RELAXATION TRAINING EFFECTS ON THE MUSCULAR AND TECHNICAL LEVEL OF ATHLETES

EFEITOS DO TREINAMENTO DE RELAXAMENTO A NÍVEL MUSCULAR E TÉCNICO DOS ATLETAS

EFECTOS DEL ENTRENAMIENTO DE RELAJACIÓN EN EL NIVEL MUSCULAR Y TÉCNICO DE LOS DEPORTISTAS

Original Article
Artigo Original
Artículo Original

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ABSTRACT

Introduction: The current teaching of athletes focuses mainly on gaining their skills, often neglecting the beneficial impacts of relaxation on the overall physical quality of its students. Therefore, clarifying the relationship between muscle relaxation training and athletic performance is important. Objective: Explore the effect of relaxation training on running athletes' technical and muscular levels. Methods: A comparative experiment was conducted on 40 male and female runners, randomly divided into two groups. Before training, the athletes in the experimental group received relaxation training through the breath regulation method, muscle relaxation method, and independent training method, with 60 minutes in each session, for 6 months. Results: Based on the assumption that there was no significant difference in the initial physical indices, the athletes in the experimental group performed better in 100m, 200m, and 300m than those in the control group, and the difference between the two groups was significant ($P < 0.05$). Conclusion: Adequate relaxation training positively affects athletes' muscular endurance and technical level. Therefore, an adequate increase in relaxation training is shown to be conducive in improving the overall physical quality and competitive level of athletes. ***Level of evidence II; Therapeutic studies - investigation of treatment outcomes.***

Keywords: Relaxation Therapy; Muscle Relaxation; Physical Fitness.

RESUMO

Introdução: O ensino atual dos atletas foca-se principalmente no ganho de suas habilidades, negligenciando muitas vezes os impactos benéficos do relaxamento na qualidade física geral de seus alunos. Portanto, é de grande importância esclarecer a relação entre o treinamento de relaxamento muscular e o desempenho atlético. Objetivo: Explorar o efeito do treinamento de relaxamento sobre o nível técnico e muscular dos atletas de corrida. Métodos: Uma experiência comparativa foi realizada em 40 corredores masculinos e femininos, divididos aleatoriamente em dois grupos. Antes do treinamento, os atletas do grupo experimental receberam treinamento de relaxamento através do método de regulação da respiração, método de relaxamento muscular e método de treinamento independente, com um total de 60 minutos de duração em cada sessão, por 6 meses. Resultados: Partindo da premissa de que não houve diferença significativa nos índices físicos iniciais, os atletas do grupo experimental tiveram melhor desempenho em 100m, 200m e 300m do que os do grupo controle, e a diferença entre os dois grupos foi significativa ($P < 0,05$). Conclusão: O treinamento de relaxamento adequado tem um efeito positivo sobre a resistência muscular e o nível técnico dos atletas. Portanto, o aumento adequado do treinamento de relaxamento mostra-se propício na melhoria da qualidade física geral e no nível competitivo dos atletas. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

***Descritores*:** *Terapia de Relaxamento; Relaxamento Muscular; Aptidão Física.*

RESUMEN

Introducción: La enseñanza actual de los deportistas se centra principalmente en la ganancia de sus habilidades, descuidando muchas veces los impactos beneficiosos de la relajación en la calidad física general de sus alumnos. Por lo tanto, es de gran importancia aclarar la relación entre el entrenamiento de relajación muscular y el rendimiento deportivo. Objetivo: Explorar el efecto del entrenamiento de relajación en el nivel técnico y muscular de los atletas que corren. Métodos: Se realizó un experimento comparativo con 40 corredores masculinos y femeninos, divididos aleatoriamente en dos grupos. Antes del entrenamiento, los atletas del grupo experimental recibieron un entrenamiento de relajación mediante el método de regulación de la respiración, el método de relajación muscular y el método de entrenamiento independiente, con una duración total de 60 minutos en cada sesión, durante 6 meses. Resultados: Partiendo de la base de que no había diferencias significativas en los índices físicos iniciales, los atletas del grupo experimental obtuvieron mejores resultados en 100m, 200m y 300m que los del grupo de control, y la diferencia entre los dos grupos fue significativa ($P < 0,05$). Conclusión: Un entrenamiento de relajación adecuado tiene un efecto positivo en la resistencia muscular y el nivel técnico de los atletas. Por lo tanto, el aumento adecuado del entrenamiento de relajación se muestra propicio para mejorar la calidad física general y el nivel competitivo de los deportistas. ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

