The Impact of Table Tennis on Public Health

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Abstract. In the 21st century, as the society get into the scientific and information era, people do less heavy manual labour than before, and the working time is gradually shortened so they pay more and more attention to sports. In China, table tennis has become a sport that can make the body and mind healthier and more interesting. It can make people have many time to enjoy their lives and many people try to make their rest time full of interests and healthy by means of colorful sport activities. The purpose of this paper is to introduce the impact of table tennis practice on the human body systematically and scientifically, including physiology, body form and psychology. The result of the research indicate that table tennis can have a profound impact on the physical quality of the human body, often participate in table tennis can improve the physical quality of the human body.

Keywords: Table tennis, Leisure-time Physical activity, Health Benefits.

1. Introduction

Table tennis is one of the most well-known and widely played racket sports in the world with more than 300 million who practice this sport. At the same time, it is a traditional sport in China, which has been popular since the 20th century until the recent years. Like most sports, table tennis provides great physical and mental stimulation, aerobic exercise, and social interaction. Unlike many sports, however, the overall risk of injury in table tennis is low and age is not limited. If people systematically carry out table tennis training for a long time, it will be beneficial to the improvement of the whole-body function level, promote mental health, and have a certain impact on the national fitness. The purpose of this paper is to analyze the impact of table tennis on the physical and mental health of the public of different genders and ages.

There are at least two reasons to understand that table tennis has a positive impact on people. First of all, as the national sport of China, table tennis has enjoyed wide participation in the last century. The group of fans who used to be keen on table tennis have been aging. They have changed psychologically and physically [1].

Second, since the 2020 Tokyo Olympic Games and 2022 Chengdu World Table Tennis Championships and other international competitions, the Chinese Table Tennis team has won many gold medals in minor events, and the Chinese Table Tennis team has gained more fans. There is a successful phenomenon that sports stars lead fans to play sports. As more and more young people began to play table tennis, there were studies of its effects on different age groups.

2. The origination of Table Tennis

Table tennis originated in England. In addition to the official term "ping pong", it is also called "ping pong" because of the "ping" and "pong" sounds of hitting and bouncing which originates from the onomatopoeic sound of the ball that appeared in the Far East in 1884 [2].

At the end of the 19th century, tennis was popular in Europe, but due to the limitations of the field and the weather, some college students in Britain moved the tennis to the indoor table, with the table as the table, the book as the net, with the parchment as the racket, to play on the table.

3. The Impact of Table Tennis on Public HealthText Characteristics and the Overall Health Benefits of Playing Table Tennis

3.1. Characteristic

The equipments of table tennis is very simple, people can play it indoor or outdoor. And also, they can decide the momentum by themselves. People of different ages, genders and physical conditions can participate.

The speed of table tennis ball is fast, and the rotation changes a lot. It requires the practitioners to have a strong response ability and adaptability to hit the ball in a short time, which can improve the sensitivity, coordination, and also improve the ability to mental concentrate and focus for long periods of time.

Table tennis events are divided into singles, doubles & mixed doubles, and team events. In doubles and mixed doubles competition, the tacit understanding and cooperation proficiency between partners are crucial. Group projects are accomplished by the cooperation of several individuals. Therefore, table tennis can cultivate the spirit of independent thinking, fighting alone and collectivism.

3.2. The Overall Health Benefits

3.2.1. Relieves stress and improves mental health

It turns out that playing table tennis plays an important role in cortisol regulation (the stress hormone), can also significantly improve the quality of our sleep, and help prevent and treat mental disorders such as anxiety or depression.

3.2.2. Improves the concentration

Concentration is the first prerequisite of table tennis. During the training and competitions, people have to track a little ball and the spin it carries, while also focusing on movement, applying the correct technique, and thinking about tactics. People who play table tennis are great at concentration, and this skill is incredibly valuable for other aspects of life, such as working or studying.

3.2.3. Keeps people fit and in good shape

There is no doubt that table tennis can keep you fit just like any other sports. Compared to other sports, it has the advantage of full-body burning. It is estimated that playing table tennis can burn 250 calories per hour. Participants need to use their abdominals, hips, legs, arms and even fingers to complete the movement. Throughout the training, the athletes need strong leg strength to keep the movement speed and also need arm swing and finger dexterity to hit the ball. People can keep a healthy shape while doing these actions [3].

4. The Physical Effects of Table Tennis

Table tennis, as a sport, has the function of improving the body's physical quality and improving the body's ability. This part describes the effects of table tennis on human respiratory function, bone, cardiovascular and nerve [4].

