

RESEARCH ON THE APPLICATION OF SPORT DANCE IN COLLEGES AND UNIVERSITIES IN THE HEALTHY DEVELOPMENT OF SPORTS



ORIGINAL ARTICLE
ARTIGO ORIGINAL
ARTÍCULO ORIGINAL

PESQUISA SOBRE A APLICAÇÃO DA DANÇA ESPORTIVA NAS UNIVERSIDADES NO DESENVOLVIMENTO SAUDÁVEL DOS ESPORTES

ESTUDIO SOBRE LA APLICACIÓN DE LA DANZA DEPORTIVA EN LAS UNIVERSIDADES EN EL DESARROLLO SALUDABLE DE LOS DEPORTES

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ABSTRACT

Introduction: Immunity is closely related to health. When the body's immunity is strong, it is healthy. On the contrary, various diseases appear. Sports dance is an entertainment and fitness sports project that integrates sports, music, aesthetics, and dance, the body movement dance as the necessary content and two-person or collective exercises as the primary form of exercise. Studies have shown that long-term adherence to Tai Chi exercise can significantly increase the serum immunoglobulin IgA, IgG, and IgM levels. **Objective:** The paper explores the effect of physical dance exercise on serum immunoglobulin and T lymphocyte subsets of college students. **Methods:** The thesis randomly selected 16 male and female students in the first-grade physical dance optional course of public physical education as the experimental group. They performed physical dance exercises three times a week, 40 minutes each time, and the training intensity was controlled at a heart rate of 135-150 beats/min. Ten weeks; besides, 16 male and female students in the first grade were selected as the control group, and no physical dance exercise was performed; all the subjects were drawn from the elbow venous blood on an empty stomach at the same time before and after the experiment to measure serum immunoglobulin and T lymph Cell subpopulation content. **Results:** After ten weeks of sports dance training, the serum immunoglobulin IgG of both men and women in the experimental group increased significantly ($P < 0.01$), and the CD4+ % and CD4+/CD8+ ratio of T lymphocyte subgroups showed extremely significant and significant increases ($P < 0.01$, $P < 0.05$), serum IgM tended to increase, IgA, CD8+ % tended to decrease, but there was no significant change. **Conclusions:** Long-term physical dance exercise can improve the body's immune function. **Level of evidence II; Therapeutic studies - investigation of treatment results.**

Keywords: Immunoglobulins; T-lymphocyte subsets; Students; Immunity.

RESUMO

Introdução: a imunidade está estrechamente relacionado com a saúde. Quando a imunidade do corpo é forte este está sano. Em caso contrário, aparecem diversas enfermidades. A dança deportiva é um projeto de entretenimento e fitness que integra o esporte, a música, a estética e a dança, o movimento corporal como conteúdo necessário e os exercícios de duas pessoas ou coletivos como forma principal de exercício. Os estudos demonstraram que a adesão a longo prazo ao exercício de Tai Chi pode aumentar também os níveis séricos de imunoglobulina IgA, IgG e IgM. **Objetivo:** O artigo explora o efeito do exercício físico de dança em subconjuntos de imunoglobulina sérica e linfócitos T de estudantes universitários. **Métodos:** Para que a tese seja selecionada aleatoriamente, 16 ex-alunos e ex-alunas do curso optativo de dança física de primeiro grau de educação física pública como grupo experimental. Realizaram exercícios de dança física três vezes por semana, 40 minutos cada vez, e a intensidade do treinamento se controlou a uma frequência cardíaca de 135-150 batimentos/min. durante as semanas; além disso, se selecionar 16 alunos e alunas de primeiro grau como grupo de controle, o qual não realizou nenhum exercício físico de dança. A todos os sujeitos se les extrajou sangue venoso do cotovelo com o estômago vazio, durante, antes e depois do experimento para medir o conteúdo da subpopulação de células T e de imunoglobulina sérica. **Resultados:** Depois de dez semanas de treinamento de dança deportiva, a imunoglobulina IgG sérica de homens e mulheres no grupo experimental aumentou complementar ($P < 0,01$), e a proporção CD4+ % e CD4+/CD8+ de los subgrupos de linfócitos T mostrou incrementos extremadamente provados. ($P < 0,01$, $P < 0,05$), a IgM sérica tendió a aumentar, a IgA, CD8+ % tendió a diminuir, mas nenhum hubo cambio projetado. **Conclusiones:** El ejercicio de danza física a largo plazo puede mejorar la función inmunológica del cuerpo. **Nivel de evidencia II; Estudios terapéuticos: investigación de los results del tratamiento.**

Descritores: Imunoglobulinas; Subpopulações de linfócitos T; Estudantes; Imunidade.

