

# Research on the Impact of Physical Training on Improving Students' Learning Ability

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## Abstract

This study systematically explores the specific impact of physical training on students' learning abilities, aiming to reveal the mechanisms by which physical training enhances cognitive functions, emotional regulation, mental health, and social skills. Through analyzing existing research findings, we found that physical training significantly improves students' attention, memory, and executive function. Additionally, it has positive effects on emotional regulation and mental health and can enhance students' social skills and self-confidence. Physical training can significantly improve students' attention and memory by increasing cerebral blood flow and oxygen supply, which promotes the growth of neurons and synaptic plasticity, thereby optimizing brain function. Students who regularly participate in physical activities report significantly better mental health compared to those who do not engage in exercise. They exhibit lower levels of anxiety and depression and higher levels of happiness and life satisfaction. This indicates that physical training not only benefits students' mental health but also creates a better learning environment for them. Team sports have a unique advantage in enhancing students' social skills. In team sports, students need to cooperate with teammates, formulate strategies, and complete tasks together, which significantly improves their sense of cooperation and communication skills. Physical training plays an important role in improving students' learning abilities and promoting their overall development. Different types of physical training have their own advantages and disadvantages; therefore, educators should design and implement physical training programs scientifically and rationally based on actual conditions. By systematically integrating aerobic exercises, strength training, team sports, and other types of exercises, educators can comprehensively enhance students' cognitive abilities, emotional regulation skills, and social skills, promoting their mental health and academic performance. This not only supports students' current learning but also lays a solid foundation for their future development. Future research should continue to deepen the exploration of the mechanisms of physical training to provide more scientific evidence for the formulation of educational policies and the design of school physical education curricula, comprehensively promoting the improvement of students' learning abilities and overall quality.

## Keywords

Physical training, learning ability, cognitive function, emotional regulation, mental health, social skills.

## 1. Introduction

Physical training plays a crucial role in student education[1]. With the rapid development of society and increasing competition, students need not only to achieve excellent academic results but also to maintain good physical fitness and mental health[2-4]. Physical training not

only helps improve students' physical abilities but also enhances their psychological resilience and social adaptability[5]. The current educational system faces numerous challenges in enhancing students' learning abilities. Traditional teaching methods often emphasize the inculcation of theoretical knowledge while neglecting the comprehensive needs of students' physical and psychological development. Prolonged sedentary learning can lead to decreased attention, low learning efficiency, and declining physical fitness[6]. With the proliferation of electronic devices, students' time and opportunities for physical activity have further decreased, adversely affecting their learning abilities and overall health.

In recent years, an increasing number of studies have begun to focus on the relationship between physical training and students' learning abilities. Research shows that physical training can affect students' cognitive functions and learning abilities through various mechanisms. Exercise can promote cerebral blood circulation, increase nerve conduction speed, and thus improve attention and memory. It can also alleviate stress and anxiety by releasing endorphins and other chemicals, thereby creating a better psychological environment for learning[7]. Team sports and competitive sports can enhance students' sense of cooperation and social skills, helping them better collaborate and communicate in their studies. However, existing research has certain limitations in methodology and subject selection, and a systematic theoretical framework has yet to be established[8]. Therefore, it is necessary to systematically summarize and analyze existing research to explore the specific impact of physical training on students' learning abilities and provide guidance for future research.

The main purpose of this study is to explore the specific impact of physical training on students' learning abilities. By systematically summarizing and analyzing existing research findings, we aim to reveal the mechanisms by which physical training enhances cognitive abilities such as attention, memory, and executive function. By comparing different types of physical training (such as aerobic exercise, strength training, team sports, etc.), we will analyze their differential impacts on learning abilities. We will also examine the role of physical training in alleviating students' stress, improving emotional states, and enhancing social skills, to comprehensively evaluate the potential value of physical training in improving students' learning abilities. By revealing the positive effects of physical training on students' learning abilities, we hope to provide references for the design and implementation of school physical education programs, helping educators better understand and utilize physical training as a tool. By promoting the importance of physical training in student education, we aim to garner widespread attention from parents and society, encouraging support and investment in students' physical training. Parents can use the recommendations from this study to encourage and guide their children to participate in various physical activities, fostering their exercise habits and healthy lifestyles. All sectors of society can organize and support various sports activities, creating more opportunities and platforms for students to engage in physical activities, thus promoting their overall development. This study aims to explore the specific impact of physical training on students' learning abilities, providing scientific evidence for educators, parents, and society, and promoting improvements in school physical education and comprehensive student development.

