

AEROBIC CAPACITY-BASED FITNESS TRAINING IN CHEERLEADERS



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TREINO DE APTIDÃO FÍSICA BASEADO NA CAPACIDADE AERÓBICA EM ANIMADORAS DE TORCIDA

ENTRENAMIENTO DE APTITUD FÍSICA BASADO EN LA CAPACIDAD AERÓBICA EN ANIMADORAS

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ABSTRACT

Introduction: The popularity of the sport, of cheerleading has become increasingly relevant although scientific knowledge and specific fitness training programs still lack formal research. **Objective:** Establish a scientific fitness training system based on aerobic capacity by exercise oxygen consumption in cheerleaders. **Methods:** Female college students in the final-year College of Physical Education cheerleading club were randomly divided into groups for training experiment at 60% and 80% aerobic capacity. The maximum oxygen consumption of the volunteers determined the trial standard. The experiment lasted 6 weeks, with 60-minute interventions three times a week. The results of the fitness tests performed before and after the intervention were statistically analyzed and discussed. **Results:** Exercise at an index of 80% VO₂max demonstrated a better ability to improve overall fitness. Still, some deviations were observed regarding improved physical quality in cheerleaders. **Conclusion:** The scientific system of physical training can be established, demonstrating that fitness training based on aerobic capacity in cheerleaders can effectively improve physical training, especially with the index at 80% VO₂max. **Level of evidence II; Therapeutic studies - investigation of treatment outcomes.**

Keywords: Physical Fitness; Endurance Training; Physical Conditioning, Human.

RESUMO

Introdução: A popularidade do esporte de animação de torcida tem se tornado cada vez mais relevante embora o conhecimento científico e os programas de treinamento específicos de aptidão física ainda careçam de pesquisas formais. **Objetivo:** Estabelecer um sistema científico de treinamento de aptidão física baseado na capacidade aeróbica pelo consumo de oxigênio do exercício nas animadoras de torcida. **Métodos:** As alunas universitárias do clube de animadoras de torcida do Colégio de Educação Física do último ano de faculdade foram divididas aleatoriamente em grupos para experimento de treino em 60% e 80% de capacidade aeróbica. O consumo máximo de oxigênio das voluntárias determinou o padrão de julgamento. O experimento durou 6 semanas, com intervenções de 60 minutos, três vezes por semana. Os resultados dos testes de aptidão física efetuados antes e após a intervenção foram analisados estatisticamente e discutidos. **Resultados:** O exercício com índice de 80% VO₂max demonstrou uma melhor capacidade para aprimorar a aptidão física geral. Ainda assim, foram observados alguns desvios em termos de melhoria da qualidade física nas animadoras de torcida. **Conclusão:** O sistema científico de treinamento físico pode ser estabelecido, demonstrando que o treino de aptidão física baseado na capacidade aeróbica das animadoras de torcida pode efetivamente melhorar o treinamento físico, principalmente com o índice a 80% VO₂max. **Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.**

Descritores: Aptidão Física; Treino Aeróbico; Condicionamento Físico Humano.

RESUMEN

Introducción: La popularidad del deporte de las animadoras ha adquirido cada vez más relevancia, aunque los conocimientos científicos y los programas específicos de entrenamiento físico aún carecen de investigación formal. **Objetivo:** Establecer un sistema científico de entrenamiento físico basado en la capacidad aeróbica mediante el consumo de oxígeno del ejercicio en animadoras. **Métodos:** Estudiantes universitarias del club de animadoras de la Facultad de Educación Física en su último año de universidad fueron divididas aleatoriamente en grupos para el experimento de entrenamiento al 60% y 80% de capacidad aeróbica. El consumo máximo de oxígeno de los voluntarios determinó la norma del ensayo. El experimento duró 6 semanas, con intervenciones de 60 minutos tres veces por semana. Se analizaron y discutieron estadísticamente los resultados de las pruebas de aptitud física realizadas antes y después de la intervención. **Resultados:** El ejercicio con un índice del 80% del VO₂máx demostró una mayor capacidad para mejorar la aptitud física general. Aun así, se observaron algunas desviaciones en cuanto a la mejora de la calidad física de las animadoras. **Conclusión:** Se puede establecer el sistema científico de entrenamiento físico, demostrando que el entrenamiento físico basado en la capacidad aeróbica en animadoras puede mejorar eficazmente el entrenamiento físico, especialmente con el índice al 80% del VO₂máx. **Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.**

Descriptorios: Aptitud Física; Entrenamiento Aeróbico; Acondicionamiento Físico Humano.



