# INFLUENCE OF HIGH-INTENSITY INTERVAL TRAINING ON TABLE TENNIS PLAYERS

*INFLUÊNCIA DO TREINAMENTO INTERVALADO DE ALTA INTENSIDADE NOS JOGADORES DE TÊNIS DE MESA*

*INFLUENCIA DEL ENTRENAMIENTO DE INTERVALOS DE ALTA INTENSIDAD EN LOS JUGADORES DE TENIS DE MESA*

**Original Article**
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## ABSTRACT

Introduction: The development of the technical level of table tennis and the reform of the rules require players to have a proportionally comprehensive technical base, aiming to climb to the top of world table tennis. Objective: Study the effect of high-intensity competition on the physical fitness of table tennis players. Methods: By analyzing the questionnaires of coaches and athletes in colleges and universities in Zhejiang province, as well as the development status and situation of soldiers and soldier teams in colleges and universities in Zhejiang province, find out the factors that restrict the competitive level of table tennis in ordinary colleges and universities in our province. Results: Most athletes felt that the specific qualities of agility and strength were important, accounting for 63% of the total, while endurance and speed were less important, accounting for 19% and 18%, respectively. Conclusion: The time devoted to physical training is short, and the disposition of training time is insufficient. Compared to high-level sports teams, the quality of physical preparation and the particular technical training time cannot be combined rationally and satisfactorily. ***Level of evidence II; Therapeutic studies - investigation of treatment outcomes.***

**Keywords**: High-Intensity Interval Training; Physical Fitness; Racquet Sports.

## *RESUMO*

*Introdução: O desenvolvimento do nível técnico do tênis de mesa e a reforma das regras, requerem que os jogadores de tênis de mesa tenham uma base técnica proporcionalmente abrangente, visando escalar o topo do tênis de mesa mundial. Objetivo: Estudar o efeito da competição de alta intensidade sobre a aptidão física dos jogadores de tênis de mesa. Métodos: Ao analisar os questionários de treinadores e atletas nas faculdades e universidades da província de Zhejiang, bem como o estado de desenvolvimento e a situação dos soldados e equipes de soldados nas faculdades e universidades da província de Zhejiang, descobrir os fatores que restringem o nível competitivo do tênis de mesa nas faculdades e universidades comuns de nossa província. Resultados: A maioria dos atletas sentiu que as qualidades específicas de agilidade e força eram importantes, representando 63% do total, enquanto a resistência e a velocidade eram menos importantes, representando 19% e 18% respectivamente. Conclusão: O tempo dedicado ao treinamento físico é breve, e a disposição do tempo de treinamento é insuficiente. Em comparação com as equipes esportivas de alto nível, a qualidade da preparação física e o tempo de treinamento técnico particular não podem ser combinados de forma racional e satisfatória.* ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

***Descritores:*** *Treinamento em Intervalo de Alta Intensidade; Aptidão Física; Esportes com Raquete.*

## *RESUMEN*

*Introducción: El desarrollo del nivel técnico del tenis de mesa y la reforma de las reglas, requieren que los jugadores de tenis de mesa tengan una base técnica proporcionalmente amplia, con el objetivo de subir a la cima del tenis de mesa mundial. Objetivo: Estudiar el efecto de la competición de alta intensidad sobre la aptitud física de los jugadores de tenis de mesa. Métodos: Mediante el análisis de los cuestionarios de los entrenadores y atletas de los colegios y universidades de la provincia de Zhejiang, así como del estado de desarrollo y la situación de los equipos de soldados y soldados de los colegios y universidades de la provincia de Zhejiang, averiguar los factores que restringen el nivel competitivo del tenis de mesa en los colegios y universidades ordinarios de nuestra provincia. Resultados: La mayoría de los atletas consideraron que las cualidades específicas de agilidad y fuerza eran importantes, con un 63% del total, mientras que la resistencia y la velocidad eran menos importantes, con un 19% y un 18% respectivamente. Conclusión: El tiempo dedicado al entrenamiento físico es breve, y la disposición del tiempo de entrenamiento es insuficiente. En comparación con los equipos deportivos de alto nivel, la calidad de la preparación física y el tiempo de entrenamiento técnico particular no pueden combinarse de forma racional y satisfactoria.* ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