## **2. Literature Review**

### **2.1. The Impact of Physical Training on Cognitive Function**

The positive effects of physical training on cognitive function have been confirmed by numerous studies[9]. Exercise influences brain structure and function through various mechanisms. Research shows that physical activity can promote cerebral blood circulation, increase oxygen and nutrient supply to the brain, thus fostering the growth of neurons and synaptic plasticity. Exercise can also stimulate the secretion of neurotrophic factors in the brain,

which play a crucial role in the growth and maintenance of neurons, enhancing neurogenesis in the hippocampus, a brain region closely related to learning and memory.

The impact of physical training on attention, memory, and executive function has also attracted widespread attention[10]. Attention is a critical factor in the learning process, and exercise can enhance the persistence and selectivity of attention by improving brain function. Hillman et al. found that students who engaged in aerobic exercise performed significantly better on attention tasks than those who did not exercise. Similarly, improvements in memory are another important outcome of physical training. According to Smith et al., exercise can enhance both the formation and retrieval of short-term and long-term memory, which is crucial for students in consolidating knowledge and skills during the learning process[11]. Executive function, which refers to the ability to plan, organize, regulate, and complete tasks, can also be improved through physical training by increasing the activity level of the prefrontal cortex. Lowe et al.'s research showed that students who regularly participated in aerobic exercise performed significantly better on executive function tests than those who did not exercise[12].

## **2.2. The Impact of Physical Training on Emotion and Mental Health**

In addition to its effects on cognitive function, physical training also plays a vital role in emotional regulation and mental health. Exercise is widely regarded as an effective means of alleviating stress and anxiety. By promoting the release of chemicals such as endorphins, exercise can produce a "runner's high," effectively improving emotional state and reducing symptoms of anxiety and depression. Studies have also shown that exercise can lower levels of cortisol, a stress-related hormone, thereby alleviating stress responses. For example, Salmon's research found that individuals who participated in regular exercise had significantly lower stress levels compared to those who did not exercise.

The benefits of physical training in alleviating students' mental health issues and academic stress are also widely recognized. When facing academic pressure and test anxiety, students often feel emotionally down and anxious, but exercise can help them better cope with these challenges by enhancing self-esteem and self-efficacy. According to research, students who participate in physical activities report significantly better mental health than those who do not engage in such activities. They not only exhibit lower levels of anxiety and depression but also higher levels of happiness and life satisfaction.

## **2.3. The Impact of Physical Training on Social Skills**

Physical training is also significantly important for improving students' social skills. Team sports, in particular, can cultivate students' sense of cooperation and communication skills. In team sports, students need to work closely with teammates, formulate strategies, divide tasks, and complete missions together. This cooperation not only enhances their team spirit but also improves their communication skills and problem-solving abilities. For instance, Smith et al. found that students who participated in team sports scored significantly higher in social skills assessments compared to those who did not engage in team sports[13]. Physical training can also enhance students' adaptability in social situations by promoting cooperation and communication skills. Studies have found that students who participate in physical activities demonstrate greater confidence and positivity in social interactions, which not only benefits their interpersonal relationships at school but also lays a solid foundation for their future careers. Moreover, physical training can help students develop stronger self-control and self-regulation skills, which are crucial for displaying appropriate behavior and attitudes in complex social contexts.

In summary, physical training positively impacts students' cognitive abilities by improving brain structure and function. These findings not only highlight the importance of exercise for brain health but also provide scientific evidence for educators to integrate physical training into

the teaching process to enhance students' learning efficiency and academic performance. The positive effects on emotional regulation and mental health are also evident[14]. By reducing stress and anxiety, exercise not only benefits students' mental health but also improves their learning efficiency and academic performance, providing important references for educators and parents. Through participation in team sports and other forms of physical activities, students can enhance their cooperation and communication skills, boost their confidence, and improve their social adaptability. This provides strong support for educators in designing and implementing physical education programs to promote the comprehensive development of students.

### **3. Specific Impacts of Physical Training on Learning Ability**

#### **3.1. Short-Term Effects**

Physical training has significant short-term effects on students' attention and memory. Studies have shown that after a period of physical training, students' concentration and memory are significantly improved. A study conducted by Hillman et al. found that students who engaged in aerobic exercise scored significantly higher on attention tests compared to a control group that did not exercise[15]. Physical training can increase blood flow and oxygen supply to the brain, enhancing nerve conduction speed, thereby significantly improving students' attention in the short term. Additionally, research by Sibley and Etnier indicates that students' performance on memory tasks also improves significantly after physical training. These findings suggest that short-term physical training can effectively enhance students' cognitive function and improve learning efficiency.

