

SPEED RESPONSE AFTER STRENGTH TRAINING IN CHINESE BOXING ATHLETES

RESPOSTA DE VELOCIDADE APÓS TREINAMENTO DE FORÇA EM ATLETAS DE BOXE CHINÊS

RESPUESTA DE VELOCIDAD TRAS EL ENTRENAMIENTO DE FUERZA EN ATLETAS DE BOXEO CHINO



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Yingwei Yang¹ 
(Physical Education Professional)

1. Zhengzhou University, School of Physical Education, Zhengzhou, Henan, China.

Correspondence:

Yingwei Yang
Zhengzhou, Henan, China. 450044.
wsxyang2022@126.com

ABSTRACT

Introduction: Chinese boxing demands the maximum potential from its practitioners. The quality of executions of single or multiple punches depends on adequate strength training, and the quality of speed is a crucial factor for victory in Chinese boxing competitions. **Objective:** Explore the effects of strength training on the speed of punches in Chinese boxing athletes. **Methods:** Eighteen Chinese boxers were selected by random sampling. The competitors perform functional exercises directed at strength training for ten weeks. Several key points of sports aerobics were comprehensively evaluated. Mathematical and statistical methods were applied in processing the data before and after the intervention. **Results:** The speed quality of Chinese boxing practitioners after strength training was statistically beneficial ($P < 0.05$). Only the particular qualities of strength did not show significant differences among the four unique qualities of strength analyzed; there were significant differences among the other three abilities ($P < 0.05$). **Conclusion:** The introduction of functional strength training into the physical training of high-level Chinese boxing athletes can significantly improve the quality of movement speed. Functional strength exercises are a safe and efficient form of exercise. This training protocol provides a good reference to compensate for the shortfall in conventional strength exercises.

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

Keywords: Physical Fitness; Exercise; Reaction Time; Resistance Training.

RESUMO

Introdução: O boxe chinês exige o potencial máximo de seus praticantes. A qualidade das execuções de golpes únicos ou múltiplos dependem de um treinamento de força adequado, sendo a qualidade da velocidade um fator crucial para a vitória nas competições do boxe chinês. **Objetivo:** Explorar os efeitos do treinamento de força sobre a velocidade dos golpes em esportistas do boxe chinês. **Métodos:** Foram selecionados 18 praticantes de boxe chinês por amostragem aleatória. Os competidores realizam exercícios funcionais direcionados ao treinamento de força durante dez semanas. Foram avaliados abrangentemente vários pontos-chave da aeróbica esportiva. Foram aplicados os métodos matemáticos e estatísticos no processamento dos dados antes e após a intervenção. **Resultados:** A qualidade da velocidade dos praticantes de boxe chinês após o treinamento de força foi beneficiada estatisticamente ($P < 0,05$). Somente as qualidades particulares de força não apresentaram diferença significativa entre as quatro qualidades únicas de força analisadas, havendo diferenças significativas entre as outras três habilidades ($P < 0,05$). **Conclusão:** A introdução do treinamento de força funcional no treinamento físico dos atletas de boxe chinês de alto nível pode melhorar significativamente a qualidade de velocidade do movimento. Os exercícios de força funcional são uma forma segura e eficiente de exercício. Este protocolo de treinamento fornece uma boa referência para compensar a carência existente nos exercícios de força convencionais.

Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.

Descritores: Aptidão Física; Exercício Físico; Tempo de Reação; Treinamento de Força.

RESUMEN

Introducción: El boxeo chino exige el máximo potencial de sus practicantes. La calidad de las ejecuciones de golpes simples o múltiples depende de un adecuado entrenamiento de la fuerza, siendo la calidad de la velocidad un factor crucial para la victoria en las competiciones de boxeo chino. **Objetivo:** Explorar los efectos del entrenamiento de fuerza sobre la velocidad de los golpes en atletas de boxeo chino. **Métodos:** Se seleccionaron 18 practicantes de boxeo chino por muestreo aleatorio. Los competidores realizan ejercicios funcionales dirigidos al entrenamiento de la fuerza durante diez semanas. Se evaluaron exhaustivamente varios puntos clave del aeróbico deportivo. Se aplicaron métodos matemáticos y estadísticos para procesar los datos antes y después de la intervención. **Resultados:** La calidad de la velocidad de los practicantes de boxeo chino tras el entrenamiento de fuerza se vio beneficiada estadísticamente ($P < 0,05$). Sólo las cualidades particulares de la fuerza no mostraron diferencias significativas entre las cuatro cualidades únicas de la fuerza analizadas, hubo diferencias significativas entre las otras tres habilidades ($P < 0,05$). **Conclusión:** La introducción del entrenamiento de fuerza funcional en la preparación física de los atletas de boxeo chino de alto nivel puede mejorar significativamente la calidad de la velocidad de movimiento. Los ejercicios de fuerza funcional son una forma de ejercicio segura y eficaz. Este protocolo de entrenamiento proporciona una buena referencia para compensar las carencias existentes en los ejercicios de fuerza convencionales.