INTRODUCTION

Cheerleading is a sports event integrating a variety of dance movements. It has a high artistic and ornamental value and is more and more popular in China. Therefore, the training and research of cheerleading is indispensable.¹ Cheerleading shows aesthetic characteristics through technical actions. It combines aerobic exercise with anaerobic exercise, and the proportion of aerobic exercise is relatively high. In high-level cheerleading events, athletes are required to have high physical coordination ability, and use professional and standardized technical actions to express different artistic styles.² Because the cheerleading project needs to complete all kinds of difficult movements within the specified time, and express different artistic characteristics. In the process of sports, the static and dynamic properties of muscles act alternately to maintain the use of limb movements, rotation, coordination, lifting, horizontal and vertical jumping and other technical actions, which has certain requirements on physical ability.³ Therefore, the physical training of cheerleading is particularly important.

The daily training of cheerleading is mainly composed of aerobic sports. Due to the diversity of Cheerleading Sports, in the daily training process, it is necessary to carry out physical training with different oxygen consumption according to the difficulty of different technical movements, so as to tap the physical talent of athletes and stimulate the upper limit of sports mobilization ability.^{4,5} According to the parameter value of oxygen consumption, this paper conducts high-intensity physical training for different links of the project, so as to make the body and psychology adapt. At the same time, to improve the sports performance as the goal, formulate a standardized sports training plan, can effectively improve the sports level and performance.⁶

METHOD

The research objective of this paper is to explore the influence of exercise oxygen consumption on the physical training of cheerleading. Therefore, in the selection of research objects, the research objects are required to have a certain Cheerleading Sports Foundation to prevent the research results from being too unfamiliar. On the other hand, the cheerleading level of the research object is in the middle of the state, and there is a high room for improvement, so as to facilitate the presentation of the research results. In view of these characteristics, this paper takes the female college students in the cheerleading club of the College of physical education as the research object, and selects 20 college students. The study and all the participants were reviewed and approved by Ethics Committee of Guangdong University of Finance & Economics (NO.2020GDUF056). Except for the different oxygen consumption of the two groups of athletes, the rest of the cheerleading training duration and training content are the same. The specific characteristics are shown in Table 1.

In this paper, four indicators of 400-meter running, vital capacity, push-ups, and sit-ups are selected as the basic physical fitness indicators of athletes. Seated leg kicks, group jumps, shoulder turns, lower bridges, horizontal forks, vertical forks left, and vertical forks right are selected in this paper. The common cheerleading movements such as, swallow balance, flexion and split jump are used as the standard for judging the physical fitness indicators related to cheerleading.

Table 1. Basic characteristics of 60% VO_{2max} group and 80% VO_{2max} group.

Basic conditions	60%VO _{2max}	80% VO _{2max}	T	P
Age	18.857 ±0.357	18.729 ±0.540	0.5733	0.5816
Height (cm)	169.807 ±3.770	156.636 ±3.822	-0.1959	0.8556
Weight (kg)	56.022 ±8.640	54.580 ±4.874	-0.1039	0.9555
VO _{2max} ml/(kg·min)	50.795 ±7.314	50.215 ±6.693	0.1191	0.4061

Before and after the start of the experiment, the two groups of athletes were tested on the relevant quality indicators, and after the 6-week training, the relevant indicators were measured again, and the data were sorted and analyzed.

RESULTS

The effect of cheerleading exercise with different oxygen consumption intensities

As shown in Table 2, after 6 weeks of training, the post-exercise energy expenditure of athletes in the 60% VO_{2max} group and the 80% VO_{2max} group was analyzed. As a periodic detection, the EPOC indicators were measured in three aspects: 0-10 minutes, 0-20 minutes, and 0-30 minutes after exercise, so as to analyze the changes in energy consumption.

It can be seen from Table 2 that in the 60% VO_{2max} group, the EPOC gradually increased from (3154.762 ± 403.355) ml/kg in 0-10 minutes to (3733.674 ± 625.118) ml/kg in 0-20 minutes, and then increased to (4121.150 ± 774.532) ml/kg for final 0~30 minutes. In the 80% VO_{2max} group, the EPOC gradually increased from (6047.515 ± 617.052) ml/kg in 0 to 10 minutes to (7044.951 ± 882.476) ml/kg in 0 to 20 minutes, and then increased to (7864.628) in 0 to 30 minutes. ±926.494) ml/kg. From the intra-group comparison, it can be seen that in the whole post-exercise recovery process, the energy consumed in 0-10 minutes accounts for the largest proportion, which is more than 75%; the energy consumption in 0-20 minutes accounts for about 90%. It can be seen that the rate of the EPOC value gradually decreases with the passage of time. Through the comparison between groups, it can be seen that the maximum energy consumption of the 60% VO_{2max} group is (4121.150 ± 774.532) ml/kg while the maximum energy consumption of the 80% VO_{2max} group is (7864.628 ± 926.494) ml/kg, and the maximum energy consumption of the 80% VO_{2max} group is (7864.628 ± 926.494) ml/kg. Energy expenditure was significantly higher than the 60% VO_{2max} group, and its ratio was about 2:1, much greater than the 4:3 ratio of 80%:60%. From this, it can be inferred that during exercise, with 80% VO_{2max} as the index of exercise oxygen consumption, a better level of energy consumption can be obtained.

