EFFECTS OF FUNCTIONAL TRAINING ON PHYSICAL FITNESS OF TRACK AND FIELD RUNNERS

EFEITOS DO TREINAMENTO FUNCIONAL SOBRE A APTIDÃO FÍSICA NOS CORREDORES DE ATLETISMO

EFECTOS DEL ENTRENAMIENTO FUNCIONAL EN LA APTITUD FÍSICA DE LOS CORREDORES DE ATLETISMO

Original Article
Artigo Original
Artículo Original

Ke Li[1]
(Physical Education Professional)

1. Hebei Sport University, Physical Education Department, Shijiazhuang, Hebei, China.

Correspondence:
Ke Li
Shijiazhuang, Hebei, China. 050041.
like800526@163.com

ABSTRACT

Introduction: The use of functional strength training in running training allows athletes to produce a continuous development behavior improving their various functional and competitive abilities. Objective: Study the effect of functional training on the physical quality of runners in track and field. Methods: Six athletes were selected whose changes in parameters of the technical index of the hurdle stage before and after training were analyzed to explore the influence of functional training on the specific technique of the hurdle stage. Results: In the fitness test items of the 6 athletes, the performances of 30 meters, 100 meters, triple standing jump, and backward ball throw were increased by 0.02 seconds, 0.09 seconds, 0.09 meters, and 0.20 meters, respectively, compared to the average before training. An average improvement of 2.50 points was shown in functional movement screening scores. Conclusion: Functional training can improve the physical quality of athletes, positively helping athletes' obstacle course running performance. ***Level of evidence II; Therapeutic studies - investigation of treatment outcomes.***

Keywords: Physical Education and Training; Running; Physical Fitness.

RESUMO

Introdução: O uso do treinamento de força funcional no treinamento de corrida permite aos atletas produzirem um comportamento de desenvolvimento contínuo melhorando suas diversas habilidades funcionais e competitivas. Objetivo: Estudar o efeito do treinamento funcional sobre a qualidade física nos corredores de atletismo. Métodos: Foram selecionados seis atletas, cujas mudanças de parâmetros do índice técnico da etapa de obstáculos antes e depois do treinamento foram analisadas, de modo a explorar a influência do treinamento funcional na técnica específica da etapa de obstáculos. Resultados: Nos itens do teste de aptidão física dos 6 atletas, as performances de 30 metros, 100 metros, salto triplo em pé e lançamento de bola nas costas foram aumentadas em 0,02 segundos, 0,09 segundos, 0,09 metros e 0,20 metros, respectivamente, em comparação com a média anterior ao treinamento. Apresentou-se uma média de melhoria de 2,50 pontos nos escores de triagem de movimento funcional. Conclusão: O treinamento funcional pode melhorar a qualidade física dos atletas, ajudando positivamente no desempenho de corrida de obstáculos dos atletas. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

***Descritores*:** *Educação Física e Treinamento; Corrida; Aptidão Física.*

RESUMEN

Introducción: El uso del entrenamiento de fuerza funcional en el entrenamiento de carrera permite a los atletas producir un comportamiento de desarrollo continúo mejorando sus diversas capacidades funcionales y competitivas. Objetivo: Estudiar el efecto del entrenamiento funcional en la calidad física de los corredores de atletismo. Métodos: Se seleccionaron seis atletas, cuyos cambios en los parámetros del índice técnico de la etapa de vallas antes y después del entrenamiento fueron analizados, con el fin de explorar la influencia del entrenamiento funcional en la técnica específica de la etapa de vallas. Resultados: En los ítems de las pruebas de aptitud física de los 6 atletas, los rendimientos de 30 metros, 100 metros, triple salto en pie y lanzamiento de espalda se incrementaron en 0,02 segundos, 0,09 segundos, 0,09 metros y 0,20 metros, respectivamente, en comparación con la media antes del entrenamiento. Se presentó una mejora media de 2,50 puntos en las puntuaciones del cribado del movimiento funcional. Conclusión: El entrenamiento funcional puede mejorar la calidad física de los atletas, ayudando positivamente a su rendimiento en las carreras de obstáculos. ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

