IMPACTS OF AEROBICS AND CHEERLEADING ON HIGH SCHOOL STUDENTS

IMPACTOS DA GINÁSTICA AERÓBICA E LIDERANÇA DE TORCIDA EM ESTUDANTES DO ENSINO MÉDIO

IMPACTOS DE LA GIMNASIA AERÓBICA Y LAS ANIMADORAS EN LOS ESTUDIANTES DE SECUNDARIA

Original Article
Artigo Original
Artículo Original

Liying Chen[1]
(Physical Education Professional)

1. Xinxiang University, School of Physical Education, Xinxiang, Henan, China.

Correspondence:
Liying Chen
Xinxiang, Henan, China. 453000.
sptec13@163.com

ABSTRACT

Introduction: Aerobic gymnastics and cheerleading are two sports most high school students are familiar with. Cheerleading is a relatively new sport. Few academic studies are comparing the effects of aerobic training with cheerleading on changes in the fitness of female students in high school. Objective: This paper explores the impacts on fitness by comparing aerobic training and cheerleading in high school girls. Methods: 90 female high school students were selected by random sampling. The three groups of volunteers had their physical fitness measured before and after the test. The research analyzes the obtained data by employing mathematical statistics. Results: The content of protein, muscle, and inorganic salts in the aerobics group and cheerleading group was significantly higher than in the control group, and the obesity rate was significantly lower than the control group in both intervention groups. The percentage of protein, muscle, and lipid in the cheerleading group was the best among the three groups. Conclusion: Both cheerleading and aerobics can improve the physical quality of high school girls. Cheerleading had a good effect on improving physical fitness due to its wide range of movements. ***Level of evidence II; Therapeutic studies - investigation of treatment outcomes.***

Keywords: Gymnastics; Middle Schools; Girls; Physical Fitness.

RESUMO

Introdução: Ginástica aeróbica e liderança de torcida são dois esportes que a maioria dos estudantes do ensino médio conhecem. A liderança de torcida é um esporte relativamente novo. Há poucos estudos acadêmicos comparando os efeitos do treino aeróbico com a liderança de torcida referentes às alterações na condição física das alunas no ensino médio. Objetivo: Este artigo explora os impactos na aptidão física comparando o treino aeróbico e a liderança de torcida em jovens do ensino médio. Métodos: Selecionou-se 90 alunas do ensino médio por amostragem aleatória. Os três grupos de voluntárias tiveram sua aptidão física medida antes e depois do teste. A pesquisa analisa os dados obtidos empregando estatísticas matemáticas. Resultados: O conteúdo de proteínas, músculos e sais inorgânicos no grupo de aeróbica e no grupo líder de torcida foi significativamente maior do que no grupo controle, sendo taxa de obesidade significativamente menor ao grupo controle nos dois grupos de intervenção. O percentual proteico, muscular e lipídico no grupo dos líderes de torcida foi a melhor entre os três grupos. Conclusão: Tanto a liderança de torcida quanto a aeróbica podem melhorar a qualidade física das meninas do ensino médio. As líderes de torcida obtiveram um bom efeito na melhoria da aptidão física devido sua ampla gama de movimentos. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

***Descritores*:** *Ginástica; Ensino Médio; Meninas; Aptidão Física.*

RESUMEN

Introducción: La gimnasia aeróbica y las animadoras son dos deportes con los que la mayoría de los estudiantes de secundaria están familiarizados. Las animadoras representan un deporte relativamente nuevo. Hay pocos estudios académicos que comparen los efectos del entrenamiento aeróbico con el de las animadoras en relación con los cambios en la forma física de las estudiantes de secundaria. Objetivo: Este trabajo explora los impactos en la aptitud física comparando el entrenamiento aeróbico y las animadoras en chicas de secundaria. Métodos: Se seleccionaron 90 alumnas de secundaria por muestreo aleatorio. A los tres grupos de voluntarios se les midió su estado físico antes y después de la prueba. La investigación analiza los datos obtenidos empleando estadísticas matemáticas. Resultados: El contenido de proteínas, músculo y sales inorgánicas en el grupo de aeróbic y en el grupo de animadoras fue significativamente mayor que en el grupo de control, y la tasa de obesidad fue significativamente menor a la del grupo de control en ambos grupos de intervención. El porcentaje de proteínas, músculo y lípidos en el grupo de animadoras fue el mejor entre los tres grupos. Conclusión: Tanto las animadoras como el aeróbic pueden mejorar la calidad física de las chicas de secundaria. Las animadoras obtienen un buen efecto en la mejora de la condición física debido a su amplia gama de movimientos. ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