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

Descriptores: Aptitud Física; Ejercicio Físico; Tiempo de Reacción; Entrenamiento de Fuerza.



INTRODUCTION

The objective rule of Sanda, “play fast and slow,” is the principal Sanda players must follow whether the athlete’s physical fitness, skills, or tactics are based on the movement’s changes. The action quality of Sanda players is the key factor in competition and actual combat. In recent years, sports experts and scholars in China have begun to pay attention to cultivating functional ability. Scholars believe that functional exercise can enhance the spine’s stability, improve neuromuscular control, and improve coordination of the upper and lower extremities.¹ Through quantitative analysis, the author identified four types of exceptional physical fitness closely related to individual sports performance. This method can provide credible physical fitness indicators for coach training and material selection and effectively monitor athletes’ exceptional physical fitness development. This makes Sanda teaching more scientific.

METHOD

Subjects

This paper takes 18 Sanda players as a research sample. Competitors perform functional exercises for ten weeks. This paper conducts a consistency test on the selected indices.² Contents include 1min side kick, 1min whip leg, 1min arm push-up, 30s flat push barbell, 1min punch, change direction slide, change direction punch, 10s punch, 10s whip leg, 10s side kick, bench press, Squats, and Shake Plates

Simulation analysis of high-level Sanda sports on foot and ankle injury

m represents the movement of the ankle during exercise. ν represents the characteristics of the Sanda competition. The intensity of high-level Sanda exercise is divided into several levels

$$\mathfrak{S}_{ij} = \frac{(m + \nu)(m - \nu)}{T_o g(\chi_j \times \chi_i)} \times \text{rank}(g(\chi_{\max}^o)) \quad (1)$$

T_o represents the range of motion during practice. X_j represents the movement type of Sanda training.³ The X_i represents the load on the foot in different exercises. *rank* stands for the intensity level of high-level Sanda training. $g(X_{\max}^o)$ represents the degree of injury of each level of Sanda athletes. O stands for weight. If it conforms to the above formula, then substituting formula (1) into formula (2) can obtain the ankle injury evaluation factor group of high-strength Sanda hands.

$$W^t = \frac{a_2 W^{(o-1)} \times \mathfrak{S}_{ij}}{(Y_j^o) g(Y_j^o) \times \kappa_o} \quad (2)$$

a_2 represents a set of variables. $W^{(o-1)}$ represents the intensity of the training. (Y_j^o) represents the types of ankle injury factors for Sanda athletes. g represents ankle load. g represents the cause of the Sanda hand’s foot injury. The ankle injury evaluation factor of high-intensity Sanda hands was obtained according to the above formula (2). This paper adopts (3) combined high-intensity Sanda exercises to evaluate the model of foot and ankle injury.

$$y(t) = \frac{x_{l,n}(t)}{LN} \times W^t \quad (3)$$

It represents the difference in the probability of injury of Sanda athletes in different sports stages. Indicates the level of a foot injury.

Data Analysis

This paper uses SPSS10.0 Forwin social statistics software to analyze the experimental data’s principal components and R-type factors.⁴ This paper uses the parameter method to compare and analyze the 18 players participating in the National Sanda and Sanda Athlete Competition in 2022. There is no need for a code of ethics for this study.

ETHICAL COMPLIANCE

Research experiments conducted in this article with animals or humans were approved by the Ethical Committee and responsible authorities of Zhengzhou University following all guidelines, regulations, legal, and ethical standards as required for humans or animals.

RESULTS

Research and results of main ingredients

In Sanda competition, the human body’s energy metabolism is dominated by glycolysis, and its metabolite lactic acid will cause the body’s muscle and brain function to decline, resulting in physical fatigue.⁵ Sanda players often use a variety of technical movements such as “far kick, close body, close body.” If there is not enough professional ability, it is difficult for athletes to carry out long-term and challenging battles.

The 1-minute side kick and the 1-minute whip kick are specific strength and endurance indicators for the legs. And one minute of push-ups with arm clips, a flat push barbell, and one minute of punching is the strength and endurance of the upper body.⁶ These two skills are characterized by a technical movement that can perform leg technique and the Sanda technique continuously and repeatedly. In Sanda, athletes often use the technique of combining upper and lower legs to attack and counterattack. The existing literature shows that the combination of fist and foot has various forms and functions. (Table 1)

Table 1. Categories and names of significant ingredients.

Main ingredient	High load index	Factor naming
1	1min side kick, 1min whip leg, 1min arm push-up, 1min push-up bar, 1min punch	The limb-specific strength endurance factor
2	Change direction slide, change direction hit	Specific sensitivity factor
3	10s punch, 10s whip, 10s side kick	Action speed factor
4	Bench Press, Squat, Shake Barbell	Specific strength factor

Comparison of performance of particular physical fitness before and after intensive training

From Table 2-5, it can be seen that there is no significant difference in the quality of exceptional strength among the four items.⁷ The quality of the other three majors is also very different. The 18 athletes must train in remarkable strength, endurance, extraordinary sensitivity, and movement speed.

