ANALYSIS OF THE WARM-UP TO IMPROVE PHYSICAL CONDITIONING OF TABLE TENNIS PLAYERS

ANÁLISE DO AQUECIMENTO PARA MELHORAR O CONDICIONAMENTO FÍSICO DOS TENISTAS DE MESA

ANÁLISIS DEL CALENTAMIENTO PARA MEJORAR LA CONDICIÓN FÍSICA DE LOS JUGADORES DE TENIS DE MESA

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Yihao Meng[1]
(Physical Education Professional)
Seung-Soo Beak[1]
(Physical Education Professional)

1. Sangmyung University, Seoul, Korea.

Correspondence:
Seung-Soo Beak
Seoul, Korea. 03016.
bai20083@126.com.

ABSTRACT

Introduction: The development of table tennis and its rule changes increased the importance of physical training with the decline of ball speed and rotation, highlighting the importance of strong quality in the game. Objective: To study the effect of the muscular warm-up phase on improving physical conditioning in table tennis players. Methods: We randomly selected 20 high school table tennis players aged between 14 and 16 years as experimental objects through the analysis of pre-test data, combined with the characteristics of the group, where a physical training plan was generated. Results: After 12 weeks of training, the measured values were analyzed and compared, and it was found that this program can effectively improve the functional movement level of male table tennis players in high school students; the total test score was significantly improved (P<0.01), and the rate of increase was 22%. Conclusion: Muscle warm-up prior to physical training is important in improving athletic ability, enhancing athletic performance, and preventing sports injuries. ***Level of evidence II; Therapeutic studies - investigation of treatment outcomes.***

Keywords: Racquet Sports; Warm-Up Exercise; Physical Conditioning, Human.

RESUMO

Introdução: O desenvolvimento do tênis de mesa e suas mudanças de regras aumentaram a importância do treinamento físico com o declínio da velocidade e rotação da bola, destacando-se a importância da qualidade da força no jogo. Objetivo: Estudar o efeito da fase de aquecimento muscular na melhoria do condicionamento físico nos tenistas de mesa. Métodos: Selecionou-se aleatoriamente como voluntários 20 mesatenistas do ensino médio com idades entre 14 e 16 anos como objetos experimentais, através da análise dos dados pré-teste, combinados com as características do grupo, onde foi gerado um plano de treinamento físico. Resultados: Após 12 semanas de treinamento, os valores medidos foram analisados e comparados, e verificou-se que este programa pode melhorar efetivamente o nível de movimento funcional dos tenistas de mesa masculinos em estudantes do ensino médio, a pontuação total do teste foi significativamente melhorada (P<0,01), e a taxa de aumento foi de 22%. Conclusão: O aquecimento muscular prévio ao treinamento físico é um fator importante para melhorar a capacidade atlética, melhorar o desempenho atlético e evitar lesões esportivas. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

Descritores: *Esportes com Raquete; Exercício de Aquecimento; Condicionamento Físico Humano.*

RESUMEN

Introducción: El desarrollo del tenis de mesa y sus cambios de reglas aumentaron la importancia del entrenamiento físico con la disminución de la velocidad y la rotación de la pelota, destacando la importancia de la calidad de la fuerza en el juego. Objetivo: Estudiar el efecto de la fase de calentamiento muscular en la mejora de la condición física de los jugadores de tenis de mesa. Métodos: Seleccionamos aleatoriamente como voluntarios a 20 jugadores de tenis de mesa de secundaria con edades comprendidas entre los 14 y los 16 años como objetos experimentales, a través del análisis de los datos del pre-test, combinados con las características del grupo, donde se generó un plan de entrenamiento físico. Resultados: Después de 12 semanas de entrenamiento, se analizaron y compararon los valores medidos, y se descubrió que este programa puede mejorar eficazmente el nivel de movimiento funcional de los jugadores de tenis de mesa masculinos en estudiantes de secundaria, la puntuación total de la prueba mejoró significativamente (P<0,01), y la tasa de aumento fue del 22%. Conclusión: El calentamiento muscular previo al entrenamiento físico es un factor importante para mejorar la capacidad atlética, aumentar el rendimiento deportivo y prevenir las lesiones deportivas. ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