***Descriptores*:** *Gimnasia; Educación Secundaria; Chicas; Aptitud Física.*

DOI: http://dx.doi.org/10.1590/1517-8692202329012022_0465 Article received on 09/01/2022 accepted on 10/24/2022

INTRODUCTION

The Basic Standards for Physical Education in Colleges and Universities was officially released in June 2014. This standard takes students' physical quality as a significant indicator to measure the overall quality of secondary schools. Although aerobics and cheerleading started not long in China, it has developed rapidly. Many people are participating in aerobics and cheerleading sports. In recent years, gymnastics has become increasingly popular among young people due to its dynamic characteristics.[1] Aerobics is a sport. There is a widespread problem in general cognition regarding whether it can promote young people's physical fitness.

Cheerleading is a new comprehensive sport that integrates music, aesthetics, dance, and gymnastics. At present, cheerleading in physical education classes in middle schools in China has been listed as an essential content in middle schools.[2] Students can skillfully complete the corresponding technical operations by participating in the cheerleading team. The sport enhances physical fitness, improves moral character, and trains the will.

Cheerleading and aerobics are both sports that combine sports, music, and dance. The purpose of both sports is the pursuit of physical health and beauty. Cheerleading is divided into aerobic cheerleading and competitive cheerleading. Aerobics is divided into dance aerobics and technical aerobics.[3] Gymnastics makes aerobic cheerleading, aerobics, and other projects more suitable for middle school students due to the high-intensity characteristics of competition and technical movement projects. Students have widely adopted aerobics and cheerleading in middle school sports. Cheerleading is a relatively new sport. It can promote the formation of students' team spirit and sense of responsibility. In academic circles, it is rare to know the effect of aerobics and cheerleading in improving the physical quality of middle school students. Middle school students are a critical period of physical development. Physical activity during this time is beneficial for promoting students' physical and mental health. Therefore, this paper uses the comparative analysis method to explore the exercise effect of female students' cheerleading, aerobics, and other sports in junior high school. On this basis, this paper discusses the effects of aerobics and cheerleading on improving students' physique, bone density, and strength explosion.

METHOD

Research objects

In this paper, 90 junior high school girls were selected by random sampling. We also divided them into three groups. There are aerobics, cheerleading, and control groups.[4] The three groups of test subjects had their physical fitness measured before and after the test. The leading indicators of physical fitness include height, weight, body composition, bone strength of bones, muscle strength, etc. In this paper, SPSS 20.0 statistical software was used to carry out a single factor variance analysis of each sample. The study's results showed that the baseline data were insignificant except for exercise time. There was no significant difference in training time between the cheerleading team and the aerobics group. (Table 1)

Table 1. Between-group comparison of baseline data of study subjects.

	Aerobics group	Cheerleading group	Control group
n	**30**	**30**	**30**
Age	13.82±0.6	13.74±0.58	13.83±0.51
Height (cm)	169.97±2.1	170.26±2.98	169.16±3.8
Body mass (kg)	54.51±1.52	53.42±1.74	54.75±3.18
BIM	20.8±1.34	19.99±1.07	21.33±1.92
Training time (months)	4.59±1.36	4.54±1.33	-

Investigation method

The study is Purely observational studies which no need to registry ID of ICMJE, and all the participants were reviewed and approved by Ethics Committee of Xinxiang University, China (NO. 2022031)

According to the informed wishes of the patients, the subjects' height, body mass, body mass index, body composition, and muscle strength were measured in July 2020. Measure muscle strength: 1) In this paper, a 2 kg solid ball was used to measure the subjects' explosive force of the upper limbs. The subjects sat upright with their backs resting on the quilt. The measurer wraps the belt around the chest and tightens it. This prevents his back from coming off the seat during the blow. The subject pushes the sphere forward. This paper measures the distance between the sphere and the reference line three times, and the best score is taken as a sample. The unit is m. 2) This article uses the vertical long jump method to measure the strength of its legs. The subjects stood barefoot and kept their legs bent after the jump line. The subject swings his arms and lunges forward with full force. This article measures the distance from the jumper. 3) The subjects were supine with their legs crossed to measure the bursts of their lumbar and abdominal flexor groups. Subjects place their fingers behind their head and bend both knees 90°. The subject lay on the mat and then exerted abdominal force. He allowed himself to stand up straight until his elbows touched his knees. This article calculates the rate per minute. 4) Subjects measured the explosive force of the lumbar and posterior muscles with a goat stand-up. The subject clasped both hands in front of their chest. Lie on your back on the push-pull machine and lean forward 90°. The subject then returned to the starting position while keeping the spine straight. Measure the number of times its 1min is completed. The unit is times/min. In this paper, GE's Lunar Prodigy dual-energy X-ray absorptiometry was used. The bone mineral density of the subjects' upper extremity bones, lower extremity bones, ribs, spine, and hip bones were determined herein. Before the experiment, the author communicated with the subjects' parents by telephone and obtained the approval of both parties.

