusion

In conclusion, this paper mainly analyzes two common ways for people to improve their cognitive abilities and there are physical exercise and taking cognitive enhancement drugs. Physical exercise is beneficial to cognitive enhancement, including the growth of the brain and nervous system and delaying cognitive function aging, which has almost no side effects on the human body. However, if you want to really improve individual cognition through physical exercise, the most critical point is that people need correct and periodic adherence to exercise, and it is definitely not a simple activity in a pure sense. In addition, taking cognitive enhancement drugs is widely used for medical purposes, which is undoubtedly necessary for people with cognitive dysfunction. However, this approach is still uncertain about the possible risks for healthy people, and it may also cause social inequities and other phenomena. Therefore, compared with taking drugs, this paper believes that physical exercise is more effective in improving people's cognitive ability.

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