RESUMEN

Introducción: la inmunidad está estrechamente relacionada con la salud. Cuando la inmunidad del cuerpo es fuerte éste está sano. En caso contrario, aparecen diversas enfermedades. La danza deportiva es un proyecto de entretenimiento y fitness que integra el deporte, la música, la estética y la danza, el movimiento corporal como



contenido necesario y los ejercicios de dos personas o colectivos como forma principal de ejercicio. Los estudios han demostrado que la adherencia a largo plazo al ejercicio de Tai Chi puede aumentar significativamente los niveles séricos de inmunoglobulina IgA, IgG e IgM. **Objetivo:** El artículo explora el efecto del ejercicio físico de danza en subconjuntos de inmunoglobulina sérica y linfocitos T de estudiantes universitarios. **Métodos:** Para la tesis se seleccionaron aleatoriamente a 16 alumnos y alumnas del curso optativo de danza física de primer grado de educación física pública como grupo experimental. Realizaron ejercicios de danza física tres veces por semana, 40 minutos cada vez, y la intensidad del entrenamiento se controló a una frecuencia cardíaca de 135-150 latidos/min. durante diez semanas; además, se seleccionaron 16 alumnos y alumnas de primer grado como grupo de control, el que no realizó ningún ejercicio físico de danza. A todos los sujetos se les extrajo sangre venosa del codo con el estómago vacío, durante, antes y después del experimento para medir el contenido de la subpoblación de células T y de inmunoglobulina sérica. **Resultados:** Después de diez semanas de entrenamiento de danza deportiva, la inmunoglobulina IgG sérica de hombres y mujeres en el grupo experimental aumentó significativamente ($P < 0.01$), y la proporción $CD4 + \%$ y $CD4 + / CD8 +$ de los subgrupos de linfocitos T mostró incrementos extremadamente significativos. ($P < 0.01$, $P < 0.05$), la IgM sérica tendió a aumentar, la IgA, $CD8 + \%$ tendió a disminuir, pero no hubo cambios significativos. **Conclusiones:** El ejercicio de danza física a largo plazo puede mejorar la función inmunológica del cuerpo. **Nivel de evidencia II; Estudios terapéuticos: investigación de los resultados del tratamiento.**

Descriptor: Inmunoglobulinas; Subgrupos de de linfocitos T; Estudiantes; Inmunidad.

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INTRODUCTION

At present, the research on sports dance in our country mostly focuses on improving mental health by sports dance, the promotion of body shape and the cultivation of aesthetic ability, and the improvement of artistic accomplishment. The research on the impact of sports dance training on the body's immune function is fundamental less reported. Therefore, this study aims to explore the impact of long-term moderate-intensity sports dance training on the body's immune function and provide a reference for the reform of college physical education.¹

METHOD

Research object

The thesis randomly selects 16 male and female students in the first-grade physical dance optional course in public physical education as the experimental group. Besides, 16 male and female students in the first grade are selected as the control group. The necessary conditions of the groups and the research objects are shown in Table 1. After asking about medical history and physical examination, it was confirmed that all the study subjects were healthy, free of endocrine and cardiovascular diseases.² During the experiment, the subjects did not perform other high-intensity exercises, and their daily routines and routines remained unchanged.

Research methods

The subjects performed a total of 10 weeks of moderate-intensity sports dance training, three times a week (every Monday, Wednesday, and Friday 17:00-18:00 exercise), each exercise time is 40 minutes (not including warm-up activities and final Relaxation

activities), choose the Latin dance Rumba and Cha the, and practice alternately between the two dances.³ We use the Finnish Polar telemetric heart rate monitor to monitor, and the exercise intensity is strictly controlled at a heart rate of 135 to 150 beats/min. The control group did not perform sports dance training, only ordinary training. Before and after the experiment, medical staff used vacuum EDTA tubes to draw 3 and 2 mL of fasting cubital venous blood before and after the experiment and the next morning. After treatment, they were sent to the hospital to determine T lymphocyte subsets and immunoglobulins IgA and IgG, IgM content.

The main instruments include BT224 semi-automatic biochemical analyzer, LIX-II centrifugal precipitation machine; HHS electric heating constant temperature water bath; FACS Calibur flow cytometer.

