

# INFLUENCE OF ABDOMINAL CORE TRAINING ON STABILITY CONTROL IN TABLE TENNIS PLAYERS

INFLUÊNCIA DO TREINO DO CORE ABDOMINAL SOBRE O CONTROLE DA ESTABILIDADE NOS JOGADORES DE TÊNIS DE MESA

INFLUENCIA DEL ENTRENAMIENTO DEL CORE ABDOMINAL EN EL CONTROL DE LA ESTABILIDAD EN JUGADORES DE TENIS DE MESA



ORIGINAL ARTICLE  
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## ABSTRACT

**Introduction:** In recent years, there have been a number of reforms in table tennis, trends in technology development, and demands on the part of athletes to improve their competitive ability and prevent injuries. **Objective:** Evaluate the effect of abdominal core strength training on ball control stability in table tennis players. **Methods:** By random sampling and grouping method, the national top-level table tennis players were divided into an experimental group and a control group (17 boys in each group and seven girls in each group); the experiment lasted for one week, during which the athletes in the experimental group performed abdominal core strength training, while the athletes in the control group performed regular training. **Results:** There was no significant difference in the longitudinal comparison of the control group before and after the experiment ( $P>0.05$ ), and there was a very significant difference in the horizontal comparison between the two groups after the experiment ( $P<0.01$ ). **Conclusion:** Abdominal core strength training has a positive effect on improving the technical stability of table tennis players. Core strength can improve the athlete's attack speed and recovery.

**Level of evidence II; Therapeutic studies - investigation of treatment outcomes.**

**Keywords:** Abdominal Core; Resistance Training; Racquet Sports.

## RESUMO

**Introdução:** Nos últimos anos, houveram uma série de reformas no tênis de mesa, tendências no desenvolvimento da tecnologia e exigências por parte dos atletas para melhorar sua capacidade competitiva bem como prevenir lesões. **Objetivo:** Avaliar o efeito do treinamento de força do core abdominal na estabilidade do controle da bola em jogadores de tênis de mesa. **Métodos:** Pelo método de amostragem e agrupamento aleatório, os jogadores de tênis de mesa de primeiro nível nacional foram divididos em grupo experimental e grupo controle (17 meninos em cada grupo e 7 meninas em cada grupo), o experimento durou uma semana, durante a qual os atletas do grupo experimental realizaram o treinamento de força do core abdominal, enquanto os atletas do grupo controle realizaram o treinamento normal. **Resultados:** Não houve diferença significativa na comparação longitudinal do grupo controle antes e depois do experimento ( $P>0,05$ ), e houve uma diferença muito significativa na comparação horizontal entre os dois grupos após o experimento ( $P<0,01$ ). **Conclusão:** O treinamento de força do core abdominal tem um efeito positivo na melhoria da estabilidade técnica dos jogadores de tênis de mesa. A força do core pode melhorar a velocidade de ataque do atleta e da sua recuperação. **Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.**

**Descritores:** Centro Abdominal; Treinamento de força; Esportes com Raquete.

## RESUMEN

**Introducción:** En los últimos años, se han producido una serie de reformas en el tenis de mesa, tendencias en el desarrollo de la tecnología y demandas de los atletas para mejorar su capacidad competitiva, así como para prevenir lesiones. **Objetivo:** Evaluar el efecto del entrenamiento de la fuerza del core abdominal en la estabilidad del control de la pelota en jugadores de tenis de mesa. **Métodos:** Mediante el método de muestreo aleatorio y agrupación, los jugadores de tenis de mesa de alto nivel nacional se dividieron en grupo experimental y grupo de control (17 chicos en cada grupo y 7 chicas en cada grupo), el experimento duró una semana, durante la cual los atletas del grupo experimental realizaron un entrenamiento de fuerza del core abdominal, mientras que los atletas del grupo de control realizaron un entrenamiento normal. **Resultados:** No hubo diferencias significativas en la comparación longitudinal del grupo de control antes y después del experimento ( $P>0,05$ ), y hubo una diferencia muy significativa en la comparación horizontal entre los dos grupos después del experimento ( $P<0,01$ ). **Conclusión:** El entrenamiento de la fuerza del core tiene un efecto positivo en la mejora de la estabilidad técnica de los jugadores de tenis de mesa. La fuerza del core abdominal puede mejorar la velocidad de ataque y la recuperación del atleta.

**Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.**

**Descriptor:** Núcleo Abdominal; Entrenamiento de fuerza; Deportes de Raqueta.



## INTRODUCTION

As we all know, the sports quality of an athlete refers to the various basic sports abilities shown by the body during activities, usually includes strength, endurance, speed, flexibility and agility, etc.<sup>1</sup> And because all the physical activities of the human body are expressed through the contraction and relaxation of muscles in the final analysis, that is to say, the strength quality in the sports quality is the foundation of sports and the key to training. Of all the sports in the modern Olympic Games, there is no sport that does not require strength qualities, therefore, we can say that without strength there is no movement. In traditional sports training, there is a set of traditional strength training system, including absolute strength training, relative strength training, rapid strength training and strength endurance training.<sup>2</sup> Most of these trainings focus on the limbs, the so-called waist and abdomen strength training is only used as an auxiliary activity for limb strength training, moreover, the traditional waist and abdomen strength is not completely core strength.

The outstanding characteristics of table tennis are fast, complex and changeable, and its competitive ability focuses on tactical ability. Therefore, the table tennis project does not require high absolute strength of athletes.<sup>3</sup> In the complex and changeable confrontation environment, athletes need to make a variety of technical movements. Various muscle groups around the lumbar hip and spine stabilize the center of gravity in complex motion environments. When the strength of the core muscles is sufficient, in complex confrontations, technical stability can be fully guaranteed. Aside from technical factors, maintaining the stability of technical movements in complex confrontations requires strong core strength to support. Good core strength can help stabilize the spine, pelvis, maintain correct body posture, the core area is like a hinge and bridge connecting the upper and lower, the stability of this link not only affects whether the fulcrum of the limbs is firm or not, but also controls the correctness of the whole body movement.<sup>4</sup>

## METHOD

### Research object

The author's research object is the National Table Tennis Training Base of Jinniu District, Chengdu City, Sichuan Province, with a total of 24 athletes, 17 males and 7 females, test the core strength level of all students, three indicators of table tennis in one minute (forehand 2/3 the number of two-point mobile attacks,<sup>5</sup> backhand push combined with sideways forehand attack, backhand rubbing combined with forehand 1/2 the number of downspins) and the number of swivel touches, the 24 athletes were divided into two groups, and there was no significant difference in the above five indicators between the two groups, as shown in Table 1.

### Experimental method

#### Special core training

Rotate in place and back high-five exercises (take the right twist as an example): A group of two, standing back to back, the distance depends on the actual situation of the two, one of them shouts the password, the two turn to the right at the same time, when the left heel reaches the maximum, the left heel can be slightly picked up, after the high-five is completed, the two hands close together after the high-five, hold for 2 seconds and then restore. (Phase 1: 40 reps, 20 reps on each side; Phase 2: 80 reps, 40 reps on each side; The third stage: 120 times, 60 times on

**Table 1.** Description of the basic situation of the research objects.

group	Man	Woman	total	sport class	clap hands
test group	8	4	12	Level 1	right hand
control group	8	4	12	Level 1	right hand

each side) Seated oblique throwing practice (take the ball to the right front as an example): One person sits on the ground, legs slightly apart, feet off the ground, and the upper body bends naturally, the other person is standing 45° in front of his right with a distance of 3 meters.<sup>6</sup>