DISCUSSION

Human body quality includes strength quality, endurance quality, speed quality, flexibility quality, and sensitivity quality. In Sanda events, players should fully use their physical potential to perform single or multiple technical movements with maximum efficiency.⁸ During the practice process, the coaches should pay attention to the speed of practicing Sanda athletes and, at the same time, master the connection of various boxing methods, leg methods, throwing methods, punches, feet, etc. In this way, the comprehensive ability of Sanda players can be improved. In Sanda athletes, there is a lot of offensive and defensive information between opponents, so athletes must attack and defend quickly according to the different situations and their opponents. This process cannot be completed simply by simple reactions but also must consider the opponent's ability to react. Improving the choice and reaction time is very beneficial for Sanda players to make timely and accurate choices and judgments in various situations in attack and defense. This is the key to using Sanda techniques to strike opponents quickly, accurately, and harmoniously. Functional strength exercises strengthen the

connection between an athlete's nervous system and muscles, increasing muscle control.⁹ This facilitates the transfer of power and reduces the selective response to Sanda players. Secondly, much functional strength intervention training uses both hands to complete the bodyweight exercise, which is relatively more straightforward. Although this training method does not have much effect on the deep muscles, it can also play a good role in conditioning. This makes the muscles of the body more flexible and flexible. In short, functional strength training can promote the function of the relevant muscle groups and accelerate the brain's commands to the muscles to quickly complete specific movements.

Factors affecting the response rate

The so-called "response" is that a person can accurately respond to each other's actions and goals, that is, how quickly the body responds to external stimuli. Signal stimulation is a training method that can improve reaction speed.¹⁰ The ultimate goal of Sanda players' reaction speed is to improve their anticipation and judgment. The effective method is to conduct actual combat in various situations constantly. Athletes constantly observe during the game to improve their anticipation and judgment. Coaches and players can also use their wits to create effective training methods.

Influencing factors of action speed

The manifestation of movement speed in Sanda generally includes the speed of Sanda, the speed of kicking, the speed of throwing force, the speed of evasion, and defense when defending. To speed up, you need to target the strength of the body. Developing a person's speed

Table 2. Comparison table of exceptional strength and endurance quality of limbs.

Object	1min side kick	1min whip leg	1min clip arm push-ups	1min punch	Flat push barbell
Championship players	101.65±3.8	105.45±3.8	76.95±1.71	258.4±2.28	72.2±1.9
Sanda players before training	73.91±7.03	78.95±8.46	44.94±13.4	210.71±14.16	46.08±9.98
Sanda players after training	98.8±2.28	102.7±1.52	74.86±1.62	254.79±3.33	70.02±2.47
P1	<0.01	<0.01	<0.01	<0.01	<0.01
P2	<0.01	<0.01	<0.01	<0.01	<0.01
P3	<0.05	<0.05	<0.05	<0.05	<0.05

Table 3. Comparison table of unique sensitive qualities.

Object	Change of direction slide	Change direction
Championship players	12.73±0.48	13.49±0.38
Sanda players before training	18.34±1.14	18.34±1.33
Sanda players after training	15.2±0.76	15.11±0.76
P1	<0.01	<0.01
P2	<0.01	<0.01
P3	<0.05	<0.05

Table 4. Action speed quality comparison table.

Object	10s punch	10s whip leg	10s side kick
Championship players	56.81±2	30.5±1.71	28.5±2.38
Sanda players before training	47.79±5.13	18.91±1.14	17.29±1.05
Sanda players after training	53.3±4.56	28.5±1.71	26.32±2.28
P1	<0.01	<0.01	<0.01
P2	<0.01	<0.01	<0.01
P3	<0.05	<0.05	<0.05

Table 5. Comparison of the quality of special forces.

Object	Bench press	Squat	Shabu barbell
Championship players	72.96±6.94	90.44±6.56	28.5±2.47
Sanda players before training	66.69±8.74	100.13±18.72	25.94±4.56
P	>0.05	>0.05	>0.05

requires a lot of repeated exercise.¹¹ There are specific exercises that can be used for actual training. It mainly includes decomposition, resistance reduction, transformation, boosting, and sound stimulation exercises. In addition, there are many ways and means of developing sports. For example, use "sprint." Exciting players through games and competitions can increase maximum speed.

Factors Affecting Movement Rate

Sanda athlete's action is a comprehensive reflection of reaction speed and action. Among Sanda athletes, the movement speed is mainly reflected in two levels: fast start and action. Quick start and quick movement can better adjust the distance with the opponent to achieve effective offense and defense. In actual practice, athletes should combine the movement of Sanda and adopt corresponding methods and measures. It mainly includes high-frequency footwork

movement exercises, high-frequency footwork transformation exercises, and explosive thigh training.

CONCLUSION

In athletes' physical training, the four categories of particular endurance factor, unique sensitivity factor, action speed factor, and particular strength factor are dominant. Based on comparing four unique physical elements, this paper determines the particular physical fitness indicators that Sanda athletes must possess. Competitors participating in national competitions showed significant improvements after targeted functional training. Functional strength training can significantly improve the speed quality of Sanda athletes.

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