

EFFECTS OF CORE RESISTANCE TRAINING ON PUGILISM IN BOXERS



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EFEITOS DO TREINAMENTO DE FORÇA DO CENTRO ABDOMINAL SOBRE O PUGILISMO EM BOXEADORES

EFFECTOS DEL ENTRENAMIENTO DE FUERZA DEL CENTRO ABDOMINAL SOBRE EL PUGILISMO EN BOXEADORES

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ABSTRACT

Introduction: Resistance training aims to improve the physical fitness of an athlete by improving their balance, movement, and agility skills. Boxers should have complementary attention to the strength of the core, a key area for boxing skills. **Objective:** Examine the effects of core strength training on pugilism in boxers. **Methods:** Ten volunteer professional boxers were selected. All undergo three months of core strength training under the described protocol. The athletes' sport quality index was studied using mathematical statistics. **Results:** After 3 months of core strength training, the physical test result was significantly higher ($P < 0.01$). Although in 400-meter runs, sandbag training and interval running scores were higher than before training, the difference was insignificant ($P > 0.05$). **Conclusion:** The core strength exercises improve the body mass of a boxing athlete and the level of their boxing. Supplementing athletes with core resistance training during regular exercise is indicated. **Level of evidence II; Therapeutic studies - investigation of treatment outcomes.**

Keywords: Resistance Training; Abdominal Core; Boxing; Athletes.

RESUMO

Introdução: O treinamento de força visa a melhorar a aptidão física de um atleta melhorando suas habilidades de equilíbrio, movimento e agilidade. Os boxeadores devem ter uma atenção complementar na força do centro abdominal, área fundamental para as habilidades pugilistas. **Objetivo:** Examinar os efeitos do treinamento de força do centro abdominal sobre o pugilismo em boxeadores. **Métodos:** Foram selecionados dez boxeadores profissionais voluntários. Todos passam por três meses de treinamento de força do centro abdominal sob protocolo descrito. O índice de qualidade esportiva dos atletas foi estudado com a utilização de estatísticas matemáticas. **Resultados:** Após 3 meses de treinamento de força do centro abdominal, o resultado de teste físico foi significativamente superior ($P < 0,01$). Embora nos 400 metros de corrida, treinamento com saco de areia e pontuação de corrida em intervalos fossem mais altos do que aqueles antes do treinamento, a diferença não foi significativa ($P > 0,05$). **Conclusão:** Exercícios de força do centro abdominal melhoram a massa corporal de um atleta do boxe e o nível de seu pugilismo. É indicado aos atletas um complemento com fortalecimento do centro abdominal durante o exercício regular. **Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.**

Descritores: Treinamento de Força; Centro Abdominal; Boxe; Atletas.

RESUMEN

Introducción: El entrenamiento de fuerza tiene como objetivo mejorar la condición física de un deportista mediante la mejora de sus habilidades de equilibrio, movimiento y agilidad. Los boxeadores deben prestar una atención complementaria a la fuerza del núcleo abdominal, una zona fundamental para las habilidades pugilísticas. **Objetivo:** Examinar los efectos del entrenamiento de la fuerza del núcleo abdominal en el pugilismo de los boxeadores. **Métodos:** Se seleccionaron diez boxeadores profesionales voluntarios. Todos se someten a tres meses de entrenamiento de fuerza en el centro abdominal según el protocolo descrito. El índice de calidad deportiva de los atletas se estudió mediante estadísticas matemáticas. **Resultados:** Después de 3 meses de entrenamiento de fuerza en el núcleo abdominal, el resultado de la prueba física fue significativamente mayor ($P < 0,01$). Aunque en la carrera de 400 metros, el entrenamiento con saco de arena y la puntuación de la carrera a intervalos fueron superiores a los de antes del entrenamiento, la diferencia no fue significativa ($P > 0,05$). **Conclusión:** Los ejercicios de fuerza del núcleo abdominal mejoran la masa corporal de un atleta de boxeo y el nivel de su boxeo. Para los deportistas está indicado un complemento con el entrenamiento de fuerza del núcleo abdominal durante el ejercicio regular. **Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.**

Descriptorios: Entrenamiento de Fuerza; Núcleo Abdominal; Boxeo; Atletas.



INTRODUCTION

The regulations of boxing competitions around the world are changing. This puts forward higher requirements for the players' physical fitness, physical fitness, and physical fitness. In boxing, core strength is the key to influencing boxing techniques, and it is also the most fundamental technique. The domestic boxing industry has made some remarkable achievements.¹ Athletes still have many problems in the process of achieving specific achievements. The cultivation of core ability is an essential skill to improve boxing techniques. This will help us with boxing and adapting to the new way of playing. The "core" is a coordinated, coordinated, coordinated, coordinated, co-working muscle that attaches to the bones of the neck, spine, pelvis, hip joints, etc. These muscles enable the body to maintain basic posture, stability, and balance when active or at rest. The stability of the core area is very critical. This is where most of the energy for technical movements is generated and transmitted throughout the game. The higher the stability of the core area, the easier it is to support the movement of the limbs and the better the coordination of the body. Core muscles also play a pivotal role in boxing. According to the particularity of men's boxing in our country, this paper formulates the main strength training program for men's boxers.² The core strength training program developed in this article can help athletes improve their physique. The research theory presented in this paper lays the foundation for achieving excellent sports performance.