***Descriptores*:** *Terapia por Relajación; Relajación Muscular; Aptitud Física.*

DOI: http://dx.doi.org/10.1590/1517-8692202329012022_0519 Article received on 09/20/2022 accepted on 10/21/2022

INTRODUCTION

Sports, as a competitive way of confrontation, requires athletes to improve their physical ability to the best state in a short time. Therefore, it is necessary to mobilize their enthusiasm and initiative from many aspects, of which sprint, as a representative sport, has more prominent characteristics.[1] As we all know, sprint is a kind of high-intensity anaerobic exercise. Therefore, the joints and muscles of athletes are overloaded during the exercise. If sprinters want to keep or even surpass the best performance for a long time, and give full play to the body energy, it needs to coordinate many joints and muscles in the running process to maintain the tension, stability and coordination of leg muscles, so as to obtain better power supply.[2] However, the traditional training methods mainly focus on improving the technical ability, mostly through action analysis to correct the movement errors and improve the accuracy of the movement, while ignoring the impact of relaxation training on the movement.[3] This will easily lead to poor endurance, movement deformation, large energy consumption and even muscle strain of athletes in the second half of the run. Therefore, it is very necessary to integrate relaxation training into the daily training of athletes. When exploring the relationship between relaxation training and athletes' muscle and technical level, this study has looked up some relaxation training operations, such as half high leg lift trot, knee turn before running and low pressure high leg lift running, which are different from traditional relaxation training. And integrate them to find a relaxation training method suitable for this experiment.[4]

In addition, from the perspective of the global development trend of sports, it is the general trend to integrate relaxation training into sports. Relaxation training is a broad concept, which refers to relaxation exercises for the physical and psychological aspects of individuals.[5] It includes a variety of relaxation methods, such as breathing regulation, muscle relaxation and consciousness relaxation, and the relaxation methods for different body parts are different. For example, the muscle relaxation method can be used for muscle training, and the breathing adjustment method can be assisted.[6]

METHOD

In this experiment, 40 healthy male and Female Sprinters (including 20 male and 20 Female Sprinters) were selected as the research subjects, aged between 19 and 23. The study and all the participants were reviewed and approved by Ethics Committee of Harbin Sport University (NO.2018HRSU28-HN). The athletes were randomly divided into the experimental group and the control group. Each group consisted of 10 male sprinters and 10 Female Sprinters, and completed the relaxation training experiment for 6 months. Through statistical analysis, it was found that there was no significant difference between the physical indexes of male subjects in the experimental group and the control group before the experiment ($P > 0.05$). The physical indexes of male subjects before relaxation training are shown in Table 1.

The physical indicators of female subjects before relaxation training are shown in Table 2, and statistical analysis has found that there is no significant difference in age, height, and weight ($P > 0.05$).

Table 1. Male body index data before relaxation training ($x \pm s$, $n = 20$).

Category	Age	Height (cm)	Weight (kg)
Test group	20.05±1.11	168.74±3.16	60.51±4.51
Control group	20.20±1.02	169.13±3.63	61.17±4.46

Table 2. Female body index data before relaxation training ($x \pm s$, $n = 20$).

Category	Age	Height (cm)	Weight (kg)
Test group	20.01±1.05	159.24±2.15	49.41±4.23
Control group	19.93±1.13	160.35±2.01	50.32±4.17

Forty male and Female Sprinters were randomly divided into two groups, 10 males and 10 females in each group, as the experimental group and the control group. Before each sprint, the athletes in the experimental group carried out relaxation exercises through breathing regulation method, muscle relaxation method and autonomous relaxation training method, and each relaxation exercise lasted for 1H; The control group was given the same time of rest without relaxation training. In addition, the results of 100m, 200m and 300m dash were compared before and after the experiment. Similarly, muscle endurance indexes were also measured by isomed 2000 isokinetic muscle strength tester made in Germany before and after the experiment. Because sprinting requires the explosive force and endurance of the lower limbs and the close cooperation of the knee and ankle joints, the peak torque, the ratio of antagonistic / active muscles and the muscle endurance of the knee and ankle joints under different angular velocities were also measured. Through statistical analysis of relevant data, the relationship between relaxation training and athletes' muscle and technical level is revealed.

