

Analysis of the Benefits of Badminton to Human Health

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Abstract. Badminton is slowly growing in popularity worldwide, being one of the world's most-watched and played sports. It is not only a sport for pleasure and competitions, but some people also play badminton to improve their health. Hence, the purpose of this paper is to explore the benefits of playing badminton on human health in different areas such as the brain, the human body, and the spirit. A range of methods were used, such as narrative reviews and randomized controlled trials. This paper finds that badminton provides a multitude of health benefits to the human body in general, notably to the brain, body, and spirit. More specifically, the study evaluates the positive effects of playing badminton towards improving dementia, cognitive skills, physical fitness, and stress markers such as anxiety and depression. Ultimately, the purpose of the research is to gain more knowledge on the benefits of playing badminton that go beyond its surface level.

Keywords: Badminton, Benefit, Human Health, Sport

1. Introduction

Badminton is a racquet sport played with a shuttlecock, requiring a lot of agility, speed, and precision. It offers multiple health benefits to the human body through moving around the court and strategizing for the next shot. Outside of competitions, badminton allows various age groups to stay in form because of its low-impact gameplay. Recent studies have concluded that playing badminton could lead to improvements related to physical fitness and cognitive parameters [1-3]. Physical and psychological aspects could greatly affect the performance of an athlete, hence suggesting the importance of cultivating one's health in consequence of playing badminton. For instance, the sudden bursts of power and frequent direction changes during a match challenge the physical capacity of the human body. Playing the sport also helps deal with stress and improves reaction time. More specifically, researchers studied the effects of badminton through methodologies including literature reviews, experimental trials with randomized and nonrandomized group assignments, training programs for specific populations, and comparing health metrics between different levels of recreational plays. This article reveals the underlying benefits of playing badminton to the human body, specifically on the mental, physical, and spiritual levels.

2. The benefits of badminton to human health

2.1. Benefits for the brain

One of the benefits of playing badminton is its impact on brain health due to its open-skill exercise. Compared to other closed-skill sports such as running or cycling, which are under stable and controlled environments, badminton involves dynamic movements with unpredictable patterns. These characteristics can improve an athlete's cognitive ability for attention, reaction speed and inhibitory control. Research shows that both chronic and acute play enhance executive functions. For instance, 10 minutes of high-intensity badminton matches or 30 minutes of moderate-intense matches per week help improve cognitive performance. Multiple neurobiological factors are involved during cognitive improvement, such as increased brain-derived neurotrophic factor, insulin-like growth factor-1, interleukin-6, better cerebral blood flow and reduced neuroinflammation [4].

Furthermore, playing badminton on a regular basis helps with several factors of dementia. In 2023, there were 55 million people affected worldwide, placing dementia as a growing global crisis for human beings. It is expected that the numbers will increase to 78 million people by 2030, making it an urgent topic to address and solve. However, studies have shown that improving the modifiable factors of dementia, such as physical inactivity, obesity, hypertension, and depression, can help reduce or even prevent up to 40% of dementia cases. Fittingly, badminton involves many of the factors listed above, making it an ideal sport for people battling with dementia. Recreational badminton 3 hours per week manages blood pressure, 10 hours of playing helps with body fat percentage and glucose levels, 100 minutes weekly reduces depression states, and playing for around 3 months benefits lipid profiles [5, 6].

Moreover, more specifically about what happens to the brain, badminton players demonstrate more gray matter concentration in the cerebellum and altered fronto-parietal connectivity because of the brain's capacity of tracking the shuttlecock trajectory and anticipating the opponent's movements. The functional near-infrared spectroscopy indicates that one badminton session increases the inhibitory control without affecting the prefrontal cortex activation, a pattern of neural efficiency suggesting that badminton sharpens cognitive performance with less metabolic effort compared to some other sports like running. Badminton is also more efficient than running because it boosts serum brain-derived neurotrophic factor (BDNF), which is a key contributor to neuroplasticity, and it also increases basal BDNF levels.

Compared to singles matches, doubles require more cognitive abilities because the athlete must think about which opponent is going to hit the shuttlecock, requiring faster reaction times. The social interactions in doubles or mixtes provide cognitive maintenance, which aids with dementia and depression. Such interactions are crucial for the outcome of a match, which includes communication, coordination of movements, and strategic planning.

2.2. Benefits for the body

Additionally, badminton is also beneficial for the human body itself. For instance, the most well-established benefit is the improvement of aerobic capacity. Researchers created a four-week program called High Intensity Intermittent Badminton Multi-Shuttle and the results show that the group who underwent the training program increased their VO₂max while those who did not participate showed no improvement. The high-intensity bursts of power during a badminton game and the short amount of recovery time contribute to the improved aerobic system. However, there is also a significant

change in the anaerobic system. In the same program, the participants were examined using a Wingate Ergometer Test and it showed that they had improvements in mean power. Afterwards, the study tested the athletes' agility using the Illinois Agility Test, which also revealed a significant improvement. In fact, badminton requires quick directional changes and reaction-making, gradually improving their agility through the short window of reaction-time [7].