***Descriptores:*** *Entrenamiento de Intervalos de Alta Intensidad; Aptitud Física; Deportes de Raqueta.*



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## INTRODUCTION

Table tennis is the national ball of our country, and it is a popular sport among the people with a high degree of popularity. With the development of sports in our country, table tennis, which is deeply loved by college students, has also grown and popularized rapidly, the vast majority of colleges and universities in our country have table tennis classes as an optional physical education class for students, and it is very popular among students.[1] With the development of the Universiade, the competitive sports in colleges and universities have become more and more developed, colleges and universities attach great importance to the Universiade and the University Student Championships, and have organized sports teams to prepare for the competition, this further promotes the improvement and development of the level of table tennis competition in colleges and universities. With the continuous improvement of the level of competition, if a sports team or athlete wants to achieve excellent results, it must not only have a strong technical level, but also have good physical fitness and special physical fitness. Athlete's physical fitness and special quality ability, they also determines the athlete's technical and tactical performance and use.[2]

Today's world table tennis has developed to a higher stage: Speed, spin, power, and change are tightly integrated, and athletes must learn to perform under increasingly fast and intense confrontation and changing conditions, skilled and accurate use of techniques and tactics. In the world's major competitions, if athletes want to achieve good results, they must be under the premise of heavy physical, mental and psychological burdens, after more than ten consecutive days of competition, due to the poor physical training level, the speed and power of the ball are reduced in the later stage of the game, and there are countless examples of losing the game. Therefore, an excellent athlete must have comprehensive technical and tactical abilities as well as good physical and psychological qualities.[3]

## METHOD

### Research object

By analyzing the questionnaires of coaches and athletes from 12 colleges and universities in Zhejiang Province, as well as the development status and situation of the table tennis teams in Zhejiang Province, the factors that restrict the level of table tennis competition in ordinary colleges and universities in our province are found.[4] Look at the training of physical fitness and special physical fitness, whether it is the main factor restricting the level of table tennis competition in colleges and universities in our province, through to 12 colleges and universities, analysis of the training situation of schools with better and backward competitive levels, whether there is a gap in the physical quality of the athletes of the backward school with the physical quality of the athletes of the better school, or on the whole, there is a big gap between the physical quality of college sports teams and professional sports teams.

### Experimental method

Determination of test indicators and methods: 1) Taking part of the 44th World Table Tennis Championships as the object, the exercise volume of the athletes of both sides in a tense table tennis match and the average daily exercise load of the athletes on the competition day were measured; 2) From the literature, collect as much as possible the indicators and methods of physical testing of table tennis players;[5] 3) Invite relevant experts to use the Delphi method to determine the test indicator system from the pre-selected indicators; 4) Test the physical fitness level of Chinese active table tennis players in 1997 with the selected indicators; 5) Use the method of factor analysis to screen the indicators, then use the method of multiple regression analysis to establish an effective regression model, and determine the test content and evaluation method; 6) It was used in the 1998-2002 Chinese elite athletes' competition, and it was continuously revised according to the problems in the competition and the athletes' performance. Assurance of test data quality: 1) All tests are managed by the Chinese Table Tennis Association, and unified tests are conducted by doctoral and master students of Beijing Sports University, which ensures the accuracy and reliability of the test data; 2) The SPSS software package is used, and statistical processing is carried out by the Statistical Measurement Teaching and Research Office of Beijing Sports University, which ensures the accuracy of the data processing results.[6]

There is no need for a code of ethics for this type of study.

## RESULTS

Experts in relevant fields are invited to select from the pre-selected indicators, the test index system determined by the Delphi method is: Side slide, 3,000-meter run, double-headed, standing long jump, pull-up, 60-meter run.[7] For test the physical fitness of 831 Chinese table tennis players in active service in 1997, use their physical fitness scores as raw data. After normalizing the raw data, the correlation matrix R is calculated. Orthogonal rotation axis is carried out by principal component analysis method and maximum variation method, the rotated factor loading matrix is obtained. (Table 1)

The number of factors with an eigenvalue greater than 1 is taken as the number of common factors. Calculate the eigenvalue and variance contribution rate of each factor, divide the variance contribution rate of each factor by the cumulative contribution rate of each module, and obtain the weight of each factor. (Table 2 and 3)

As can be seen from Figure 1, the number of times of physical fitness training in Zhejiang colleges and universities is relatively small, at most three times, and most of them are one or two times. Among the 12 colleges and universities in Zhejiang, 67% only practice physical fitness training 1-2 times a week, 25% practice 2-3 times a week, and only 8% practice more than three times.In fact, only one of the 12 colleges and

**Table 1.** List of factor loading matrices of Chinese table tennis players' physical fitness index after rotation.

| | Man | | | Woman | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 1 | 2 | 3 |
| 3000m | 0.903 | | | 0.871 | 0.131 | |
| 60m | 0.216 | -0.833 | | 0.256 | -0.795 | |
| pull up | | 0.895 | | -0.163 | 0.796 | 0.224 |
| Standing long jump | | 0.689 | 0.414 | | 0.714 | 0.231 |
| from both ends | | 0.627 | 0.350 | | 0.589 | 0.462 |
| side slide | | | 0.922 | | | 0.909 |