Descriptores: *Deportes de Raqueta; Ejercicio de Calentamiento; Acondicionamiento Físico Humano.*

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INTRODUCTION

Table tennis is a competitive sport against nets, and high-intensity sports are carried out in a relatively small space, has a fast moving speed, many technical and tactical changes, etc, with the change of the rules of table tennis and the improvement of the technical level, it is required that the athletes must have a relatively comprehensive physical quality as the basis, after using the 40mm large ball, return ball speed dropped by 13% and spin dropped by 21%, with the large ball limiting spin and speed, highlighting the role of power in the game. This change of rules and balls makes the confrontation of the table tennis game more intense, towards faster speed and more changes, the direction of the action structure is more complex, athletes are required to complete high-quality shots in fast movement, which puts forward higher requirements for athletes' physical fitness.[1,2] In multi-joint and multi-dimensional sports, how to integrate the movements of various joints and muscles on different planes to form an efficient dynamic chain, thereby improving the quality of hitting, is a common concern of this project.

Special physical training occupies an extremely important position in the overall training stage of athletes, it can not only effectively improve the special quality and ability of athletes, but also improve the special awareness of athletes, so as to lay a good foundation for its future sports development path.[3] For young table tennis players, special awareness and special training are of great significance, it can enable young table tennis players to accurately judge the opponent's next move in actual combat training or actual competition, and it can work out corresponding solutions based on the actual situation of the opponent, which provides more important help for young table tennis players in the process of actual combat training or competition. Therefore, it is necessary to formulate more effective special physical training methods for young table tennis players, so as to ensure the future sports career of young table tennis players.[4]

METHOD

Research object

The experimental subjects were 20 male table tennis players aged 14 to 16 in the table tennis team. The basic information of the experimental subjects is shown in Table 1.

Experimental method

The author analyzed various frontal data of 20 middle school male table tennis players aged 14-16 years old, combined with expert interviews, develop a trunk support strength training program that meets the characteristics of the group, and conduct a 1-week pre-experiment, targeted adjustment of the experimental program and training methods, through 40-50 minutes of training each time, 3 times a week, for a period of 12 weeks,[5] the data changes before and after the experiment were compared and analyzed, and the effect of trunk support strength training on the training effect of middle school students' male table tennis players in unit time was discussed.

The test content is divided into two test units and is divided into two days, the first unit is a functional movement screening test, which is scored by a physical coach, no warm-up activities are performed before the test.[6] The second unit is the physical fitness and special technical test. Before the test, the physical fitness coach will lead to complete the warm-up activities (8-10 minutes), the test sequence is as follows: The middle stage forehand pulls the ball, moves to touch the stage, and throws the solid ball from the side.

Table 1. Basic information of experimental subjects (N=20).

number of people	age	height (cm)	weight (kg)	training years
20	15.50±0.51	175.15±2.62	67.55±6.27	8.70±0.92

Data Analysis

SPSS 17.0 software was used for statistical analysis of experimental data, and paired-sample T test was used to compare the data before and after the experiment, the results were described by the mean±standard deviation (Means±SD), and $P<0.05$ was considered significant difference.[7]

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

RESULTS

Subject bent elbows 90" on the ground and shoulder-width apart, the palms are down, the toes of both feet are on the ground, the legs are straight and shoulder-width apart, the shoulders, knees, and knees are on a horizontal plane, and the body is parallel to the ground, when the subject cannot complete the action as required, the test is terminated, calculated according to the previous grade.[8] The scoring criteria are shown in Table 2.

The subjects flexed their elbows 90° with one elbow on the ground, palms down, keep your legs straight and one foot on the ground, shoulders, hips, knees, and ankles are kept in line, and the body is perpendicular to the ground, when the subject fails to complete the action requirements,[9] the test is terminated and the score of the previous level is calculated. The scoring criteria are shown in Table 3.