Statistical analysis was completed by SPSS 21.0, and data were expressed as mean ± standard deviation ($x \pm s$). $P < 0.05$ indicates that there is a significant difference between the two groups of data, that is, it has statistical significance; otherwise, it has no difference.

RESULTS

Relationship between relaxation training and athletes' technical level

It can be seen from Table 3 that the 100m, 200m and 300m results of the experimental group have been greatly improved after 6 months of pre-exercise relaxation training. Among them, the 100m results of the control group are only (12.76 ± 1.176) s, and they are increased to (12.39 ± 1.426) s after relaxation training. Although the difference between the two groups is significant ($P < 0.05$), the increase is small, and with the increase of the sprint distance, this promotion advantage is gradually obvious. For example, the score of the experimental group was (54.33 ± 3.124) s, while that of the control group was only (57.098 ± 5.321) s, and there was a significant difference between the two groups ($P < 0.01$).

Relationship between relaxation training and athletes' muscle endurance

According to Table 4, when the angular velocity is the same, the peak torque of knee joint and elbow joint of the athletes in the experimental group after relaxation training is higher than that of the control group, which indicates that relaxation training can increase the torque of knee joint and elbow joint to obtain greater muscle torque. And this effect is more obvious in the ankle joint.

Table 3. Comparison of sprint performance of athletes after the experiment ($x \pm s$, $n = 40$).

Category	100m	200m	300m
Experimental group/s	12.39±1.426	24.73±2.317	54.33±3.124
Control group/s	12.76±1.176	25.98±3.011	57.098±5.321
P	<0.05	<0.05	<0.01

Table 4. Comparison of peak moment of knee joint and elbow joint of athletes ($x \pm s$, $n = 40$).

Category	Angle speed (°)/s	Knee joint		Ankle joint	
		Left	Right	Left	Right
Control group	60	96.6±12.2	98.1±12.3	24.9±5.6	24.7±4.1
test group		121.3±21.1	125.2±14.5	34.7±6.4	33.1±5.5
P		>0.05	>0.05	<0.01	<0.01
Control group	240	86.9±16.3	86.2±11.1	21.6±4.4	20.1±4.3
test group		98.3±12.5	99.9±15.6	30.6±9.1	30.1±7.9
P		<0.05	<0.05	<0.01	<0.05

Compared with the (24.9 ± 5.6) peak torque of the left ankle joint of the control group, the peak torque of the experimental group was increased to (34.7 ± 6.4) and the difference between the two groups was extremely significant (P < 0.01). In addition, with the increase of angular velocity, the peak torque of knee joint and ankle joint also gradually decreased, indicating that muscle endurance gradually decreased. However, the experimental group is still larger than the control group, and the difference between the two groups is significant when the angular velocity is 240 (°) / S (P < 0.05), and the left ankle joint is the most obvious.

By comparing Table 5, it is found that under the same angular velocity, the ratio of antagonistic / active muscles of knee and ankle joints in the experimental group undergoing relaxation training is significantly higher than that in the control group, indicating that the athletes in the experimental group have higher explosive power of lower limb muscles. However, comparing the differences between the ankle joint groups under different angular velocities, it was found that there was no significant difference (P > 0.05), but there was a significant difference between the groups on the knee joint (P < 0.05), which was consistent with the characteristics of high explosive force of sprint.

As shown in Table 6, after receiving the relaxation training, the average endurance of the knee and ankle muscles of the athletes in the experimental group is higher than that of the control group. Compared with the endurance value of the right knee joint (0.71 ± 0.13) of the control group, the endurance value of the experimental group is (0.83 ± 0.15). It can be found that the increase is obvious, which also shows that the athletes have obtained more durable muscle endurance and joint toughness after the relaxation training. In addition, it can also be found from table 6 that the endurance values of the knee joint and the ankle joint are significantly different between the groups (P < 0.05), and the difference and promotion effect are most obvious in the left joint.