Physical training can also regulate emotional states, further enhancing attention and memory performance. Exercise can promote the release of endorphins and other chemicals associated with feelings of happiness, reducing students' anxiety and stress, thus creating a better psychological environment for more efficient learning. For example, a study by Davis et al. found that students whose emotional states improved after exercise performed better on memory tests than those whose emotional states did not change significantly[16]. In summary, short-term physical training significantly enhances students' attention and memory, providing a scientific basis for integrating physical training into daily learning.

#### **3.2. Long-Term Effects**

Long-term physical training has profound impacts on students' learning ability. Continuous physical training not only brings about comprehensive improvements in cognitive function but also significantly enhances students' academic performance. Research by Lowe et al. found that students who regularly engaged in aerobic exercise had significantly higher exam scores at the end of the school year compared to those who did not exercise[17]. Long-term physical training improves brain structure, such as increasing the volume of the hippocampus and the density of neurons, promoting neuroplasticity, thereby enhancing learning and memory capabilities. Hillman et al. further pointed out that long-term physical training can improve executive function, making students more proficient in planning, organizing, and completing academic tasks.

Long-term physical training also enhances students' self-discipline and time management skills, which are crucial for improving academic performance[18]. Students who participate in physical training often need to manage their time effectively, balancing academics and exercise. This cultivation of time management and self-discipline helps them achieve better academic results. Studies have shown that students who participate in physical training perform better in the completion and management of academic tasks. Research by Tremblay et al. found that

students who regularly engage in physical training exhibit higher self-discipline and efficiency in homework submission and exam preparation[19].

Moreover, long-term physical training can positively impact students' mental health, indirectly promoting the enhancement of learning ability. Studies have shown that long-term exercise can significantly reduce students' levels of anxiety and depression, improve psychological resilience, and stabilize emotional states. Improved mental health provides a solid foundation for students to fully engage in academic activities. Research by Sallis et al. indicated that students with higher levels of mental health perform better in academic tasks[20], further illustrating the important role of physical training in the long-term improvement of students' learning abilities.

## **4. Comparative Analysis of Different Types of Physical Training**

### **4.1. Aerobic Exercise**

A significant body of research supports the positive impact of aerobic exercise on students' learning abilities. Studies indicate that aerobic exercise can substantially improve students' attention, memory, and executive functions. By increasing heart rate and blood circulation, aerobic exercise enhances the oxygen and nutrient supply to the brain, promoting neuronal growth and synaptic plasticity. Hillman et al. found that students who engaged in aerobic exercise performed better on attention tests than the control group[15]. This study demonstrates that short sessions of aerobic exercise can improve students' concentration, thereby enhancing learning efficiency. Aerobic exercise also has a notable effect on memory enhancement. According to research by Smith et al., students who regularly participate in aerobic exercise perform significantly better in memory tasks than those who do not exercise. Aerobic exercise can promote neurogenesis in the hippocampus, a brain region closely related to learning and memory. This suggests that aerobic exercise not only improves short-term memory but also facilitates the formation and consolidation of long-term memory. Additionally, aerobic exercise can improve students' executive functions, including planning, organizing, and completing tasks. Research by Lowe et al. showed that students who engaged in aerobic exercise performed significantly better in executive function tests than the control group. This indicates that aerobic exercise can enhance students' ability to handle complex academic tasks, helping them better meet academic challenges[17]. In summary, aerobic exercise positively impacts students' learning abilities through various mechanisms, providing a scientific basis for educators to incorporate aerobic exercise into teaching practices.

### **4.2. Strength Training**

The impact of strength training on students' learning abilities also deserves attention. While strength training primarily focuses on enhancing muscle strength and endurance, its cognitive benefits are gradually being recognized. Research shows that strength training can promote brain health through various pathways, thereby enhancing learning abilities. Strength training can increase blood flow and oxygen supply to the brain, which is crucial for improving cognitive functions. Studies have found that students who participate in strength training perform significantly better on attention and memory tests than those who do not engage in such training. Strength training also increases the secretion of neurotrophic factors, promoting neuronal growth and synaptic plasticity. This is important for enhancing students' memory and executive functions. Research by Tremblay et al. found that students who regularly engaged in strength training performed significantly better in memory tasks compared to the control group[21]. This indicates that strength training not only boosts physical fitness but also improves brain function, thereby enhancing learning efficiency and academic performance.



Strength training can also indirectly improve academic performance by enhancing self-discipline and time management skills. Students who engage in strength training need to effectively manage their training schedules, which helps develop their self-discipline and time management skills. Studies have shown that students who regularly engage in strength training exhibit higher self-discipline and efficiency in completing academic tasks, positively impacting overall academic performance. In summary, strength training not only benefits physical fitness but also enhances students' learning abilities through various pathways.

