EFFECT OF PLYOMETRIC ON THE LOWER LIMBS OF SPORTS DANCERS

EFEITO DE PLIOMETRIA NOS MEMBROS INFERIORES DOS DANÇARINOS ESPORTIVOS

EFECTO DE LA PLIOMETRÍA EN LOS MIEMBROS INFERIORES DE LOS BAILARINES DEPORTIVOS

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Ru Li[1]
(Physical Education Professional)

1. Zhengzhou Shengda University, College of Physical Education, Zhengzhou, Henan, China.

Correspondence:
Ru Li
Zhengzhou, Henan, China, 451191.
liru0421@163.com.

ABSTRACT

Introduction: The quality of explosive strength in pliometry is one of the most determinant factors for solid construction of the physical fitness of sports dancers and the material base for completing the complete harmony of movements, being the central quality of all visual impressions of sports dancers. Objective: Verify the impacts of plyometric training on the lower limbs of sports dancers. Methods: 20 male and 20 female university students with sports dance training were divided into four groups for comparative study. Results: The training method of type "maximal resistance at 85% 1RM, half squat for 3 times + 30% 1RM, rapid jump followed by squat for four times" was better for improving the vertical jump height of sports dancers; Using "85% 1RM, half squat for 3 times + 15% 1RM, rapid jump followed by squat for four times" presented better for the performance of sport dance athletes in-situ half jump height and the effect was shown to be better in in-situ vertical jump height. Conclusion: The submaximal plyometric resistance training method can significantly promote the lower limb explosiveness of sports dancers and can be used in sports dance training with practical effectiveness. ***Level of evidence II; Therapeutic studies - investigation of treatment outcomes.***

Keywords: Physical Education and Training; Sports; Plyometric Exercise; Athletic Performance.

RESUMO

Introdução: A qualidade da força explosiva em pliometria é um dos fatores mais determinantes para uma construção sólida da aptidão física dos bailarinos esportivos e a base material para a conclusão da completa harmonia dos movimentos, sendo qualidade central de todas as impressões visuais dos bailarinos esportivos. Objetivo: Verificar os impactos do treino de pliometria sobre os membros inferiores dos dançarinos esportivos. Métodos: 20 estudantes universitários do sexo masculino e 20 do sexo feminino, com formação em dança esportiva, foram divididos em 4 grupos para estudo comparativo. Resultados: O método de treinamento do tipo "resistência máxima em 85% 1RM, meio agachamento por 3 vezes + 30% 1RM, salto rápido seguido de agachamento por 4 vezes" foi melhor para aprimorar a altura de salto vertical de dançarinos esportivos; Usando "85% 1RM, meio agachamento por 3 vezes + 15% 1RM, salto rápido seguido de agachamento por 4 vezes" apresentou-se melhor para o desempenho dos atletas de dança esportiva in-situ meia altura de salto e o efeito mostrou-se melhor na altura de salto vertical in-situ. Conclusão: O método de treinamento de resistência submáximo em pliometria pode promover significativamente a explosividade do membro inferior dos dançarinos esportivos, e pode ser usado no treinamento de dança esportiva com eficácia prática. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

Descritores: *Educação Física e Treinamento; Esportes; Exercício Pliométrico; Desempenho Atlético.*

RESUMEN

Introducción: La calidad de la fuerza explosiva en la pliometría es uno de los factores más determinantes para una sólida construcción de la aptitud física de los bailarines deportivos y la base material para la realización de la armonía completa de los movimientos. Objetivo: Verificar los impactos del entrenamiento de pliometría en los miembros inferiores de los bailarines deportivos. Métodos: 20 estudiantes universitarios masculinos y 20 femeninos con formación en danza deportiva fueron divididos en 4 grupos para el estudio comparativo. Resultados: El método de entrenamiento del tipo "resistencia máxima al 85% de 1RM, media sentadilla durante 3 veces + 30% de 1RM, salto rápido seguido de sentadilla durante 4 veces" fue mejor para mejorar la altura de salto vertical de los bailarines deportivos. Conclusión: El método de entrenamiento de resistencia pliométrica submáxima puede promover significativamente la explosividad de las extremidades inferiores de los bailarines deportivos, y puede utilizarse en el entrenamiento de la danza deportiva con eficacia práctica. ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

Descriptores: *Educación y Entrenamiento Físico; Deportes; Ejercicio Pliométrico; Rendimiento Atlético.*