4.1. Respiratory

Playing table tennis generally can improve the respiratory system and make body with high lung capacity. At the same time, it can also improve the strength of the respiratory muscles and the depth of breathing. Scientific research shows that in a quiet state, the amount of O2 per minute of the human body is about 7L, while in the state of table tennis, the amount of O2 inhaled per minute can be increased to about 125 L. The human body needs a large amount of O2 supply in the process of table tennis, and the breathing exercise will be accelerated and deepened, so as to effectively exercise the respiratory muscle group and enlarge the chest cavity of the human body. The direct impact is that the elasticity of the alveoli increases, the capacity increases, and the lung capacity of the human body

increases significantly. Scientific research shows that after often participating in table tennis, men's lung capacity can increase by about 2700mL (3200mL to 6,500 mL), and women's lung capacity can be increased from 2300mL by 1400mL to 3700 mL [5].

4.2. Nerve

Table tennis has the characteristics of repeating the same action many times. Repeated hitting actions can increase the stimulation of the brain-centered nervous system. A large amount of neural stimulation significantly improves the intensity and sensitivity of neurons and nerve endings in the nervous system to receive stimulation and their ability to withstand stimulation. Research shows that in table tennis training and competitions, through the transformation of various hitting actions (such as smashing, chop etc.), people can effectively inhibit the excitement process of the cerebral cortex and avoid nerve fatigue caused by excessive tension of the brain-centered nervous system [4]. The amount of O2 consumed by the nervous system is 25% of O2 consumed by the human body. Table tennis accelerates the breathing of the human body, so that the human body can absorb more O2 to ensure the stability of the work of the nervous system [6].

4.3. Bone

A long time of table tennis training is beneficial to the growth of human bones and the perfection of skeletal system.

In the process of long-term training and high-intensity competition, the human body is in a state of explosive movement for a long time, the speed of blood circulation is accelerated, and nutrients can reach the bone system more quickly, thus promoting the growth and development of the bone system.

Players in the process of movement to constantly move, at the same time to spike, pull, defense and other actions. This creates constant stimulation of the skeletal system, especially in the limbs [7]. On the one hand, it can promote the rapid growth of epiphysis cartilage cells at both ends of long bone and increase the length of long bone. On the other hand, it can increase the bone density of the human body, make the limbs of the human body become stronger, and improve the ability of the bones to withstand pressure.

Biologically speaking, participating in table tennis speeds up the metabolism of your bones. Through the interaction between blood cells and bone marrow can promote the synthesis of bone protein, increase the amount of bone salt precipitate, thus improving the quality of bone. At the same time, the periosteum thickens and plays a better role in protecting the bone path. In addition, proper table tennis can make bones better absorb vitamin D, iron and calcium required in the process of growth, so as to reduce the loss of nutrients in the bone system, increase bone density and promote the healthy growth of the bone system.

4.4. Cardiovascular

The cardiovascular system controls the body's blood circulation and is the body's logistics system for oxygen and nutrients. It is mainly composed of the heart and all levels of blood vessels, among which the heart is the cardiovascular system and human body is a very important organ, it provides power for the flow of blood. Table tennis is a moderate intensity sport, its impact on the cardiovascular system is mainly manifested in the heart. When playing table tennis, the human body needs a lot of energy supply, then the heart needs to beat faster to send more blood to meet the needs of the human body. Long-term exercise increases the heart's ability to beat, specifically to contract and expand. In the process of human movement, the heart delivers a large amount of blood to various systems of the human body, which accelerates the speed of blood circulation and promotes the process of human metabolism. In addition, table tennis also has a great impact on the heart rate, often participate in table tennis can improve the heart. Heart rate (HR) and its different manifestations—such as maximum (HRmax), mean (HRmean), and minimum (HRmin)—are generally studied parameters for forming one of the few direct physiological indices applied during competition without

altering its essence [8]. Those studies that have analyzed HRmean to determine the intensity of table tennis obtained mean values of 135–163 beats·min−1or 136–147 beats·min−1. Moreover, HRmax values have been reported to fall within the ranges of 177–183 beats·min−1 or 159–173 beats·min−1. Therefore, efforts are made in table tennis with wide cardiac variability where submaximum-type efforts predominate, but at a high HR (from 68% to 92% of HRmáx) [9]. As an indirect method, %HRmax is another option to determine the percentage of cardiovascular effort made while playing table tennis.

5. The Body Shape of Table Tennis

Under the influence of China's unique national sports policy, the age for athletes to start training has gradually decreased. In the process of training, the physical function and shape of people, especially children and adolescents, are also constantly changing, among which table tennis training has a relatively large impact on the limbs [10].