***Descriptores*:** *Educación y Entrenamiento Físico; Carrera; Aptitud Física.*

DOI: http://dx.doi.org/10.1590/1517-8692202329012022_0623 Article received on 11/01/2022 accepted on 11/30/2022

INTRODUCTION

The use of functional strength training in sprint training can enable athletes to produce sustainable development effects and improve athletes' various competitive abilities.[1] Hurdle running is one of the track and field sprint events, which requires athletes to pass a certain number of hurdles at high speed in a short period of time, which has high requirements on athletes' physical fitness and sports skills. Sports researcher Abbaspoor E defines functional training as "a holistic movement training,

stable and efficient through action mode, not limited to local muscle strength training".[2] In addition, domestic scholar Mohammadi N believes that "functional training is a holistic, multi-dimensional, multi-joint action training mode, including the practice of acceleration, deceleration, stability and other movements".[3] Li Q pointed out that in terms of the special characteristics and requirements of short spans, the athlete's central nervous system needs to be highly excited, emphasizing the athlete's strong strength and speed, good rhythm, and reasonable technique.[4] Nagai S implemented core strength training for men's 100-meter sprinters, the results show that core strength training can enhance the balance, stability, and coordination of athletes, and can promote sprinters to improve their sprint ability and running posture, thereby improving sprint performance.[5]

Functional training is an innovation of the sports training mode under the current new form of competitive sports development, and its effectiveness and advancement have been proven in practice around the world.[6] Functional training has its own unique advantages, but it is not the whole of sports training, it plays a positive role in improving the physical dysfunction of athletes, preventing sports injuries, strengthening movement ability, and achieving breakthroughs in special performance.

METHOD

Research object

The author takes the effect of functional training on the hurdling technique of second-level athletes in the 110-meter hurdles as the research object.

Research methods

Documentation Law

Through the Internet, journals and other information carriers, the relevant literature was consulted, these include books and journals related to physical training theory and methods, hurdle running training, sports training theory and methods, functional training, etc., sort out the relevant theories and data to lay a solid theoretical foundation for the experiment.[7]

Experimental method

By sorting out relevant literature, listening to the opinions of relevant experts, and based on the kinematic characteristics of hurdle step technology and the actual situation of athletes, etc., in order to determine the corresponding functional training means, content, schedule, load and develop a reasonable training plan.

Selection of experimental subjects

The subjects of this experiment are from the hurdle running training team of the Institute of Physical Education, all 6 athletes in the experiment have obtained the second-level level, which can represent the level of the second-level athletes at this stage, Table 1 is the basic situation of the athletes.

Determination of training period and training times

6 athletes used functional training, training frequency 5 times per week, the training time is 50 minutes/time (the corresponding functional training is mainly arranged during the preparatory activities and after completing the normal training tasks), and the training period is 16 weeks in total.

Table 1. Basic information of athletes.

Serial number	Age	Height	Weight	Score	Sport class	Training years
1	19	180	70.5	15.4	secondary	4
2	19	180	71.6	15.8	secondary	4
3	19	181	70.3	15.8	secondary	3
4	21	182	72.5	15.8	secondary	3
5	20	183	73.9	16.0	secondary	4
6	20	178	69.8	16.1	secondary	4

Selection of physical fitness test indicators

According to the characteristics of the hurdle running project and the results of reviewing relevant literature and expert interviews, four physical fitness indicators that have a greater impact on the 110-meter hurdles performance are selected, the specific test items are: 30-meter run, 100-meter run, standing triple jump, and throwing a medicine ball.[8]

Mathematical Statistics

Statistical software spss19.0 and office2016 were used for statistical analysis of the data of the experimental results, and the mean ± standard deviation ($x \pm s$), paired sample t test and box plot were used for in-depth analysis of the data results. Box plots display the maximum, minimum, median, and two quartiles of a set of data, as well as outliers between samples. It is mainly used to reflect the characteristics of the original data distribution, and can also compare the distribution characteristics of multiple groups of data.[9]

Ethical Compliance

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

RESULTS

Analysis of physical fitness of athletes before and after training

The 110-meter hurdles belong to the speed and strength sprint event, in the short-distance running, in order to continuously cross one obstacle after another, the athlete must be able to complete complex technical movements and maintain a high speed at the same time, in order to achieve this goal, a single movement of the athlete must be faster, thereby increasing the speed utilization. The 30-meter run results mainly reflect the athlete's explosive speed, and the 100-meter run results mainly reflect the athletes' ability to maintain absolute speed in short-distance running, the standing triple jump performance mainly reflects the athlete's explosive power, rhythm control ability, and trunk core strength under asymmetric movements, the performance of the back-throwing medicine ball mainly reflects the athlete's explosive power and trunk core strength. According to the changes in physical fitness of athletes before and after training, the effect of functional training is further tested, the specific situation is shown in Figure 1 and Figure 2.