As can be seen from the test results in Figure 1, among the 20 middle school table tennis players who were tested, 12 had a total score of less than 14, and the lowest score for rotational stability was 1.65, followed by trunk stability push-ups, both squat and shoulder mobility scored 1.8. In the rotational stability test, the main test is in the process of the linkage between the upper and lower limbs, stability of the body core, shoulder girdle and pelvis in multiple planes, 42. A lower score on this test suggests less stability in the subject's core and torso, hip and shoulder mobility is limited. The trunk stability push-up mainly tests the human body in closed-chain movement, the ability of the human body to stabilize the spine in the sagittal plane when the upper body is supported symmetrically, reflecting the stability of the core body, lower scores on this item test suggest: 1. Poor stability of the core of the body. 2. The

Table 2. Eight-level down bridge test standard.

grade	Test time (seconds)	Require	Score
Level 1	30	feet and hands	1
secondary	15	Left arm raised, three-point support	3
Level 3	15	Right arm raised, three-point support	5
Level 4	15	Left leg raised, three-point support	6
Level 5	15	Right leg raised, three-point support	10
Level 6	15	Left arm, right leg raised, two-point support	15
Level 7	15	Right arm, left leg raised, two-point support	25
eighth grade	30	feet and hands	35

Table 3. Test standards for five-level side bridges.

grade	Test time (seconds)	Require	Score
Level 1	30	feet together	1
secondary	15	straight leg raise	3
Level 3	15	Straight Leg Swing	5
Level 4	15	straight back swing	6
Level 5	30	legs together	10

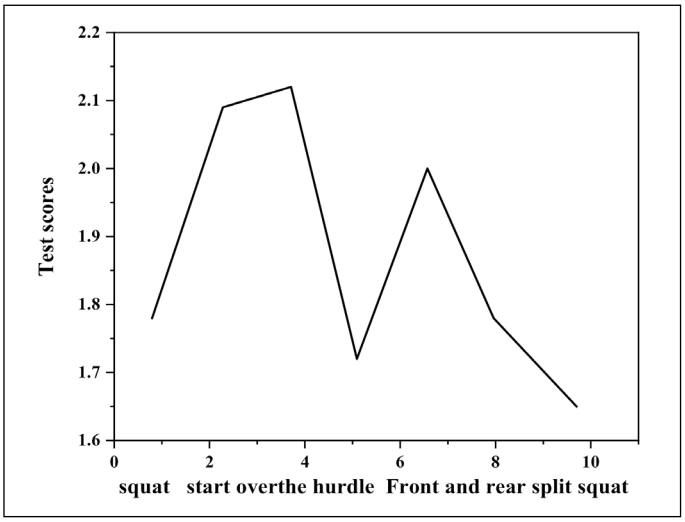

Figure 1. FMS test scores.

stability of the scapula is weak and the strength of the upper body is weak. 3. The mobility of the hip and thoracic spine is limited. The range of motion of both shoulders can be observed through the shoulder flexibility extension test, which suggests: Flexibility and stability of the scapulothorax due to imbalanced muscle development, flexibility of the glenohumeral joint is limited.[10]

DISCUSSION

Strength is the foundation and core of physical fitness, so strength training is the core of physical training and the foundation of sports. Develop the special strength quality of the upper limbs, and can perform various freehand (specified number of exercises or time) swing movements; Hold an iron racket (about 0.5kg) for various swing exercises; Hold light dumbbells for various swing exercises; Use the clapping hand to practice long throws; Practice smashing and smashing long shots. Develop the special strength quality of the lower limbs, you can use the weight-bearing half squat and then the jumping exercise; The weight-bearing half squat and side slide exercise; Weight-bearing cross-step movement exercises; Weight-bearing single and double foot jump exercises; Sand-bearing vests or sand-bound leggings for various footwork movement exercises. Zhongke adopts 800m, 1500m, 3000m; 10min cross-country running (to calculate distance); 50m variable speed running (8-10 times); 1-30min combined technique of hand footwork practice; Practice such as pushing left and right attacking, pushing and blocking sideways, attacking corners after attacking, cutting long and short balls with forehand and backhand; 200-300 consecutive smashing exercises while moving; Do 1-3min various footwork movement exercises between the lines at both ends of the table; Carry out 3-5min various rope skipping exercises; Use an iron racket to perform single or combined batting exercises.[11]