3D visual positioning of gymnastics movements

Advancement and improvement of sports programs

After the preprocessing of the gymnastics movement data is completed, each point in the gymnastics picture is projected onto each picture of the three-dimensional movement. This paper performs corresponding operations on the captured data.[5] In this paper, the projection planning from the gymnastics screen is carried out. The aim is to reduce the complexity of the gymnastics picture. The gymnastics motion picture must be discarded if it meets the following conditions.

(1) The gymnastics image projection is calculated on the key screen in this paper. Assuming that the position of the gymnastics image does not belong to the critical picture, its position is discarded. (2) In this paper, the distance between the gymnastics image and the adjacent feature points is obtained, and the optimal position is selected. If the 3D vision system can obtain the matching relationship between the 3D gymnastics action image points and the RGB pixel points, the camera pose ξ can be estimated. In this paper, the residual function is used to estimate the posture of gymnastics. The residual function is expressed as:

$$s = (s_\alpha, s_\beta, s_k)^T \quad (1)$$

s_ω, s_β is the remnant of gymnastics screen coordinates. s_k is the residual distance between the gymnastics image and the adjacent feature points. The calculation formula of the error between the calculated value and the predicted value of the gymnastics action image point is as follows:

$$s = (s_\alpha, s_\beta, s_k)^T = [\alpha, \beta, k] - \Pr\, pj(\exp(\xi)\sigma) \quad (2)$$

The best case is when the remaining amount is 0. This paper uses the residual function of least-weight gymnastics images to remove noise in gymnastics images.[6] The residuals can be distributed according to the probability model $\sigma(s \mid \xi)$. This paper uses the residual function of the least weighted gymnastics action image to estimate the camera's pose. The expression is:

$$\xi = \arg_{\xi} \min \sum_{i=1}^{n} q_i s_i^T \sum^{-1} s_i \quad (3)$$

q_i represents a weight that reduces residual effects. s_i is the error rate factor. The lower the value of s_i, the more accurate the gymnastics positioning result of 3D vision is.

Database technology of gymnastics 3D visualization

This paper analyzes the stereo vision positioning of gymnastics. At the same time, the structure of the gymnastics library is established in this paper, and then the action matrix of gymnastics is obtained. This paper calculates the matrix to obtain the eigenvectors and eigenvalues of gymnastics movements. In this paper, the three-dimensional visualization of the movement is realized by solving the characteristic vector of the gymnastics movement.[7] Adding gymnastics motion data can increase the variety of motions. This is good preparation for the decomposition of the 3D image.

$$DT = (G_1, G_2, \ldots, G_M) \quad (4)$$

Where G' represents each movement of gymnastics. The M frame data of gymnastics can be set as:

$$G' = (L_1, L_2, \ldots, L_M)^T \quad (5)$$

Where L_1, L_2 G' represents the data difference between the first and second frames of gymnastics. L_M represents frame M of the movement, setting the average gymnastics movement:

$$\varphi = \frac{1}{M} \sum^{M} L \quad (6)$$

Here A includes the total number of frames in the sequence of gymnastics operations. This article sets the operation matrix:

$$R = \frac{1}{M} \sum^{M} k \quad (7)$$

$k' = L - \varphi$ represents the difference between gymnastics movements and average movements. The eigenvalue θ_1, θ_2,..., θ_M and eigenvector α_1, α_2,..., α_M corresponding to the corresponding movement of the gymnastics matrix A are obtained by the operation of equation (7). At this time, this article sets the reserved information for gymnastics, and its expression is:

$$\gamma = \frac{\sum^{M} \theta}{\theta} + W \quad (8)$$

Data Analysis

This paper uses SPSS20.0 statistical software to analyze the test results. In particular, this paper uses descriptive statistics to obtain the basic statistics of the indicators related to the subjects.[8] This paper uses the Bonferroni method in one-way ANOVA to make multiple comparisons between different groups. P<0.05 was considered a significant difference.