As shown in Table 2, the physical qualities of the 6 athletes have been improved to a certain extent, and the 30-meter running is about

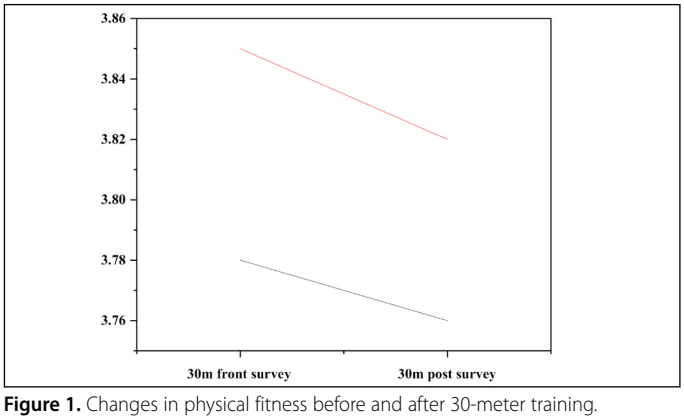

Figure 1. Changes in physical fitness before and after 30-meter training.

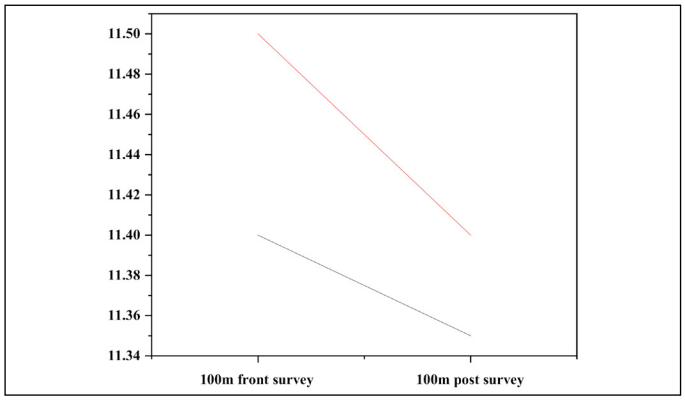

Figure 2. Changes in physical fitness before and after 100-meter training.

Table 2. Changes in physical fitness of athletes before and after training.

	Before training (n=6)	After training (n=6)	t	P
30 meters	3.82±0.06	3.80±0.04	2.89	0.034*
100mi	11.46±0.13	11.37±0.11	11.13	0.000*
Triple jump	9.24±0.15	9.33±0.12	-5.58	0.003**
Back toss medicine ball	18.53±0.79	18.72±0.79	-5.72	0.002**

Note: * means the difference is relatively significant (P<0.05), ** means the difference is very significant (P<0.01).

0.022 seconds longer than before training, after paired sample t test, p=0.034<0.05, there is a significant difference compared with before training, as can be seen from Figure 1, among them, the best results of the 30-meter performance fluctuated, and did not further break the best value, indicating that some athletes may be in the bottleneck period of explosive speed growth, overall, the overall level of the athletes after training has improved, it can be speculated that the explosive speed of most athletes has increased, but the improvement is limited, indicating that functional training has little effect on improving the explosive speed of athletes. From before and after the 100-meter test, the average 100-meter scores of athletes before and after training were 11.46±0.13 and 11.37±0.11, respectively, after paired sample t test, p=0.000<0.01, compared with before training, there is a very significant difference, according to Figure 2, the overall level of athletes before and after training is relatively improved, after training, the athletes' 100-meter running performance increased by 0.09 seconds on average, it can be seen that functional training has a significant effect on improving the absolute speed of athletes. The mean scores before and after standing triple jump training were 9.24±0.15 and 9.33±0.12 respectively, after paired sample t test, p=0.003<0.01, there was a very significant difference compared with before training, compared with the average increase of 0.09 meters before training, the overall level of the athletes has been greatly improved compared with that before training, among which the best and worst results before training have improved. The test before and after the training of throwing the medicine ball was 18.53±0.79 and 18.72±0.79 respectively, after the paired sample t test, p=0.002<0.01, there was a very significant difference compared with before the training, compared with the average increase of 0.2 meters before training, the overall level of the 6 athletes has improved significantly compared with that before training, the best results and the worst results were improved compared with those before training, indicating that functional training has a better effect on improving explosive power and trunk core strength.