Index test: Serum immunoglobulins IgM, IgG, IgA content are measured by the BT224 semi-automatic biochemical analysis instrument made in Italy by the immunoturbidimetric method; T lymphocyte subgroups $CD4+$ and $CD8+$ are measured by the FACS Calibur flow cytometer of BD company in the United States for two-color immunity Fluorescence determination, the experimental reagents are imported from the US CALTA company.⁴

Connection restoration and mathematical model establishment of limb movement model

According to the relationship between the angle change of the upper and lower leg and time, the functional relationship between the upper and lower leg angles can be calculated.⁵ In this way, three representative models can be obtained as shown in equations (1) to (3). (Figure 1)

The correlation function relationship obtained by the fitted curve is as follows:

Thigh function over time:

$$\begin{aligned}
 Y = & 0.1819 + 0.1919 \cos(579.3T) + 0.2226 \sin \\
 & (579.3T) + 0.08284 \cos(2 \times 579.3T) + 0.02762 \sin(2 \times \\
 & 579.3T) + 0.03129 \cos(3 \times 579.3T) - 0.0297 \sin(3 \times \\
 & 579.3T) + 0.004242 \cos(4 \times 579.3T) - 0.01342 \sin(4 \times 579.3T)
 \end{aligned}
 \tag{1}$$

Table 1. The necessary physical condition of research subjects.

Group	gender	n/ people	Age / year old	Height/cm	Weight/kg
Control group	male	16	19.12±0.56	172.32±2.34	63.90±3.56
	Female	16	18.87±0.75	161.66±4.35	52.85±2.65
Test group	male	16	19.69±1.14	171.67±2.66	61.90±2.86
	Female	16	19.67±0.52	162.87±5.15	53.97±4.18

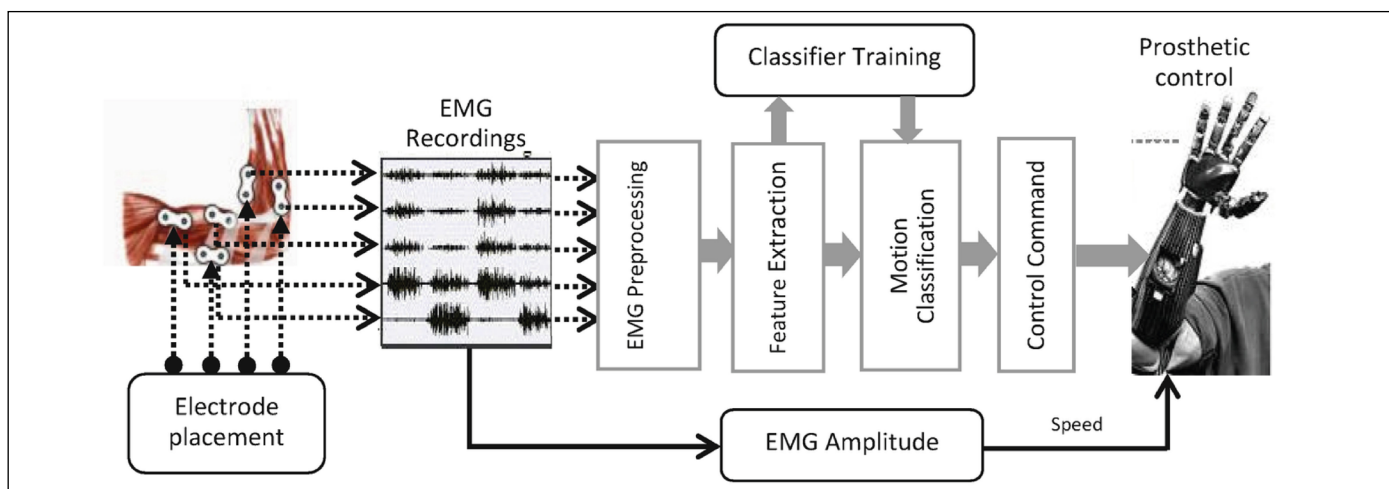


Figure 1. Realization of the mathematical model of limb movement.

The function of the calf changes over time:

$$\begin{aligned}
 Y = & -13.4 - 11.75 \cos(270.2\theta) - \\
 & 19.43 \sin(270.2\theta) + 7.047 \cos(2 \times 270.2\theta) - \\
 & 12.66 \sin(2 \times 270.2\theta) + 6.151 \cos(3 \times 270.2\theta) - \\
 & 0.4925 \sin(3 \times 270.2\theta) + 0.8817 \cos(4 \times 270.2\theta) \\
 & + 0.9528 \sin(4 \times 270.2\theta)
 \end{aligned} \quad (2)$$

The calf changes with the angle of the thigh:

$$\begin{aligned}
 Y = & 630900 - 841500 \cos(0.08452\theta) + \\
 & 7958 \sin(0.08452\theta) + 210600 \cos(2 \times 0.08452\theta) - \\
 & 3969 \sin(2 \times 0.08452\theta)
 \end{aligned} \quad (3)$$

Statistical methods

All data were statistically processed with SPSS14.0 for windows, and each group of data was expressed by the mean \pm standard deviation.⁶ The significant difference was compared by paired T-test, and the significance level was $P < 0.01$.