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

RESULTS

The contents of protein, muscle, and inorganic salts in the aerobics and cheerleading groups were significantly higher than those in the control group (P<0.05). The obesity rate of the two exercise groups was significantly lower than that of the control group (P<0.05). And the percentage of protein, muscle, and fat in the cheerleading group was the best among the three groups (P<0.05). The density of hip bones in the cheerleading and aerobics groups was significantly higher than in the control group (P<0.05). In the cheerleading group, the gluteal bone increased the most (P<0.05). The explosive strength of the lower limb muscles of the cheerleading team and the aerobics group was significantly higher than that of the control group (P<0.05). The cheerleading group was also significantly higher in the cheerleading group compared to the upper limbs, lower limbs, lumbar abdominal flexors, lumbar dorsi flexors, and lumbar extensor muscles (P < 0.05). The increase in explosive power was the largest among the cheerleading teams (P < 0.05). (Table 2, Table 3, Table 4).

DISCUSSION

Aerobics or cheerleading training are all aerobic exercises. The body's fat is completely oxidized only when the oxygen supply is sufficient. In addition, some experiments have shown that aerobic exercise can increase insulin and leptin levels in the human blood. The former can speed up the breakdown of blood sugar. Insulin can promote gluconeogenesis of fat. The latter can promote the degradation of adipose tissue and thus reduce the body's fat content.

A large number of investigations show that good aerobics and cheerleading can improve the bone strength of the human body. The contraction of the muscle causes mechanical tension in the bone and also affects the mechanical state of the bone itself. This promotes the activity of osteoblasts and leads to increased bone density.

Table 2. Basic statistics and F test of the percentage of subjects' constitution.

Group	Fat	Protein	Muscle	Inorganic salt
Aerobics group	19.55±3.49	16.79±1.92	33.53±2.03	5.46±0.64
Cheerleading group	18.57±2.21	18.26±1.65	35.57±1.4	5.59±0.5
Control group	25.17±4.15	13.76±2.01	30.79±2.18	5.2±0.53

Table 3. Bone Mineral Density and F-Tests in Parts of Subjects.

Index	Aerobics group	Cheerleading group	Control group
upper limb bone	0.75±0.06	0.76±0.05	0.74±0.05
Lower extremity bones	0.95±0.05	0.97±0.07	0.95±0.04
Rib cage	0.63±0.05	0.63±0.06	0.61±0.05
spine	0.96±0.17	0.99±0.18	0.94±0.13
Hip bone	1.07±0.13	1.1±0.15	1.03±0.14

Table 4. Muscle power and F test of different parts of the subjects.

Index	Aerobics group	Cheerleading group	Control group
upper limb muscles/m	4±1.41	4.61±1.06	3.53±1.95
Lower extremity muscles/cm	178.35±12.7	185.82±11.19	173.69±16.24
Lumbar flexor	36.97±7.24	41.11±5.9	34.54±7.58
Low back extensors	30.57±4.88	32.56±3.39	29.35±4.7

Cheerleading exercise can promote the muscles of upper and lower limbs, waist and abdomen flexors, and waist and back extensors of middle school students. Its effect on the enhancement of lower limb muscle strength is not apparent. Comparing the technical characteristics of the two sports shows that the cheerleading team is superior to aerobics in terms of intensity, complexity, and difficulty.[9] The burst strength of a muscle is generally the sum of the muscle contraction rate and the contraction rate. Muscle contraction rate and contractility are related to different muscle fiber types.

Compared with aerobics, cheerleading has a noticeable effect on improving female middle school students' flexibility, explosiveness, and endurance. The action prescriptions of aerobics and cheerleading are composed of three parts: preparation, primary and final. The preparation part focuses on aerobic fitness training. Training intensity and duration are comparable to aerobic endurance training. Basic jobs have not changed significantly either. Its main action is stretching. The base composition differed considerably in the two different exercise prescriptions. Aerobics is carried out according to the structure of the human body. Its movements are mainly based on basic postures and hand postures. The whole exercise method is straightforward.[10] Aerobics can exercise the neck, shoulders, waist, abdomen, legs, and other parts to improve cardiopulmonary function. The whole set of cheerleading movements includes high-difficulty dance steps such as bare-handed, balanced, twisted, and jumped. Compared with aerobics, dancing and cheerleading is a form of strength that is "fast, accurate, and controlled." The footwork changes quickly, and the movement is smooth. This sport has high demands on the control of the human body. The movements are mainly in the air, landing, and cushion movements. Its multi-level spatial transformation helps to enhance the human body's ability to withstand. Compared with aerobics, cheerleading has the characteristics of high intensity, serious difficulty, and high physical fitness. Long-term cheerleading practice can significantly improve students' speed, endurance, flexibility, and bounce quality. For example, cheerleading can increase stamina. Multiple high jump exercises can enhance the explosiveness and bouncing of lower limbs so that the standing long jump performance of female junior high school students can be significantly improved. Flexibility and balance stretch during exercise is good for training self-mobility. It is beneficial to the forward flexion performance of the athlete in the sitting position.