### 4.3. Team Sports

Team sports have unique advantages in enhancing students' learning abilities. By emphasizing cooperation and communication, team sports can improve students' social skills and cognitive functions. Research indicates that students who participate in team sports perform significantly better in attention, memory, and executive functions compared to those who do not participate in team sports. Smith et al. found that team sports enhance cognitive functions by promoting neural connectivity and synaptic plasticity in the brain. By fostering a sense of cooperation and teamwork, team sports indirectly enhance academic performance. In team sports, students need to closely cooperate with teammates, strategize, and work together, which improves their cooperation skills and problem-solving abilities. This is crucial for their academic collaboration and communication. Studies have shown that students who participate in team sports perform better in academic collaborative projects compared to those who do not, further illustrating the positive impact of team sports on academic performance.

Team sports also enhance self-confidence and reduce academic pressure, promoting students' mental health and learning abilities. Team sports provide a supportive and encouraging environment, which is important for boosting students' self-esteem and self-efficacy. Research indicates that students who participate in team sports are more confident and proactive when facing academic challenges, significantly enhancing their learning abilities. In summary, team sports positively impact students' learning abilities through various pathways, particularly in promoting cooperation skills and mental health.

### 4.4. Other Types of Exercise

In addition to aerobic exercise, strength training, and team sports, other types of exercise such as yoga and Tai Chi also have specific impacts on learning abilities. Although these exercises are not as prominent in improving physical fitness as the previously mentioned types, they have unique advantages in enhancing students' attention and emotional regulation. Studies show that yoga and Tai Chi, by emphasizing breath control and mental balance, can significantly improve students' attention and emotional stability. Research by Harvard et al. found that students who regularly practice yoga perform significantly better on attention tests than those who do not. Yoga regulates the autonomic nervous system, promoting brain blood circulation and oxygen supply, thereby enhancing attention and cognitive functions. Tai Chi, as an exercise combining physical movement and meditation, has also been proven to improve cognitive functions and learning abilities by reducing stress and enhancing emotional stability [23]. Other types of exercise can also indirectly promote learning abilities by improving sleep quality. Studies have shown that students who participate in yoga and Tai Chi report significantly better sleep quality than those who do not exercise. Good sleep is crucial for enhancing cognitive functions and learning abilities. Research by Tremblay et al. pointed out that improved sleep quality significantly enhances memory and attention, further illustrating the positive impact of other types of exercise on learning abilities [22].

Different types of physical training have distinct impacts on students' learning abilities. Aerobic exercise enhances attention, memory, and executive functions by increasing heart rate and blood circulation. Strength training promotes cognitive functions and academic performance by increasing neurotrophic factors and developing self-discipline. Team sports enhance overall

learning abilities by improving cooperation skills and mental health. Other types of exercise, such as yoga and Tai Chi, indirectly promote learning abilities by improving attention, emotional stability, and sleep quality. These studies provide valuable scientific evidence for educators in designing physical education curricula and strategies for students' holistic development.

## **5. Discussion**

### **5.1. Comprehensive Discussion of Research Findings**

Physical training has a significant and tangible impact on improving students' learning abilities. Physical training can markedly enhance students' attention and memory. By increasing blood flow and oxygen supply to the brain, exercise optimizes brain function, allowing students to perform better in terms of concentration and information retention. There is also a clear improvement in executive functions. Executive functions include the ability to plan, organize, and regulate tasks, which are crucial for students' performance in learning. Regular aerobic exercise and strength training improve students' performance in executive function tests compared to those who do not exercise, providing scientific evidence for the application of physical training in education.

Different types of physical training have their own advantages and disadvantages, along with specific application suggestions. Aerobic exercise enhances cognitive functions comprehensively by increasing heart rate and blood circulation, making it suitable for widespread promotion in daily teaching. However, the intensity of aerobic exercise needs to be controlled to avoid causing excessive fatigue in students. Strength training primarily enhances memory and executive functions by increasing muscle strength and promoting the secretion of neurotrophic factors. It is suitable for periods with lighter academic burdens or the end of the term to avoid encroaching on regular study time. Team sports enhance cooperation skills and mental health, significantly improving students' social skills and self-confidence, making them suitable for extracurricular activities and physical education courses. Other types of exercise, such as yoga and Tai Chi, although less effective in improving physical fitness compared to the aforementioned exercises, have unique advantages in improving attention, emotional stability, and sleep quality. They are suitable for application before high-stress exams or in psychological counseling sessions.