RESULTS

Comparison of serum immunoglobulin before and after training

It can be seen from Table 2 that the serum IgG concentrations of men and women after ten weeks of moderate-intensity sports dance training were higher than those before the experiment, and the difference was extremely significant ($P < 0.05$). There was no significant difference in IgG, IgA, IgM before and after training ($P > 0.05$); there was no significant difference in IgG, IgA, IgM before and after the control group ($P > 0.05$).

Table 2. Changes of serum immunoglobulin before and after ten weeks of moderate-intensity sports dance.

Group	Gender	Control group		Test group	
		Male	Female	Male	Female
n/person		16	16	16	16
IgG	Before the experiment	11.54 \pm 1.85	11.48 \pm 1.94	11.52 \pm 1.96	11.51 \pm 2.03
	After the experiment	11.66 \pm 1.98	11.52 \pm 2.06	12.01 \pm 2.00 ¹⁾	12.02 \pm 2.04 ¹⁾
IgA	Before the experiment	2.18 \pm 0.58	2.19 \pm 0.52	2.17 \pm 0.62	2.19 \pm 0.43
	After the experiment	2.17 \pm 0.63	2.18 \pm 0.74	2.16 \pm 0.49	2.15 \pm 0.69
IgM	Before the experiment	1.31 \pm 0.42	1.32 \pm 0.26	1.30 \pm 0.47	1.30 \pm 0.30
	After the experiment	1.32 \pm 0.34	1.33 \pm 0.29	1.33 \pm 0.32	1.34 \pm 0.30

Compared with before experiment, $P < 0.01$; 2) Compared with before experiment, $P < 0.05$.

Comparison of changes in T lymphocyte subsets before and after training

It can be seen from Table 3 that after ten weeks of sports dance training, the serum CD4⁺% increased significantly ($P < 0.05$). There was no significant difference in the ratios of CD4⁺, CD8⁺, CD4⁺/CD8⁺ between males and females before and after ten weeks of physical dance exercise ($P > 0.05$); there was no significant difference in the ratios of CD4⁺, CD8⁺, CD4⁺/CD8⁺ in the control group ($P > 0.05$).

Table 3. Changes of T lymphocyte subsets in 10 weeks of moderate-intensity sports dance training.

Group	Gender	Control group		Test group	
		Male	Female	Male	Female
n/person		16	16	16	16
CD4 ⁺	Before the experiment	45.82 \pm 5.65	45.58 \pm 4.93	45.70 \pm 5.51	45.69 \pm 5.08
	After the experiment	45.93 \pm 4.87	45.75 \pm 5.02	47.65 \pm 4.12 ¹⁾	47.63 \pm 4.65 ¹⁾
CD8 ⁺	Before the experiment	46.57 \pm 6.84	46.53 \pm 6.34	46.55 \pm 7.21	46.56 \pm 6.79
	After the experiment	46.44 \pm 7.95	46.75 \pm 8.02	46.27 \pm 8.10	46.24 \pm 7.42
CD4 ⁺ /CD8 ⁺	Before the experiment	1.03 \pm 0.25	1.03 \pm 0.31	1.02 \pm 0.29	1.03 \pm 0.31
	After the experiment	1.04 \pm 0.31	1.04 \pm 0.29	1.08 \pm 0.29 ²⁾	1.08 \pm 0.32 ²⁾

1) Compared with before experiment, $P < 0.01$; 2) Compared with before experiment, $P < 0.05$.

DISCUSSION

The impact of 10 weeks of moderate-intensity sports dance training on immunoglobulin

Exercise is a form of stimulation to the body and can also be seen as stimulation to regulate the body's immune function. Studies have shown that long-term high-intensity exercise training can reduce the body's immune function. Generally speaking, aerobic exercise helps to improve the immune function of the body. However, there are different reports on aerobic exercise's impact on the body's immune globulin content. Some people believe that long-term aerobic training will increase the body's IgG, IgA, and IgM levels and increase immune function. Some scholars reported that the IgG, IgM, and IgA levels in ordinary women's blood increased or remained unchanged immediately after exercising for 45 minutes under the intensity of 65% VO₂max. It is also believed that moderate exercise training seems to have little or no effect on these immune indicators. There are also reports that exercise makes it increase. Some scholars have shown that after 12 weeks of aerobic exercise, the serum IgA and IgM levels of those who participate in aerobic exercises three times a week are slightly higher than those of the control group. Still, there is no difference from the control group. Significant ($P > 0.05$). The results of some scholars have shown that: ordinary female college

students have an upward trend after ten weeks of moderate-intensity (150 times/min<HR<HR), and IgA has a downward trend, but there is no significant difference ($P>0.05$), suggesting that ten weeks of physical education Dance exercise improves the body's immune capacity, reduces the body's morbidity, and improves the body's health.