### General Core Training

Prone Elbow Support: Lie on your stomach, with your legs together, and your elbows bent at a right angle to support your body, make empty fists with both hands parallel to the ground, face down. Pay attention to keeping the body straight, especially the lower back, and avoid bending up or down. (Stage 1: 40 seconds; Stage 2: 80 seconds; Stage 3: 120 seconds) Lateral Elbow Support (take right arm support as an example): Lie on your side, with the inside of your left foot and the outside of your right foot on the ground and your left foot in front of your right foot, bend your right elbow to support your body, make an empty fist with your right hand on the ground, face left, and stretch your left arm at a right angle to your torso.<sup>7</sup> Pay attention to keeping the body straight, especially the lower back, and avoid bending up or down. (Phase 1: 40 seconds; Phase 2: 80 seconds; Phase 3: 120 seconds)

### Data Analysis

Data statistics SPSS 13.0 statistical software was used for data statistical analysis, paired T test and one-way ANOVA were used for statistical analysis, taking  $P < 0.05$  as the significant level, and  $P < 0.01$  as the very significant level.<sup>8</sup>

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

## RESULTS

Table 2 shows that there was no significant difference in the level of core strength (the time of the eight-level abdominal bridge) and the number of rotations between the experimental group and the control group before training ( $P > 0.05$ ).

Table 3 shows that after 9 weeks of core strength training in the experimental group, without any intervention to the athletes in the control group, there was a very significant difference in the grade 8 abdominal bridge performance between the experimental group and the control group ( $P < 0.01$ ), and there was a significant difference in the performance of swivel contact ( $P < 0.05$ ). (horizontal comparison).

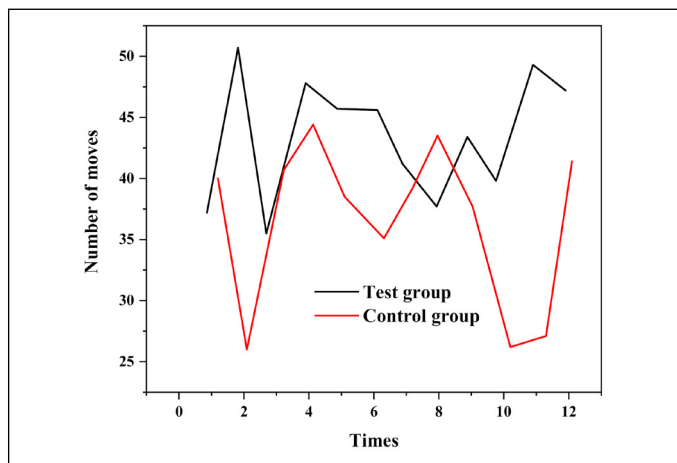
Figure 1 shows the table tennis skills of the players in the experimental group and the control group in one minute (the number of forehand 2/3 two-point moves, the number of backhand pushes combined with sideways forehand,<sup>9</sup> and the backhand rub combined with forehand 1/2). There was no significant difference ( $P > 0.05$ ).

**Table 2.** The difference test analysis between the core strength level of the students in the experimental group and the control group and the pre-test of swivel touch.

	n	test group		control group		t	df	p
		X (Second)	SD	X (Second)	SD			
Eight-level abdominal bridge	12	2.86	0.63	1.86	0.43	4.53	22	0.000
swivel contact	12	1.73	13.58	1.55	22.83	2.39	22	0.026

**Table 3.** Post-test difference test analysis of the eight-level abdominal bridge and swivel touch platform (horizontal comparison) of the athletes in the experimental group and the control group.

	n	test group		control group		t	df	p
		X (Second)	SD	X (Second)	SD			
Eight-level abdominal bridge	12	1.78	0.41	1.82	0.45	-0.25	22	0.817
swivel contact	12	155	12.73	152	20.75	0.524	22	0.599



**Figure 1.** Horizontal comparison of the test results between the experimental group and the control group after the experiment (the number of forehand 2/3 two-point moves).

The above: Before the core strength training, we analyzed the results of the eight-level abdominal bridge, table tennis technique and rotation experiment on all subjects, the 24 subjects were divided into the experimental group and the control group, that is to say, the core strength and table tennis skills of the two groups were all on the same basis, that is, there was no significant difference ( $P > 0.05$ ).