METHOD

Research objects

This paper takes ten male boxers as experimental subjects. Table 1 lists the basic information of the contestants.

Behavior identification using the data obtained from boxing

This paper analyzes the possibility of static maintenance of a boxer's posture and divides it into offline state and online state.

(1) In the offline state, a static posture maintenance mode T_j is established by the artificial method.

(2) In the real-time state, this paper analyzes the possibility μ_d of the current boxer's static state maintenance. The player's postural static maintenance pattern T_j in this method includes postural duration mean \bar{t}_j , variance λ_j and critical point Q_j .

$$T_j = \{\bar{t}_j, \lambda_j, Q_j\} \quad (1)$$

The possibility μ_d of the duration of the current pose is as follows:

$$\mu_d = \mu(t_j, \bar{t}_j, \lambda_j) = \frac{\sqrt{2}}{2\lambda_j} e^{-\frac{1}{2\lambda_j}(\frac{t_j - \bar{t}_j}{\lambda_j})^2} \quad (2)$$

In the formula, t_j is the current posture static maintenance time and its calculation method is as follows.

Assuming that the position vector of the i point in the j frame is represented by $F_j^i = [x_j^i, y_j^i, z_j^i]$, then in the j picture, the set vector of all the points of the boxer is represented as $\delta_j = [F_j^1, F_j^2, \dots, F_j^N]$. A set $\{F_j | j \in [1, j_{cur}]\}$. $F_j = [F_j^1, F_j^2, \dots, F_j^N]$ can be obtained from the first frame to the current frame j_j . An action series represents the j picture's boxer pose. The boxer's pose vector recognition group j frames

$y_j = \{F_{l_arm}, F_{r_arm}, F_{l_leg}, F_{r_leg}, F_{torso}\}$ are obtained through the above calculation.

A series of characteristic parameters of the boxer's joint points constituted by the first to current time frame j_{cur} can be obtained. Assume that all video action is still. The boxer's posture must remain stationary for some time, and this index $\theta_{r_ShoulderEHand}$ is described using the angle of the elbow of the right upper extremity as an example [4]. A set of identical windows is set on the timeline between the first and j_{cur} frames. For example, when the window size is 10, the time window corresponding to the first to tenth pictures is the first window, and the variance of the minimum angle of the toggle vector is $\sigma_{1,d} = \sum_{f=1}^{10} \theta_{r_ShoulderEHand}$.

Data Statistical Methods

The test results use the mean \pm standard value. This paper uses the statistical software Excel2010 and SPSS20.0 to make statistics on the measurement results.

ETHICAL COMPLIANCE

Research experiments conducted in this article with animals or humans were approved by the Ethical Committee and responsible authorities of Beijing Sport University, Harbin Sport University, People's Public Security University of China, following all guidelines, regulations, legal, and ethical standards as required for humans or animals.

RESULTS

After 3 months of core strength training, boxers' 1 min medicine ball, 1 min skipping rope, 30s left rotation and 30s right rotation were significantly higher than those before training. Actions such as 10-second sandbag, 20-second start-up target, 1-minute medicine ball, 1-minute double-shake rope skipping, 30-second left turn, and 30-second right turn were all significant ($P < 0.05$, $P < 0.01$). Although the 400m running, 1 point sandbag and 2min \times 4 interval running was higher than those before exercise, the difference was not statistically significant ($P > 0.05$). (Table 2)

Through the comparison with before and after training, it is found that the overall sports quality of Chinese male boxers has been significantly improved. Men's boxers scored less in the 30-second left turn and 30-second right spin in each test item before training. This indicates that a person's pace flexibility and body balance stability are relatively poor. After more than three months of core strength training, the male boxer's various indicators have no significant improvement except the one-minute sandbag performance. The other indicators have significantly improved. This shows that the physical quality training methods and technical means in this period were relatively scientific. We suggest that future training work should strengthen the strength and endurance of male boxers.

Athlete A's overall athleticism development before practice is uneven. The results of fast flat push medicine ball against the wall for 1 min, interval running for 2min \times 4, and double rocking skipping rope for 1 min were relatively low. The athlete's mobility, forward-backward transition, and pace flexibility must be further strengthened.³ After exercise, various physical fitness indicators improved slightly compared with those before training, but there was no significant improvement in the exercise performance of interval running for 2 min \times 4. This suggests that the next step should focus on athletic ability training during exercise.