DISCUSSION

Studies have shown that traditional strength training methods lack the correlation with specific technical characteristics, and functional strength training can effectively make up for this problem. Functional strength training is playing an increasingly important role in competitive sports, with advantages and benefits that other training methods do not have. Functional strength training enables the effective transmission of power in human movement, increases the stability of core muscle groups and the strength of various small muscle groups in the human body, creating good conditions for power transmission.[10]

CONCLUSION

Functional strength is based on the kinematic chain effect of the body, and is the strength exerted in order to complete a specific action. Functional strength training methods can improve athletes' athletic performance, enhance neuromuscular exercises, and reduce injuries, so it should be paid attention to in sprint strength training. At present, concepts and methods in the field of physical fitness training such as functional strength training are gradually increasing in the field of competitive sports, but there is an urgent need to increase the application of functional strength in track and field sprint events. Therefore, in the research on the strength training of sprinters, how to scientifically use functional strength training to improve the athletes' competitive ability has important practical significance.

The author declare no potential conflict of interest related to this article

AUTHORS' CONTRIBUTIONS: Each author made significant individual contributions to this manuscript. Suqin Cao: writing and data analysis; Hui Wang: article review and intellectual concept of the article.

REFERENCES

1. Zhao HY, Han JQ, Liu HT, Wang HT, Zhou Q, Zhu C, et al. Effects of hand continuous passive motion system combined with functional training and pressure gloves in treating early scar contracture after burn on the back of the hand. Zhonghua Shao Shang Za Zhi. 2021;37(4):319-26.
2. Abbaspoor E, Zolfaghari M, Ahmadi B, Khodaei K. The effect of combined functional training on BDNF, IGF-1, and their association with health-related fitness in the multiple sclerosis women. Growth Horm IGF Res. 2020;52(1):101320.
3. Mohammadi N, Hadian MR, Olyaei GR. Comparison of the effects of Wii and conventional training on functional abilities and neurocognitive function in basketball-players with functional ankle instability: Matched randomized clinical trial. Clin Rehabil. 2021;35(10):1454-64.
4. Li Q, Wang X, Wang S, Xie Y, Xie Y, Li S. More flexible integration of functional systems after musical training in young adults. IEEE Trans Neural Syst Rehabil Eng. 2020;28(4):817-24.
5. Nagai S. Regulatory hurdles for CAR T-cell therapy in Japan. Lancet Haematol. 2021;8(10):e686-7.
6. Patel P. Potassium batteries show promise: Hurdles remain, but potassium could someday make sense for grid storage - [News]. IEEE Spectr. 2020;57(3):11-2.
7. Napoleon A, Sulistyani DP, Bakri. Test of Physical Quality Compost and PH of Combination of Water Hyacinth (Eichornia Crassipes Mart. Solm) and Goat Manure Using Rument Liquid Mol as Activator. IOP Conf Ser Earth Environ Sci. 2021;810(1):012003.
8. Alawiyah T, Mujnisa A, Jamilah J. Physical quality and imago population of corn infected with Sitophilus zeamais with the addition of cinnamon (Cinnamomum burmannii). IOP Conf Ser Earth Environ Sci. 2021;788(1):012070.
9. Prayitno AH, Rukmi DL, Widiyawati A, Prasetyo B. The fortification effect of duck eggshell nano-calcium on the physical quality of beef sausage. IOP Conf Ser Earth Environ Sci. 2022;980(1):012016.
10. Bacher M, Schmidt O, Bondi G, Fenton O. Influence of dung pats on soil physical quality mediated by earthworms: from dung deposition to decay and beyond. Soil Res. 2020;58(5):421-9.