## DISCUSSION

When it comes to the training method of core strength, the first thing to be clear is the difference between core strength training and traditional waist and abdominal strength training. Understanding the difference between the two is also the basis for rationally arranging

core strength training.<sup>10</sup> For the difference between the two, there are many misunderstandings at this stage. Core strength training refers to the training of core muscle groups such as strength, stability and control. The goal of core strength training is to train the strength of the deep stabilizing muscles and increase the stability of the core muscles, efforts are made to integrate the entire body, connect all parts of the body into a whole, enhance the body's ability to control each part, and enable the core muscles to stabilize the center of gravity and transmit power when the athlete performs movements. The traditional waist and abdominal strength training is only the isotonic contraction of the superficial muscles of the waist and abdomen, and lacks sufficient stimulation for the strength of the deep small muscle groups and the ability to balance and stabilize control.<sup>11</sup>

## CONCLUSION

With the continuous development of competitive sports, the importance of scientific training has become more and more obvious, and table tennis is no longer a purely technical contest, the higher and higher confrontation intensity also puts forward higher requirements on the physical fitness of athletes. Athletes can improve their competitive ability more efficiently and maintain a healthy level, which also requires that modern sports training must be more scientific and comprehensive. Core strength is an important part of modern physical training and a very critical physical quality for table tennis players. Practice has proved that, core strength training is of great significance to improving the training efficiency, competitive ability, and injury prevention and rehabilitation of table tennis players.

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All authors declare no potential conflict of interest related to this article

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**AUTHORS' CONTRIBUTIONS:** Each author made significant individual contributions to this manuscript. YM: writing and data analysis, YB: article review and intellectual concept of the article.

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## REFERENCES

- Kumar V. Effect of sling training on core stability and shoulder strength among tennis players. *IJAEMA*. 2020;12(2):1189-92.
- Dahl KS, Tillaar R. The Effect of Eight Weeks of Sling-Based Training with Rotational Core Exercises on Ball Velocity in Female Team Handball Players. *J Hum Kinet*. 2021;77(1):261-72.
- Larissa K, Weber H, Horstmann T. Effects of core stability training on throwing velocity and core strength in female handball players. *J Sports Med Phys Fit*. 2019;59(9):1479-86.
- Cao Z, Xiao Y, Lu M, Ren X, Zhang P. The Impact of Eye-closed and Weighted Multi-ball Training on the Improvement of the Stroke Effect of Adolescent Table Tennis Players. *J Sports Sci Med*. 2020;19(1):43-51.
- Wang Y, Wang C, He W, Meng Z, Yan S, Li Y, et al. The effect of charged defects on the stability of implanted helium and yttrium in cubic ZrO<sub>2</sub>: a first-principles study. *Phys Chem*. 2021;23(45):25727-35.
- Kang MS, Hong YP, Kim SJ, Park SY, Lee DT. The Effect of Core Training on Development and Stability of Lower Extremity Muscle Strength in Female Soccer Players. *Journal of the Korean society for Wellness*. 2020;15(3):431-43.
- Shamsoddini A, Morovati Z, Farhadian M. The Effect of Core Stability and TheraBand Strength Training Exercises on Cardiovascular Risk Factors and Cardio-Respiratory Fitness in Elderly. *Journal of Isfahan Medical School*. 2019;36(501):1288-96.
- Genc H, Cigerici AE, Sever O. Effect of 8-week core training exercises on physical and physiological parameters of female handball players. *Phys Ed Students*. 2019;23(6):297-305.
- Samson A, Night D, Subramani A. Effect of Core Training on Abdominal Strength and Back Strength among Volleyball Players. *InfoKara*. 2020;9(9):134-7.
- Fatahi F, Ghasemi GA, Karimi M, Beyranvand R. The effect of eight weeks of core stability training on the lower extremity joints moment during single-leg drop landing article. *Balt. J Health Phys Act*. 2019;11(1):34-44.
- Hu ZQ, Li ZH. The effects of 12 week core strength training on balance control ability and physical function of basketball college students. *Zhongguo yingyong shenglixue zazhi = Chinese journal of applied physiology*. 2019;35(6):510-2.