EFFECTS OF PHYSICAL TRAINING ON CYCLISTS' SPEED

EFEITOS DO TREINAMENTO FÍSICO SOBRE A VELOCIDADE DOS CICLISTAS

EFECTOS DEL ENTRENAMIENTO FÍSICO EN LA VELOCIDAD DE LOS CICLISTAS

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ABSTRACT

Introduction: Cycling is a competitive sport and has high demands on the athletes themselves, such as versatile use of skills, physical fitness, and explosiveness. Objective: Increase the specific speed endurance of athletes. Methods: Fourteen prominent male short-distance cyclists were divided into a group of constant cyclists (CG group, n=7) and a group of decreasing cyclists (DG group, n=7) and subjected to a physical training protocol. Results: Peak activity and average endurance improved in both groups of athletes; rest periods improved significantly compared to the previous ones, and deceleration decreased by 12.2% and 14.6% in the CG and DG groups, respectively, immediately after the end of the rest period. Latency decreased significantly in both groups (P<0.05). Conclusion: Compared with the program with the same number of rides, the training load in the stage-based pilot program with the decreasing number of rides was higher, and the training effect was more significant in the improvement of peak power, 1 km total power maintenance capacity, and anaerobic threshold. The energy supply ratio of aerobic metabolism during exercise at the above intensity was also improved. **Level of evidence II; Therapeutic studies - investigation of treatment outcomes.**

Keywords: Physical Education and Training; Exercise; Athletes.

RESUMO

Introdução: O ciclismo é um esporte de competição e tem altas exigências para os próprios atletas, tais como o uso versátil de habilidades, aptidão física e explosividade. Objetivo: Aumentar a resistência de velocidade específica dos atletas. Métodos: Catorze proeminentes ciclistas masculinos de curta distância foram divididos em um grupo de número constante de ciclistas (grupo CG, n=7) e um grupo de número decrescente de ciclistas (grupo DG, n=7), submetidos a um protocolo de treinamento físico. Resultados: Os picos de atividade e média de resistência sofrem uma melhoria nos dois grupos de atletas, períodos de repouso melhoraram significativamente em comparação com os anteriores, a desaceleração diminuiu 12,2% e 14,6% nos grupos CG e DG, respectivamente, imediatamente após o final do período de repouso. A latência diminuiu significativamente em ambos os grupos (P<0,05). Conclusão: Em comparação com o programa com o mesmo número de pedaladas, a carga de treinamento no estágio baseado no programa piloto com o número decrescente de pedaladas foi maior, o efeito do treinamento foi mais significativo na melhoria da potência de pico, na capacidade de manutenção de potência de 1 km total e no limiar anaeróbico. A relação do fornecimento de energia do metabolismo aeróbico durante o exercício com intensidade acima da intensidade também foi aprimorada. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

Descritores: *Educação Física e Treinamento; Exercício Físico; Atletas.*

RESUMEN

Introducción: El ciclismo es un deporte de competición y tiene grandes exigencias para los propios atletas, como el uso versátil de las habilidades, la aptitud física y la explosividad. Objetivo: Aumentar la resistencia a la velocidad específica de los atletas. Métodos: Catorce destacados ciclistas masculinos de corta distancia fueron divididos en un grupo de número constante de ciclistas (grupo CG, n=7) y un grupo de número decreciente de ciclistas (grupo DG, n=7), sometidos a un protocolo de entrenamiento físico. Resultados: La actividad máxima y la resistencia media experimentan una mejora en ambos grupos de atletas, los periodos de descanso mejoran significativamente en comparación con los anteriores, la desaceleración disminuye un 12,2% y un 14,6% en los grupos CG y DG, respectivamente, inmediatamente después de finalizar el periodo de descanso. La latencia disminuyó significativamente en ambos grupos (P<0,05). Conclusión: En comparación con el programa con el mismo número de salidas, la carga de entrenamiento en el programa piloto basado en etapas con el número de salidas decreciente fue mayor, el efecto del entrenamiento fue más significativo en la mejora de la potencia máxima, la capacidad de mantenimiento de la potencia total en 1 km y el umbral anaeróbico. También mejoró la relación de suministro de energía del metabolismo aeróbico durante el ejercicio a una intensidad superior. ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