The effect of different oxygen consumption cheerleading exercise on the physical function of athletes

In the process of research on physical fitness training of cheerleading sports, according to the characteristics of cheerleading sports, physical fitness is divided into two aspects: one is the basic physical fitness indicators represented by 400-meter running, lung capacity, push-ups, sit-ups, etc. On the other hand, cheerleading physical fitness indicators represented by seated leg kicks, group jumps, shoulder turns, lower bridges, cross forks, left vertical forks, right vertical forks, swallow balance, flexion and split jumps, etc. The basic physical fitness of the 60% VO_{2max} group and the 80% VO_{2max} group before the experiment is shown in Table 3.

After 6 weeks of training, the latest data on the basic physical fitness of the two groups of athletes are shown in Table 4.

Combining Table 3 and Table 4, the changes in the basic physical fitness indicators of the two groups of athletes before and after the

Table 2. Changes of EPOC values in 60% VO_{2max} group and 80% VO_{2max} group after 30 minutes of exercise (unit: ml/kg).

Time after exercise	60%VO _{2max}	ratio to maximum	80% VO _{2max}	ratio to maximum
0~10min	3154.762 ±403.355	76.55%	6047.515 ±617.052	76.90%
0~20min	3733.674 ±625.118	90.60%	7044.951 ±882.476	89.58%
0~30min	4121.150 ±774.532	100.00%	7864.628 ±926.494	100.00%

Table 3. Basic physical fitness of 60% VO_{2max} group and 80% VO_{2max} group before the experiment.

Test indicators	60%VO _{2max}	80% VO _{2max}	P
400m run(s)	77.413 ±11.434	77.777 ±10.364	0.0000
Lung capacity (ml)	3,218.331 ±608.813	3,024.327 ±789.491	0.0000
push-up(s)	39.146 ±3.659	38.095 ±5.329	0.0000
Crunches (pieces)	41.322 ±4.091	38.347 ±5.103	0.0000

Table 4. Basic physical fitness of 60% VO_{2max} group and 80% VO_{2max} group after the experiment.

Test indicators	60%VO _{2max}	80% VO _{2max}	P
400m run(s)	76.588 ±11.206	71.183 ±9.370	0.0000
Lung capacity (ml)	3,218.331 ±697.874	3,396.212 ±792.395	0.0000
push-up(s)	38.980 ±2.122	44.328 ±4.436	0.9119
Crunches (pieces)	40.489 ±2.799	45.120 ±5.471	0.0000

experiment can be obtained. Through the intra-group comparison, it can be seen that the athletes in the two groups have achieved significant improvements in the four indicators of 400-meter running, lung capacity, push-ups, and sit-ups. It can be seen from the comparison between groups that the athletes in the 80% VO_{2max} group have significantly higher levels of improvement in the four indicators than the 60% VO_{2max} group. Therefore, in the same training period, the exercise oxygen consumption is set to 80% VO_{2max}. The effect is better.

Table 5 shows the physical fitness of cheerleading in the 60% VO_{2max} group and the 80% VO_{2max} group before the experiment.

After 6 weeks of training, the latest data on the physical fitness of the two groups of athletes is shown in Table 6.

Combining Table 5 and Table 6, it can be concluded that the changes in the physical fitness indicators of the two groups of athletes before and after the experiment. Through the comparison within the group, it can be seen that in terms of improving the physical quality of cheerleading, after six weeks of training, most of the test indicators of the two groups have improved, which shows that active cheerleading training can effectively improve the performance. Athlete cheerleading expression skills. However, from the comparison between groups, it can be found that different movement indicators have different improvement in performance. Although in most cases, the improvement in the test indicators of the 80% group is higher than that of the 60% group, there are still some exceptions, such as the vertical fork movement. It can be seen that although the training effect of the 80% VO_{2max} group is better than that of the 60% VO_{2max} group in most aspects, there are still some deviations. Therefore, when choosing an appropriate exercise program, we cannot make arbitrary decisions, but choose an appropriate training method according to the specific action characteristics of cheerleading, so as to obtain better exercise training effects.