The students who participated in the cheerleading team performed better on the physical fitness test than the students who did not participate in the cheerleading team. Experiments show that cheerleading teams can improve the physical quality of young students in China. This sport can improve students' physical ability and protect their physical health. Cheerleading teams enable students to develop more in various sports in the school. The sport also injected new ideas into physical education teaching in junior high schools. This article clarifies the impact of cheerleading team sports on students' physical and mental health. The application of cheerleading in the physical education system of junior high school is described. Currently, the proportion of women in cheerleading teams is relatively high, while the proportion of men is relatively low. This is closely related to the plan formulation and the trainees' self-awareness. In the teaching process of the cheerleading team, challenging sports such as lifts and throws can be set up. This will allow more male trainees to participate and enhance their physical fitness.

CONCLUSION

The contents of protein, muscle, and inorganic salts in the aerobics and cheerleading groups were significantly higher than those in the control group. The obesity rate in the two exercise groups was significantly lower than in the control group. And the percentage of protein, muscle, and fat in the cheerleading group was the best among the three groups. The density of hip bones was significantly higher in the cheerleading and aerobics groups than in the control group. In the cheerleading group, the bone mass of the hip bone increased the most. The explosive strength of the lower body muscles of the cheerleading team and the aerobics group was significantly higher than that of the control group. The upper and lower extremities, lumbo-abdominal flexors, lumbar dorsi flexors, and lumbar extensor muscles were also significantly higher in the cheerleading group. The most significant increase in explosiveness among the cheerleading teams. Aerobics or cheerleading can improve the physique of middle school students and their bone strength and strength. On the whole, the intervention effect of the cheerleading team is better than that of aerobics. This has a particular relationship with its technical characteristics and exercises intensity.

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

AUTHORS' CONTRIBUTIONS: The author made significant contributions to this manuscript. Liying Chen: writing and performing surgeries; data analysis and performing surgeries; article review and intellectual concept of the article.

REFERENCES

1. Whitehead J, Slater G, Wright H, Martin L, O'Connor H, Mitchell L. Disordered eating behaviours in female physique athletes. Eur J Sport Sci. 2020;20(9):1206-14.
2. Lyberger M, Yim BH, Mccarthy LM. Sport Facility Feasibility Study: Assessment, Value and Demand. Asia Pacific Journal of Applied Sport Sciences. 2020;1(1):35-50.
3. Petrova A, Bala T. The cardiorespiratory system state of the 10th-11th grade boys after the introduction of the variable module "Crossfit". Slobozhanskyi Her Sci Sport. 2020;8(3):20-33.
4. Meng K, Qiu J, Benardot D, Carr A, Yi L, Wang J, et al. The risk of low energy availability in Chinese elite and recreational female aesthetic sports athletes. JISSN. 2020;17(1): 1-7.
5. Dobrosielski DA, Sweeney L, Lisman PJ. The association between poor sleep and the incidence of sport and physical training-related injuries in adult athletic populations: a systematic review. Sports Med. 2021;51(4):777-93.
6. Wojnowich K, Dhani R. Care of the Active Female. AFP. 2022;106(1):52-60.
7. Kosma M, Erickson N. The love of aerial practice: Art, embodiment, phronesis. IJKSS. 2020;8(1):14-25.
8. Goldstein ER, Fukuda DH. Connecting energy availability and iron deficiency with bone health: implications for the female athlete. Strength Cond J. 2020;42(4):2-11.
9. Shin H. Investigation on the recognition of referees on the scoring rules for TAEKWONDO demonstration competition. Kinesiology. 2020;5(2):1-11.
10. Mocanu GD, Dobrescu T. Improving upper body flexibility in students through various types of stretching during physical education lessons. J Phys Educ Sport. 2021;21(3):1533-43.