Descriptores: *Educación y Entrenamiento Físico; Ejercicio Físico; Atletas.*

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INTRODUCTION

Cycling is a physical sport, whether it is a road bike or a track bike, it requires strong physical fitness as support. From this it can be seen that, for athletes to achieve excellent results, the special technical level of cycling itself is one aspect, and good physical fitness is another important aspect. Cycling is characterized by requiring athletes to develop on the basis of all-round physical fitness, speed up through technical training. From the perspective of sports science, the nervous system in adolescence has high flexibility, which is the best stage of cycling training.[1] The components of cycling speed ability are divided into simple and complex motor response latency; The speed and frequency of completing simple movements with little external resistance. The quality of speed is the same as the quality of strength, because the performance of speed is not a single, the most basic ability performance, therefore, widely known as speed capability. The latency of simple and complex motor responses refers to the response time between the athlete receiving the stimulus and the muscle action. First, the sensory organs are stimulated to arouse excitement; Secondly, the excitement is transmitted to the center along the afferent nerves; Thirdly, analyze according to past experience, and then transmit the impulse from the center to the corresponding muscles, and the muscles respond according to the requirements. In the case of little external resistance, the speed of completing simple actions can be understood literally, that is, the speed of simple actions measured without external resistance. Action frequency refers to the ability to complete the number of actions per unit time.[2] After such analysis, it can be clearly seen that the speed ability of cycling is a training process that integrates collective energy, endurance and explosive power, and requires the overall improvement of athletes' physical and psychological qualities.

METHOD

Research objects

14 male cyclists were selected, including 5 national athletes and 9 first-level athletes, aged 18-25; The sports special is a short-distance project on bicycle venues, and the special training period is 4 to 10 years. All team members are in good health and have no organ system diseases; During the course of the study, none of the tested athletes discontinued training for any reason.[3] The Wingate test was carried out 10 days before the training started, 14 athletes were ranked from high to low according to the relative value of maximum power (W/kg) measured and numbered from 1 to 14, two players with similar abilities were divided into one group, a total of 7 groups were obtained, using a paired design method, two athletes in each group were divided into a constant number of cycling group (CG) and a reduced number of cycling group (DG), with 7 athletes in each group.[4] Before the start of the study, the athletes were mainly explained the purpose and significance of the study, the procedures and precautions of each functional test and training, and familiarized themselves with the methods and steps of the test. The details of the research subjects are shown in Table 1.

Table 1. List of basic information of research objects.

	CG	DG
age (yrs)	19-24	18-25
Height (cm)	178-185	175-187
Weight (kg)	76-86	77-90
Years of special training (yrs)	4-8	4-10
Relative maximal oxygen uptake (ml/kg/min)	52-68	52-68
Relative maximum power (W/kg)	15-19	16-18

Training program

The subject research was carried out during the winter training of the cycling team to prepare for the Games, from November 26, 2020 to February 10, 2021, the regular special training (NT) phase, which is based on repetitive speed endurance training on the field, and the SIT phase, which is mainly based on power car speed-type interval training, lasted for 12 weeks.[5] The training site is located in a velodrome, and the athletes tested are relatively closed during winter training, the training takes one week as a small cycle, and the training content is arranged in the morning and afternoon from Monday to Saturday, rest every evening, thursday morning and Sunday all day, on rest days, athletes mainly focus on stretching, massage and relaxation therapy and non-physical recreational activities; The diet during the 12-week period was uniformly arranged by the athlete's restaurant, and the daily energy intake was controlled at a relatively stable level. The 14 athletes in the two groups first completed 6 weeks of NT, and the weekly training content was the same, as shown in Table 2, including 3 physical strength training sessions (6h/week), 3 aerobic recovery cycling sessions (50% VOpeax intensity, 6h/week), 5 site-specific training sessions. Each class of physical strength training is 2 hours, and the content is basically the same. In the stage of site-specific training, strength training focuses on maintaining the maximum strength level, each class includes 30 minutes of warm-up, 30 minutes of small muscle group stabilization, coordination training, and 60 minutes of trunk and upper and lower body strength training at 80% of maximum strength with equipment. The aerobic recovery cycle is 2 hours per class, and athletes ride on a road bike or power bike at an intensity lower than the anaerobic threshold heart rate, for recovery cycling after special training.[6] Field-specific training includes 2 explosive training sessions (effective riding distance 1720m/week, time ~3min/week), 1 maximum speed training session (effective riding distance 800m/week, time ~1min/week) and 2 speed training sessions Endurance training class (effective riding distance 5000m/week, time ~6min/week).

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

RESULTS

Figure 1 shows the changes in Cmean-T of 20 consecutive rides in a SIT class in the two experimental groups. In the 4 groups of training, the two experimental groups showed a trend of the highest average cadence on the first ride, and then continued to decrease; However, from the overall trend of change, the cadence of the 4 consecutive groups of SIT riding in the CG group did not change much, while the cadence of the latter two groups in the DG group showed an increasing trend, in particular, the Cmean-T of the last two rides (the 19th and 20th)

Table 2. List of training content and training volume of NT in one week.