DISCUSSION

The shortcomings of cheerleading training

Cheerleading is mainly a performance in nature, is a new type of sports with the purpose of cheering. The cheerleading project has a strong emotional drive, and through energetic and passionate technical movements, it can improve the emotional atmosphere of the audience, which is exciting. However, most people default cheerleading as a female-focused dance event rather than a sport. Therefore, there is currently a lack of professional cheerleading course teaching, which leads to problems such as lack of personnel and imbalance of male and female ratios in the professional training and development of cheerleading projects.

Cheerleading is a sports event that has just emerged in recent years. At present, the number of relevant literature and professional teams in China is relatively scarce, and there is no unified formulation of relevant

Table 5. The physical quality of cheerleading in the 60% VO_{2max} group and the 80% VO_{2max} group before the experiment.

Test indicators	60%VO _{2max}	80% VO _{2max}	P
Seated leg kick (units)	32.625 ±1.284	32.299 ±1.363	0.0000
Body dance (s)	45.804 ±253.317	41.759 ±6.233	0.0000
Shoulder turn(cm)	50.448 ±22.834	61.293 ±27.330	0.2730
Lower bridge (cm)	52.522 ±4.834	55.007 ±26.368	0.0069
Cross fork (cm)	11.120 ±8.226	9.570 ±10.563	0.1039
Longitudinal fork left (cm)	3.292 ±2.715	3.117 ±3.371	0.0919
Longitudinal fork right (cm)	2.640 ±2.525	2.774 ±3.312	0.0010
Swallow Balance(s)	46.368 ±14.223	48.406 ±14.266	0.0010
Bend and Split Jump (cm)	119.469 ±11.771	113.048 ±19.520	0.0000

Table 6. The physical fitness of cheerleading in the 60% VO_{2max} group and the 80% VO_{2max} group after the experiment.

Test indicators	60%VO _{2max}	80% VO _{2max}	P
Seated leg kick (units)	32.793 ±0.998	36.580 ±1.890	0.0000
Body dance (s)	45.815 ±3.541	42.248 ±6.773	0.0000
Shoulder turn(cm)	48.191 ±22.855	50.956 ±27.766	0.0000
Lower bridge (cm)	49.293 ±14.474	54.075 ±26.490	0.0010
Cross fork (cm)	9.200 ±8.839	8.581 ±11.389	0.0436
Longitudinal fork left (cm)	3.989 ±2.178	3.254 ±3.925	0.0010
Longitudinal fork right (cm)	3.168 ±2.182	2.915 ±3.740	0.0020
Swallow Balance(s)	42.718 ±13.755	51.341 ±13.693	0.0059
Bend and Split Jump (cm)	121.724 ±12.058	119.662 ±8.519	0.0062

teaching materials. Therefore, learning can only be done through multiple channels. Due to the lack of personnel and resources, China has not established a complete system of cheerleading teaching and training, and there is still a certain gap between many domestic professional groups and international high-level groups. It is difficult to enrich the content of cheerleading training, and the development is in a bottleneck period.

Cheerleading physical fitness training methods

In the daily training process, it is necessary to focus on training related to muscle strength, so that athletes can accurately control the degree of muscle tightness. Do high-intensity training to increase muscle power. Improve athlete's muscle strength through high-intensity incremental strength training such as bench presses and squats. Effectively improve the ability of athletes to control their bodies. Scientifically formulate a training plan, so that the muscles of each part of the body can be trained accordingly.

Good sensitivity can enable athletes to complete various technical movements to a high standard. It is also a sign of core performance at the cheerleading athlete level. The athlete's agility is related to the activity of his own cerebral cortex and nervous system. Through daily sensitivity training, combined with diet and reasonable rest. Improve athlete's agility and reaction ability. Make your own technical level can be fully demonstrated.

CONCLUSION

Due to the lack of systematic and scientific teaching, cheerleading sports training has always been in an awkward position, and effective research is needed. In this paper, aiming at the index of exercise oxygen consumption, the training effect of physical fitness training of cheerleading is analyzed. The research results show that, on the basis of obtaining the students' maximum oxygen uptake, keeping the students' oxygen consumption at 80% of the maximum oxygen uptake during exercise can achieve relatively good exercise effects. Therefore, in the daily teaching, it is necessary to scientifically judge the load intensity of physical training, and adopt the method of combined training to improve the training effect.

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