**Table 2.** List of physical fitness index evaluation systems for male table tennis players in my country.

| Factor | Typical indicators | Eigenvalues | variance contribution rate | Cumulative contribution rate | Weights |
|---|---|---|---|---|---|
| 1 | side slide | 3.325 | 41.521 | 41.512 | 0.491 |
| 2 | pull up | 2.125 | 20.05 | 61.562 | 0.237 |
| 3 | 3000m | 2.403 | 23.03 | 84.592 | 0.272 |

**Table 3.** List of physical fitness index evaluation system for Chinese female table tennis players.

| Factor | Typical indicators | Eigenvalues | variance contribution rate | Cumulative contribution rate | Weights |
|---|---|---|---|---|---|
| 1 | side slide | 3.502 | 43.013 | 43.013 | 0.504 |
| 2 | pull up | 2.012 | 19.55 | 62.523 | 0.229 |
| 3 | 3000m | 2.389 | 22.83 | 85.393 | 0.267 |

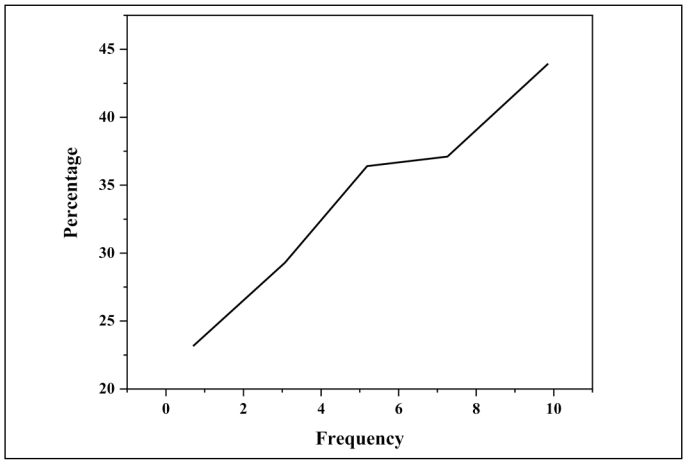


**Figure 1.** Distribution of weekly training times for table tennis teams.

universities has physical fitness training after each technical training session, other colleges and universities also add some special physical fitness training to technical training sessions, mostly once or twice a week.[8] In fact, the special physical training of table tennis is very important in the provincial and national teams, thousands of years ago, the Chinese table tennis team led by Cai Zhenhua hired a physical fitness coach. The knowledge of training has a deeper understanding, several coaches of the national track and field team have been invited as physical fitness coaches, when preparing for the Olympic Games in 2007, senior coaches from the American Physical Fitness Association were also invited to guide the physical training of the national team. The special physical training of the national team begins in the daily warm-up training, and the preparation activities begin, which means that the athletes of the national team have special physical fitness training every day.[9]

## DISCUSSION

Strength is the core and foundation of physical fitness training, therefore, strength training is the main training content of physical fitness training. Our current training focuses on training the upper and lower body muscle groups. The training of lower body strength is mainly to improve the speed of initiation and movement, while the strength of upper body and core is mainly to strengthen the balance ability of athletes, and increase the speed and power of hitting the ball.[10]

Core strength training (Core Training) mainly emphasizes the strength exercises of the waist and abdomen. "Core" usually refers to what we call the trunk, including the spine and pelvis and the muscles surrounding it. Waist and abdominal strength is the most core part of human strength, and it is the key to connecting the strength of the upper and lower limbs. Core strength training, focusing on using your own weight, on various inclinations that form unbalanced, complete various strength exercises, and you can even stand on a skateboard to do barbells and dumbbells. Balance training is of great significance to table tennis, the shift in the center of gravity we are talking about is actually seeking balance, balance between left and right, and balance between front and rear. The core strength of table tennis players can be effectively improved by using barbells, dumbbell high cleans, medicine ball combination exercises, and bare-handed lifts and back lifts.

By interspersing special exercises with maximum strength exercises and light loads in a small training cycle, the elastic strength of the lower limbs of table tennis players can be effectively improved.[11]

## CONCLUSION

The evaluation method determined by the author's research is a set of relatively intuitive, simple, practical, accurate and scientific comprehensive evaluation methods, which can understand the physical fitness of athletes, organize training classes for coaches, strengthen coaches' attention to special physical fitness training, and improve coaches' awareness of special physical fitness training. Organize visits to study professional team training, and understand the current focus and direction of my country's high-level sports teams in terms of special physical fitness. Examining the training effect provides an objective basis for the formulation of the training plan, the effective control of the training process and the selection of athletes.

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