	Venue special	Morning		Afternoon	
		Content	Training volume/class	Content	Training volume/class
Monday	Field explosiveness	start in place	860m	physical strength	2h
Tuesday	speed endurance	blue line	3000m	aerobic recovery ride	2h
Wednesday	explosive force	start in place	860m	aerobic recovery ride	2h
Thursday		rest		physical strength	physical strength
Friday	speed endurance	blue line	3000m	aerobic recovery ride	2h
Saturday	Maximum speed	big slope	800m	physical strength	2h
Sunday		rest		rest	

reached 125.7 ± 1.4 rpm and 119.4 ± 1.6 rpm, respectively, which well accomplished the training goal.[7]

Figure 2 lists the kinematic parameters that reflect the intensity and volume of athlete training in the two SIT classes. The Pmean of the CG group continued to decrease in 4 consecutive cycling groups, while the DG group continued to increase; There was no significant difference between the Pmean of the first group of cycling in the DG group and the CG group, while the Pmean of the last three groups of cycling was 9.2%, 30.0%, and 81.4% higher than those in the CG group (P<0.05), respectively, the total average power of the four groups in the DG group was also 28.3% higher than that in the CG group, and the difference was statistically significant (P<0.05).[8] Vmean and Pmean showed a similar change rule. After the completion of the DG group, the Vmean of the two groups was 10.2% and 25.1% higher than that of the CG group, and the difference was significant (P<0.05).

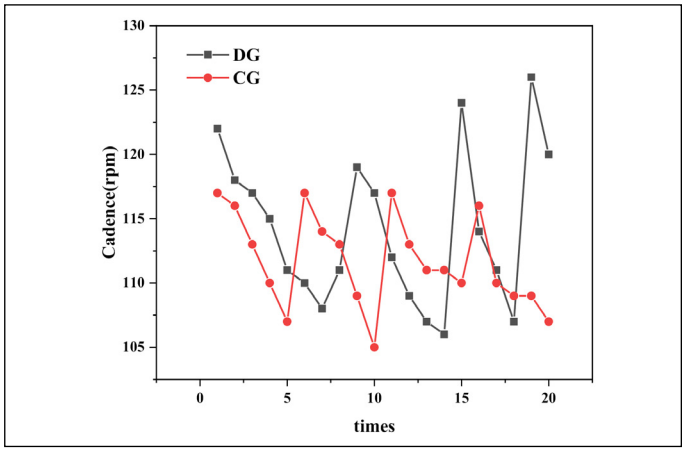

Figure 1. Changes in Cmean-T of the two SIT groups after 20 consecutive rides.

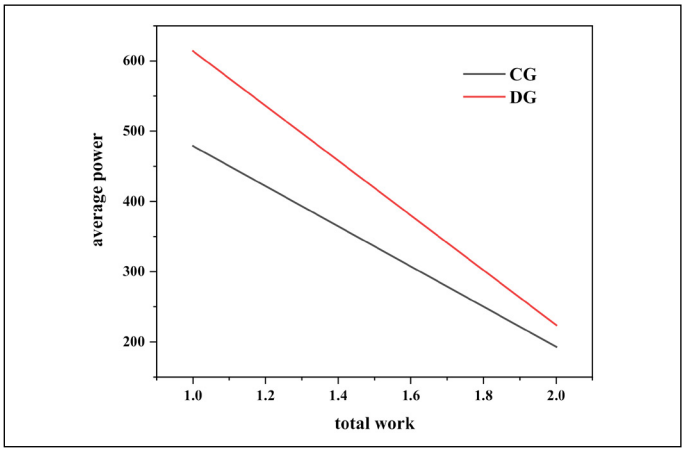

Figure 2. Comparison of the total average power and total work of the four groups in the two SIT groups.

DISCUSSION

For cycling competitions, most of the athletes' leg muscles are very demanding, and an athlete's reaction rate also determines the competition performance to a certain extent.[9] At the same time, cycling not only has high requirements on the legs, but also requires high-intensity training for the pedaling movements of the athletes' feet, let the athletes know that their pedaling speed should also keep up during the competition, so that they can focus on improving their pedaling speed and their own leg muscle strength during normal training, in addition, it is necessary to focus on improving the relevant training indicators of athletes in the fast movements of the legs, which has a very obvious effect on improving the pedaling speed or the fast movements of the legs of the cyclists during the competition, at the same time, slope practice can also be carried out, so as to improve the effective cognition of athletes and teammates in short-distance events to a certain extent.[10]

CONCLUSION

Sprint cyclists during a power bike SIT class, the total amount of high-intensity cycling training completed is higher than the speed and endurance repetition training courses on the field; However, when the number of rides in a SIT class is the same, the number of rides decreases compared to the same number of rides, it enables athletes to complete higher training intensity and total training volume, and reduces the adverse effect of fatigue during training on cycling efficiency. The outstanding male short-distance cyclists in this study did not see significant improvement in repeated sprinting ability, simulated 1km timed cycling performance, and aerobic exercise ability after 6 weeks of training with field speed and endurance repetition training as the main content. Training mainly based on SIT and supplemented by other abilities (such as physical strength, etc.) can effectively improve the anaerobic metabolism of short-distance cyclists, but it is necessary to focus on fatigue elimination and physical recovery after SIT class to prevent the body from being caused by heavy load SIT, excessive fatigue affects the training effect.

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