DISCUSSION

Relaxation training, as a pre competition auxiliary relaxation method, has been applied to many sports events in recent years, but most of them remain in simple operation. More scientific and in-depth relaxation training methods still need to be popularized. Relaxation training covers a variety of technical operations, of which the main purpose is to use muscle relaxation training to relieve muscle tension and psychological anxiety of athletes. From the physiological point of view, sprint sports are characterized by strong explosive force, short time, high intensity and high load, so more energy is needed to supply the body for sports. In the principle of muscle glycogen in muscle cells can be oxidized and decomposed to generate energy, but muscle tension reduces the rate of muscle glycogen decomposition, the accumulation of cell metabolites, and anaerobic breathing generates more lactic acid. Therefore, Improving the muscle endurance and relaxation level is a good way to solve these problems.

Through the statistical analysis of the relevant parameters of muscle endurance of Sprinters in this study, it is found that after a period of relaxation training, there are significant differences in the peak torque of ankle joint and the antagonistic / active muscle ratio of knee joint when the joint angular velocity of sprinters is 60 (°) / s or 240 (°) / S (P < 0.05). This is because sprinters mainly rely on the cooperation of knee joint and ankle joint, The muscle relaxation rules for the above parts keep the muscles in a relatively relaxed state, thus improving the maximum strength of the flexor and extensor muscles of the knee and ankle joints, and strengthening the explosive force and endurance of the muscles. Therefore, the peak torque of the ankle joints and the ratio of the antagonistic / active muscles of the knee joints of the athletes have increased after the experiment. The improvement of muscle endurance in the experimental group more directly shows the important role of relaxation training in promoting the muscle quality of sprinters.

Table 5. Antagonistic / active muscle ratio of knee joint and ankle joint of athletes (x ± s, n = 40).

Category	Angle speed (°)/s	Knee joint		Ankle joint	
		Left	Right	Left	Right
Control group	60	0.51±0.12	0.54±0.11	0.27±0.05	0.25±0.04
test group		0.61±0.12	0.64±0.15	0.28±0.07	0.27±0.08
P		<0.05	<0.05	>0.05	>0.05
Control group	240	0.56±0.23	0.56±0.28	0.21±0.15	0.20±0.11
test group		0.61±0.12	0.63±0.13	0.26±0.11	0.25±0.12
P		<0.05	<0.05	>0.05	>0.05

Table 6. Comparison of mean muscle endurance of knee joint and ankle joint of subjects (x ± s, n = 40).

Category	Knee joint		Ankle joint	
	Left	Right	Left	Right
Control group	0.75±0.07	0.71±0.13	0.88±0.05	0.91±0.14
test group	0.81±0.19	0.83±0.15	0.91±0.17	0.95±0.01
P	<0.01	<0.05	<0.01	<0.05

CONCLUSION

From the experimental results of this study, it can be seen that the corresponding relaxation training before exercise is conducive to improving the muscle relaxation degree and technical level of athletes, and this positive promotion effect can be positively transferred in different sprint sports, and becomes more obvious with the increase of sprint distance. Therefore, to improve the athletic level of track and field athletes, it is necessary to give priority to the muscle relaxation training method and breathing regulation method in the training, and comprehensively improve the muscle quality and technical level of athletes from the aspects of energy consumption, muscle quality and technical movements. Therefore, in daily sports training, it is not only necessary to improve the muscle strength of the flexors and extensors of the relevant joints to make them have better stability and coordination, but also to avoid the misunderstanding of traditional training habits, and define relaxation training as simple knee elbow ankle joint movement; In addition, according to the different types of sports, we should choose the relaxation training methods, and teach students according to their aptitude to meet their sports characteristics; It is also extremely important to determine the time of relaxation training in sports. The same relaxation method has different effects on athletes before and after sports. In a word, it is of great significance to grasp the time and mode of relaxation training to promote the development of athletes' muscle and technical level.

ACKNOWLEDGEMENT

This paper was supported by Heilongjiang young teacher training project.

All authors declare no potential conflict of interest related to this article

AUTHORS' CONTRIBUTIONS: The author has completed the writing of the article or the critical review of its knowledge content. This paper can be used as the final draft of the manuscript. Every author has made an important contribution to this manuscript. Li Shubao: writing and execution. Han Dong: data analysis and article reviews.

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