The body mass percentage of an individual is also a critical psychological factor for determining the health of a human body. In the high-playing time (HPT) badminton group, they had more lean body mass, 50.3kg, compared to the sedentary group, who had 45.6kg, regardless of the amount of weekly badminton sessions. In fact, badminton requires athletes to stimulate muscle maintenance effectively for high-intensity movements such as lunges, jumps, and short distance running. Meanwhile, the body fat percentage decreased while the HPT group played approximately 9.72 hours per week, the LPT group played for 3.34 hours a week, and a sedentary control group. Compared to the control group, the HPT group showed signs of fat reduction of around 22%. They also had less than the LPT, but it shows no significant difference in the study [8].

Next, researchers found that the group who played badminton showed lower fasting serum glucose levels compared to the control group, reducing approximately 4.3%. Regular physical activity promotes glucose uptake and glycogen restoration. High-intensity intermittent exercise like badminton helps boost mitochondrial oxidative phosphorylation, which supports active glucose consumption.

A study showed a significant development of lower-body muscular endurance in the badminton group compared to the control group. After undergoing a 15-week training program, the participants increased the number of repetitions during a 30-second chair stand test. The repeated lunging, squatting and directional changes indicate that the lower-body muscles are worked a lot, such as the quadriceps, hamstrings, and glutes. Enhanced lower body endurance helps with maintaining mobility and balance, especially as humans grow older. Additionally, although not as significant as the lower body muscular endurance improvement, the group still showed gains in handgrip strength compared to the control group. The increased grip strength reveals that the forearm and hand muscles are prominently used while gripping the racket and hitting the shuttlecock during training [9].

2.3. Benefits for the spirit

An important aspect to notice during badminton play is the reduction of anxiety, one of its most significant spiritual benefits. For instance, in a 12-week randomized controlled trial involving 160 graduate students with sleep disorders, researchers found that the participants who participated in badminton training experienced a decrease in anxiety levels, according to the Self-Rating Anxiety Scale (SAS). Badminton training includes high-intensity interval training, agility drills and endurance exercises, showing drastic changes in the participants' anxiety levels. In the beginning of the 12-week program, the SAS score was 45.4, but after the training, it decreased significantly to 36.3 compared to the control group who only decreased from 45.2 to 43.8. The sport teaches players how to maintain calmness during critical points or after making a mistake. They learn how to manage pressure while maintaining their performance. The study reveals that badminton training with specific drills for physical strengthening favors the release of emotional stress and a calmer state of mind.

Moreover, sleep quality also improves as a result of playing badminton. By using the Pittsburgh Sleep Quality Index (PSQI), experts found that sleep quality was improved over a 12-week badminton training program. Those who went to the training program improved their sleep from 8.6

to 5.8, while the control group only went down from 8.4 to 8.0. By getting better sleep quality, the human spirit also increases significantly through greater daytime alertness, reduced irritability and better emotional stability. Badminton training hence nourishes the spirit by allowing the mind and body to fully rest and recover [10].

Badminton also creates deep social connections and bonds that directly improve one's spirit through strengthened social ties, improved communication skills, enhanced leadership qualities and sportsmanship. Players feel more inclusive and connected to others, forming friendships that last beyond the match. In fact, whether it is a singles or doubles match, playing badminton requires a certain knowledge of the opponent's playing style and, in doubles, it requires coordination and communication between the partners. This sense of belonging and mutual support uplifts the spirit and mood, especially for young adults having issues with anxiety and social integration [11].

3. Discussion of health benefits

3.1. Role of badminton on human health

Overall, badminton plays a multifaceted role in promoting human health, especially for people facing intellectual disabilities with lower physical activity. According to the studies, regular badminton participation produced measurable improvements in cognitive abilities, cardiovascular efficiency, muscular endurance and emotional well-being. Through the skill development perspective in badminton, the sport helps with motor competency in intellectually disabled patients. For example, better lower body muscular endurance and grip strength are essential for everyday life activities, which help those patients effectively. In general, healthy individuals can also improve their overall health by playing badminton, as proven across the mind, body, and soul.

3.2. Discoveries

Although a lot of physiological factors showed significant improvement after playing badminton, there were some indicators that demonstrated no evident change. For instance, the lipid profile showed no signs of significant improvement. Blood levels of triglycerides, total cholesterol, high-density lipoprotein, and low-density lipoprotein did not differ much in the study groups. This occurred possibly because the study group being researched on were already healthy, so they may not have had baseline lipid metabolic disorders, leaving little room for improvement. Moreover, the sample group studied is too small, limiting the ability to find statistical differences in different factors.

4. Conclusion

In conclusion, the analysis revealed that playing badminton contains multiple benefits to the human body, especially to the mind, body, and spirit. This article contributes to the existing body of knowledge by compiling the information from different studies on the benefits of badminton and coming to a full-round analysis. However, the studies are limited by certain factors that showed no benefit from playing badminton, such as the lipid profile, and limitations in the sample group and statistical results, which could have affected the generalizability of the findings. Future focus should focus on how to make the health benefits of badminton more accessible to different populations, not only through badminton, but also through simulations or alternatives that provide the same positive results. Overall, this paper provides insight into the specific benefits of badminton and its relevance

in the world. Despite its popularity, people should still take the time to recognize the underlying truths behind what happens to our bodies when we play badminton. People who have difficulty finding the right sport for them while maintaining good health can seek guidance by knowing the benefits of playing badminton.

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