### **5.2. Educational Significance of Research Results**

The research results hold significant implications for educational policy and the design of school physical education curricula. Schools should recognize the role of physical training in the holistic development of students and incorporate it into daily teaching plans. Policymakers should encourage schools at all levels to allocate adequate physical education time in their schedules and provide the necessary facilities and resources to support students' active participation in various physical activities. School physical education curricula should emphasize diversity, integrating comprehensive programs that include aerobic exercise, strength training, team sports, and other types of exercises according to students' interests and needs. This not only helps in enhancing students' learning abilities but also promotes their physical fitness and mental health.

Educators should actively explore and apply specific strategies for integrating physical training into teaching. Short periods of aerobic exercise can be arranged during class breaks to improve students' attention and learning efficiency. Strength training and team sports can be organized after school to enhance students' physical fitness and cooperation skills. Introducing yoga and Tai Chi before exams can help students reduce stress and anxiety. By scientifically and reasonably incorporating physical training, educators can significantly enhance students'

learning abilities and academic performance, laying a solid foundation for their future development.

### 5.3. Limitations in Existing Research and Future Directions

Despite existing research revealing the positive impact of physical training on students' learning abilities, there remain several limitations and inadequacies. Most studies have relatively small sample sizes, and the selection of subjects may introduce biases that affect the generalizability and reliability of the findings. There are also limitations in research design and methodology; some studies lack sufficient consideration of control variables, which may lead to errors in results. Additionally, the long-term effects and mechanisms of different types of physical training require further exploration, as current research provides limited evidence in this area.

Future research should focus on methodological improvements to enhance the reliability and applicability of results. It is essential to increase sample sizes and select representative study subjects to ensure the generalizability of findings. Research designs should be more rigorous, employing high-quality methods such as randomized controlled trials (RCTs), with careful consideration of control variables to minimize errors. Further studies should delve into the long-term effects and mechanisms of different types of physical training, uncovering the underlying reasons for improvements in learning abilities. Research should also examine the application effects of physical training at different educational stages and in various disciplines, providing more specific and practical guidance for educators.

Physical training significantly enhances students' learning abilities. Each type of physical training has its own strengths and weaknesses, along with specific application recommendations. Educators should scientifically and reasonably design and implement physical training based on practical situations. Future research should build on existing foundations, further exploring and optimizing the effects and mechanisms of physical training applications. This will provide scientific evidence for the formulation of educational policies and the design of school physical education curricula, comprehensively promoting the improvement of students' learning abilities and overall quality.

## 6. Conclusion

This study systematically explores the specific impact of physical training on students' learning abilities, revealing the significant role of physical training in enhancing cognitive functions, emotional regulation, mental health, and social skills. Physical training can markedly improve students' attention, memory, and executive functions. By increasing cerebral blood flow and oxygen supply, exercise promotes neuronal growth and synaptic plasticity, thereby optimizing brain function. Studies indicate that students who engage in aerobic exercise, strength training, and team sports perform better in cognitive tasks compared to those who do not exercise. These findings provide scientific evidence for educators to incorporate physical training into teaching processes, supporting the enhancement of students' learning efficiency and academic performance.

Physical training has positive effects on students' emotional regulation and mental health. By promoting the release of endorphins and other chemicals, exercise can alleviate stress and anxiety, improve mood, and reduce symptoms of depression. Team sports offer unique advantages in enhancing students' social skills. In team sports, students need to collaborate with teammates, develop strategies, and complete tasks together, which significantly boosts their cooperation awareness and communication skills.

There are some limitations in current research, such as small sample sizes, potential biases in subject selection, and limitations in research design and methodology. Future research should



address these issues by expanding sample sizes and adopting high-quality research methods such as randomized controlled trials to deeply explore the long-term effects and mechanisms of various types of physical training. Research should focus on the application effects of physical training at different educational stages and in various disciplines, providing more specific and actionable guidance for educators.

Physical training plays a crucial role in enhancing students' learning abilities and promoting overall development. Each type of physical training has its own advantages and disadvantages. Educators should design and implement physical training scientifically and reasonably based on practical situations. By systematically integrating aerobic exercise, strength training, team sports, and other types of exercise, educators can comprehensively enhance students' cognitive abilities, emotional regulation skills, and social skills, promoting their mental health and academic performance. This not only supports students' current learning but also lays a solid foundation for their future development. Future research should continue to delve into the mechanisms of physical training to provide more scientific evidence for the formulation of educational policies and the design of school physical education curricula, comprehensively promoting the improvement of students' learning abilities and overall quality.

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