Special speed training method Speed is the key to physical training, and the five elements in table tennis: Among the speed, strength, arc, landing point, and rotation, only the speed is the most likely to exceed the physiological limit (reaction) of the human body and is the most difficult to adapt. Physical training should emphasize movement speed, there should be special high-speed strength training, which not only emphasizes the starting speed and acceleration during strength training, it also emphasizes the acceleration when stopping and the acceleration when changing direction. At present, a very good evaluation method has been formed, which is very practical.

CONCLUSION

In summary, because table tennis has high requirements for table tennis players, special training and special awareness also play an important role for table tennis players, therefore, it is necessary to develop special awareness and special training for table tennis players. Physical training is an important factor to improve athletic ability, improve athletic performance, and avoid sports injuries. Grasping the rules of physical fitness training in table tennis, making preparations for training, and carrying out systematic physical training according to the characteristics of each athlete is an important guarantee for winning the game.

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REFERENCES

1. Hagstrom AD, Marshall PW, Halaki M, Hackett DA. The Effect of Resistance Training in Women on Dynamic Strength and Muscular Hypertrophy: A Systematic Review with Meta-analysis. Sports Med. 2019;50(6):1075-93.
2. Chance S, Cividini-Motta C, Livingston C. Assessing the Effects of Observational Conditioning and Response-Contingent Pairing on the Vocalizations of Children with Autism Spectrum Disorder. TAVB. 2021;37(2):194-216.
3. Coso JD, Madruga M, Hernández-Davó JL, Moreno-Pérez D, Romero-Rodriguez D, Madruga-Parera M, et al. Acute effects of dynamic versus foam rolling warm-up strategies on physical performance in elite tennis players. Biol Sport. 2021;38(4):595-601.
4. Hsu FY, Tsai KL, Lee CL, Chang WD, Chang NJ. Effects of Dynamic Stretching Combined with Static Stretching, Foam Rolling, or Vibration Rolling as a Warm-Up Exercise on Athletic Performance in Elite Table Tennis Players. J Sport Rehabil. 2020;30(2):1-8.
5. Huang Z, Chen Q, Zhang L, Hu X. Research on Intelligent Monitoring and Analysis of Physical Fitness Based on the Internet of Things. IEEE Access. 2019;7(99):1.
6. Kyranoudis AE, Ispyrlidis I, Chatzinikolaou A, Gargalianos D, Michailidis Y, Papadopoulou SD, et al. Effect of the pre-warm-up exercise program on muscle performance. J Phys Educ Sport. 2021;21(1):396-405.
7. Silva-Capella V, González-García RJ, Campos CP. Effects of physical warm-up on the attention of adolescent students. J Phys Educ Sport. 2021;21(1):406-15.
8. Elkeky A, Esmail M, Alkhaldy F. The Effect of Using Cross Training on Improving Some of the Physical abilities of Basketball players and its Relationship to the Biochemical Variables. Int J Appl Sports Sci. 2020;10(1):120-33.
9. Tekin G, Mutu ZE. The Effect of Research-Inquiry Based Activities on the Academic Achievement, Attitudes, and Scientific Process Skills of Students in the Seventh Year Science Course. EUER. 2021;4(1):109-31.
10. Ye M, Wang L, Xiong J, Zheng G. The effect of mind–body exercise on memory in older adults: a systematic review and meta-analysis. Aging Clin Exp Res. 2021;33(5):1163-73.
11. Gatbonton R, Galang-Gatbonton GR. Systematic review on the effects of mobile teaching applications in improving students physics performance. Int J Curr Res. 2020;12(1):9757-61.