The effect of 10 weeks of moderate-intensity sports dance training on T lymphocyte subsets

Human T lymphocytes are a multifunctional cell population. According to their membrane antigens, T cells are divided into several subgroups with monoclonal antibodies. Among them, CD4⁺ cells and CD8⁺ cells are the two main subgroups of T lymphocytes. CD4⁺ is a helper T cell, which assists and induces immune response; CD8⁺ is an inhibitory T lymphocyte, which has an inhibitory or killing effect in the immune response. The ratio of CD4⁺/CD8⁺ represents the overall immune balance level. The change in the ratio will cause the body's immune dysfunction or immune disease. Most current studies have shown that high-intensity or exhaustive exercise can cause a decrease in the total number of T lymphocytes, a decrease in CD4⁺/CD8⁺, a decrease in the body's immunity, and an increase in the possibility of infection; moderate-intensity or perennial adherence to appropriate exercise can make T Lymphocytes and their subpopulations present positive immune responses. Some scholars have studied middle-aged men who have persisted in exercise (medium-intensity exercise) for more than ten years. It has been shown that the number of CD4⁺ and CD8⁺ and CD4⁺/CD8⁺ of long-term moderate-intensity exercise for more than ten years has not changed significantly. Still, the body's overall immune capacity is improved. The reason may be that other immune cells have been affected, and many related factors have played a positive role. Some scholars studied the changes in the cellular and humoral immune response of female gymnasts and untrained women after training.

After running training, the blood samples collected by subjects at two h and 24h were analyzed. The results showed that training resulted in T lymphocytes. CD4⁺, CD8⁺ increased significantly. Some scholars have reported that the elderly who have exercised Tai Chi for many years and those of the same age who have not exercised the habit of exercise for 25 minutes, the elderly who have exercised Tai Chi for many years show an increase in the percentage of CD3⁺ and CD4⁺ cells, an increase in the ratio of CD4⁺/CD8⁺, and the body's immunity enhanced. They believe that this result is related to the fitness characteristics of Tai Chi and the changes in hormones in the body. Some scholars studied the

effects of low- and medium-load exercise on psychologically stressed rats' immune function and found that the serum CD4⁺ and CD8⁺ in the psychological stress group at eight weeks did not change significantly. Still, there was a downward trend, and the body's immunity decreased. The number of CD4⁺ in the "exercise stress" group was significantly increased, and the effect on CD8⁺ was not significant, which improved the body's immunity. Although the above studies have different changes in T lymphocyte CD4⁺ and CD4⁺/CD8⁺, there is no change or increase related to exercise duration, exercise intensity, exercise form, and other factors, but generally has the same effect. That is, moderate exercise can improve the body's immunity. This study showed that after ten weeks of moderate-intensity sports dance exercise, the percentage of CD4⁺ increased significantly ($P<0.01$), and CD8⁺ had a downward trend, but there was no significant significance. The ratio of CD4⁺/CD8⁺ increased significantly ($P<0.05$). There is no gender difference in indicators, suggesting that CD4⁺ and CD8⁺ have nothing to do with gender. Ten weeks of sports dance training help improve the body's immunity and improve its ability to resist diseases. The appearance of this change may be related to the following reasons.

Studies have shown that low-load exercise cannot increase β -EP, and β -EP participates in exercise-induced immunosuppression. The more β -EP is released, the deeper the body's immune suppression. The change of β -EP content was negatively correlated with the change of CD4⁺ T cells and the change of CD4⁺/CD8⁺ ratio.

CONCLUSION

The results of this experiment show that the ratio of CD4⁺ and CD4⁺/CD8⁺ increases after physical dance exercise. It is speculated that this may be related to the fact that moderate exercise did not cause the increase β -EP content. Besides, long-term moderate training causes lymphocytes to be repeatedly exposed to the hormones that inhibit them. The number and sensitivity of the hormone receptors on the surface of lymphocytes decrease, making lymphocytes insensitive to hormones' inhibition is manifested by the body's immune function enhanced.

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