Athlete B has an uneven development of overall athleticism before practice. The results of fast flat push medicine ball against the wall for 1

Table 1. Subject profiles.

Gender	N	Age	Height (cm)	Weight (kg)	Training years
Male	10	19.61 \pm 3.12	172 \pm 5.51	73.36 \pm 5.46	3.61 \pm 2.61

Table 2. Comparison of Boxer Athletes on Athletic Ability Tests.

Test indicators	Before training	After training
10s sandbag	36.15 ± 2.92	40.72 ± 3.45
20s	126.12 ± 11.86	134.2 ± 13.38
Medicine ball 1min	73.81 ± 8.7	89.98 ± 9.26
400m	97.26 ± 7.49	97.77 ± 7.12
Sandbags 1min	110.57 ± 6.88	115.14 ± 8.08
Interval running 2min×4	2479.67 ± 33.61	2601.63 ± 73.13
Double rocking skipping rope 1min	120.94 ± 11.43	129.63 ± 12.94
30s left rotation	65.73 ± 2.88	71.53 ± 2.76
Rotate right for the 30s	67.41 ± 2.67	73.97 ± 2.76

minute and double rocking skipping rope for 1 minute were relatively low. This shows the lack of athletes' lack of strength and endurance quality, forward and backward transition, and agile pace.⁸ Before and after the training, all other indicators except the two-end starting target for the 20s and the sandbag for 1min have been improved to a certain extent.

DISCUSSION

Aerobic and anaerobic methods provide the energy supply method in boxing. This requires athletes to have high ATP resynthesis. Athletes try to reduce lactic acid in their bodies as much as possible during competition.⁴ This is an important reason for the decrease in the overall exercise level of the body. The explosive muscle contraction of a boxer causes the hit muscle to quickly secrete a large amount of lactic acid, which hinders the synthesis of ATP. This can cause muscle fatigue and affect motor nerve transmission. This results in poor performance of the athlete. If the athlete uses the power of the center of gravity, the force of the blow is transmitted to the limbs from the pull of the leg and the center of the body. The athlete's working muscles are not constantly in a state of intense contraction and explosiveness, which can reduce energy consumption.

The fighting style of the world's top boxers is not purely explosive but more of focusing on the body. In this way, the maximum power can be better exerted to reduce the load on the body and improve the accuracy of the strike. This can improve the continuous attack and control of the court. It can be seen that the best way to improve and develop the level of boxing is to take boxing as the foundation and to be power-oriented. The accuracy of hitting points in boxing is related to the power and effect of the hit and the application of techniques and strategies. The prime mover, agonist, and sub motor muscles can be maximally contracted when the athlete uses violent explosive contractions to complete the strike. The resting muscles are entirely passive in this movement.⁵ This training degrades its mobility and skews its attack position. Boxers use the center's power to strike, which helps to fully engage the muscles of the whole body and ensure the accuracy of the strike. It can improve the initiative and hitting efficiency of the boxer's hitting action.

A boxer's chain attack measures a person's skill level. One punch can be done well in an explosive punch. The combination of left and right punches will change a lot. The athlete's movement involves a significant muscle contraction. This means that it takes a big turn to hit consecutive hits. This is also how many boxers take the transition of the first punch, the adjustment of the second punch, and the force of the third punch to ensure the continuity of the punches.⁶ This significantly reduces the technical level of boxers in the game.

The rules of competitions worldwide have undergone numerous changes from the number of effective punches, the degree of dominance, initiative, techniques and tactics, and violations. In addition to simply calculating the number of effective punches, the other four methods contain many details. Details such as field advantage, offensive and defensive initiative, technical application specifications, precise tactical play, intentional or unintentional violations, etc., are all evaluated in the competition.⁷ Under the new rules, it will be considered a failure even if the number of good punches exceeds the opponent.⁸ Active control of a boxer in a fight is significant. This paper studies the game styles of international and domestic top players and believes that backbone technology can create distance, timing, connection, induction, integration, and overall initiative in the attack, defense, execution of technical and tactical changes, and changes on the spot. This has a perfect effect on improving the active control of boxers in the game. In addition, the transitional stride movements are simplified to form the strike pattern of the front, upper and rear legs. This ensures that players can maintain their balance and use their skills. In addition, this method can make the player maintain the best preparation posture and increase the strike force of the kick. In this way, you can better control the distance and grasp the fighter.

CONCLUSION

After three months of core strength training, the sports quality indexes of male boxers except 400m running, sandbag 1min, and interval running 2min×4 were significantly higher than those before training. The difference was statistically significant ($P < 0.01$). The main strength training methods and techniques developed by this center can better improve the comprehensive competitive ability of Chinese male boxing players. The improvement of each score is not significant, indicating that the core competency training program proposed by the center needs to be better linked to the particular situation.

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