5.1. Upper Limbs

Studies have shown that the tension circumference, relaxation circumference and right forearm circumference of athletes who have received systematic table tennis training for 3-4 years are different from those who have not been trained. However, there is little difference between the length of the limbs and the tension circumference of the left upper arm, the relaxation circumference and the circumference of the left forearm. After measurement, it was found that the difference between the length of the upper limbs of the left hand is less than 0.04cm, while the difference between the right hand is about 0.4cm due to long-term practice; the difference between the relaxation and tension of the right arm is also between 0.8-1.2cm, and there is no obvious difference between the left arm [10].

5.2. Lower Limbs

Table tennis sport has high requirements on the ability of the lower limbs, long-term training will have a deep impact on the lower limbs. Therefore, the differences between the legs of non-trained and trainees were compared in the study. There are 20 men and females who have received table tennis training and 20 men and females who have not received table tennis training, totally 80 people. The comparison found that in the group, which is without training, there are only 3% of men and 2% of girls with O-shaped leges. Among the subjects who received training for a long time, the proportion of men’s and women’s O-shaped legs accounted for 50% and 36%, respectively. The comparison shows the certain impact of table tennis on the shape of human lower limbs [11].

Load-intensity training has an impact on the physical function and physical quality of athletes [12]. Therefore, after analyzing the reasons for the changes in the physical function and quality of athletes, reasonable improvement measures should be taken to correct the difference in the thickness of arms, O-shaped legs and other adverse effects.

6. The Psychological Effects of Table Tennis

Table tennis is a competitive and confrontational sport. The psychological quality in this sport occupies an important position. In the process of table tennis, in addition to the high return rate of the ball, it also includes intellectual factors such as the understanding of the opponents' tactical intentions, the grasp of various opportunities and the selection of types of tactics, which requires participants to be calm when facing the danger. They also need have a more agile thinking and a calm mentality, so that when they face honor and disgrace correctly, they can receipt them well and develop the personal mental health at the same time [13].

6.1. Improve Emotion

Research shows that playing table tennis for 1-2 hours a day makes it easier to forget the troubles, anxiety and other bad emotions in work and study. The input and construction of such happy emotions and the release and loss of bad emotions are important means for the formation of people's mental health [14]. Therefore, if a person often relaxes himself through table tennis, he will maintain a good attitude to achieve real health.

6.2. Make People Confident and Enterprising

Table tennis has the characteristics of knowing the results immediately at the end of the game or predicting the results during the game. It does not need to be classified by referees such as figure skating and athletic gymnastics which need to wait for the results in the waiting area. Fast and clear information feedback is easier to stimulate people's enterprising spirit. It is not difficult to maintain the enterprising spirit in victory and success, but it is much more difficult to maintain the enterprising spirit in failure, so the enterprising spirit is more valuable. Table tennis often makes people taste failure and makes failure a normal and natural result. Anyone who fails in the game will think of working harder and making progress next time. In addition, we can also see from the growth experience of many table tennis players (such as Deng Yaping, the champion of table tennis women's singles and doubles at the 1996 Atlanta Olympic Games) that whether you are short or average in intelligence, as long as you are willing to train hard, you will have the opportunity to defeat your opponent with better objective conditions. And find self-esteem and self-confidence [15].

6.3. Cultivate Indomitable Willpower

Table tennis is entertaining and playful, but as a result, it is a competitive sport. There are many rounds in table tennis, and it will last for a long time. Especially when the technical level of both sides of the competition is closer, the more intense the competition is, and the greater the physical exercise of the participants. This requires strong will and patience to help participants overcome and maintain extreme physical fatigue. Only by persevering can the participants achieve the final victory. In the fierce competition, the spirit of the participants is always very focused. Leading the score and lowering the score have been alternating in the middle of the game. The situation in the stadium is complex and changeable, the atmosphere of the game is tense, and the energy consumption of the nervous system is huge. All of these require participants to have good physical strength and good willpower. Don't blindly be pessimistic or lose confidence in victory because of temporary defeat. This will be very important for people to adapt to social life. Therefore, long-term table tennis exercise helps to improve the quality of will and motivate them.

7. Concusion

Table tennis has a good mass base in China. As a popular sport that integrates physical activity and entertainment, it not only has unique sports advantages such as suitable for all ages and wonderful full-body exercise effect, but also has a fixed social value in national fitness activities. It is especially important in strengthening the body, exercising the quality of will, entertainment and making friends. Therefore, table tennis can not only exercise people's thinking and cultivate people's will quality, but also promote people's understanding and communication, thus promoting the harmonious and stable development of the whole society.

National Fitness Policy in China is a huge engineering system. As a national ball, table tennis is not only an important part of national fitness activities, but also an effective activity mode for implementing national fitness plan smoothly. Therefore, in order to better carry out table tennis better, all sectors of society should pay active attention to and support it, so as to make the fitness methods of table tennis more scientific and the fitness effect more comprehensive.

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