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INTRODUCTION

Sports dance is a highly artistic and technical sport. How to make the complete set of movements with changeable rhythm and diverse movement structure complete smoothly, stably, with large range and beautiful movement requires athletes to have good comprehensive sports quality.[1] Among them, special strength is the basis of special speed, so special strength training plays an important role in sports dance training. Explosive force is a form of expression of fast power. Because of its important role in sports performance, it has also become a physical quality that people pay special attention to.[2] In modern sports training, there are various training methods and means to develop explosive power. According to the relationship with special projects, there are general physical explosive power training and special physical quality explosive power training closely related to special projects; Other methods include weight-bearing and overcoming their own weight, such as weight-bearing jump, deep jump and other exercises.[3] With the continuous improvement of modern competitive level and the development and innovation of sports training theory, combined strength training method has positive significance for the improvement of athletes' explosive power in sports training practice, which has become the consensus of more and more sports workers.[4]

METHOD

Subjects: 40 students majoring in dance and sports training of grade 20 in a university, 20 men and 20 women. Experimental method: the above 40 athletes stand in two rows according to gender, and then report 1 and 2 numbers in each row respectively. Those who report 1 are group A and those who report 2 are group B, with 10 people in each group. There is no significant difference through a series of test indexes.[5]

Grouping of different combination strength training methods:

The first training method is that group a carries out 85% 1RM half squat for 3 times and 30% 1RM fast squat take-off for 4 times;

The second training method is that group B carries out 85% 1RM half squat for 3 times and 15% 1RM fast squat take-off for 4 times;

Experimental time: from early October 2021 to the end of December 2021, a total of 8 weeks.

The physical fitness indexes tested are: run-up vertical jump height, in-situ semi squat jump height and in-situ vertical jump height.

1. Run up vertical jump height: the height of feet from the pedal after stepping on the smartspeed pedal after two to three steps of run-up.
2. Jump height in situ semi squat position: stand on the smartspeed pedal with your feet in the semi squat position, straighten your hands above your head, and jump up the height of your feet from the pedal after semi squatting.
3. CMJ: stand with your feet on the smartspeed pedal, straighten your hands above your head, squat and jump quickly, and the height of your feet from the pedal.

The test time of the above indicators: before the start of training, 4 weeks after training and 8 weeks after training. After 4 weeks, the new 1RM squat was used as the standard for training.[6]

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

RESULTS

Comparison and analysis of physical fitness indexes before and 8 weeks after the experiment

It can be seen from table 1 that before and after 8 weeks of training, there are very significant differences in the indexes of run-up vertical jump height, in-situ semi squat jump height and in-situ vertical jump height of male and female players in group A and group B ($P < 0.01$), indicating that the two combined strength training methods can significantly improve the lower limb explosive power of dancers.[7]

Comparison and analysis of average scores of physical fitness indexes before experiment, 4 weeks after experiment and 8 weeks after experiment

As shown in Figure 1, Figure 2 and Figure 3, before the experiment, 4 weeks after the experiment and 8 weeks after the experiment, the run-up vertical jump height and in-situ semi squat jump performance of men and women in group B were significantly higher than those of men and women in group A; However, the performance of men and women in group a in-situ vertical jump height is significantly higher than that of men and women in group B.[8]

Analysis of physical fitness performance

1. Analysis of the results of run-up vertical jump height. The results of men's run-up vertical jump height in experimental group a increased by 13%, and the results of men's run-up vertical jump height in experimental group B increased by 1.7%. There was significant difference between the two groups ($P = 0.034$ ($0.01 < p < 0.05$)); The results of female run-up vertical jump height in experimental group a increased by 12% and that in experimental group B increased by 1.6%. There was significant difference between the two groups ($P = 0.021$ ($0.01 < p < 0.05$)). This shows that the combined training method of experimental group B is more effective than the combined training method of experimental group A in improving the performance of sports dance run-up and vertical jump height.[9] The run-up vertical jump height needs a certain speed foundation, and the improvement of muscle rapid contraction ability can effectively improve the performance of run-up vertical jump height. It may be because group B carried out 30% rapid jump practice after 75% ~ 85% IRM squat training, which effectively stretched the leg muscles, so as to improve the rapid contraction ability of muscles.

Table 1. Comparison results of physical fitness indexes of team members in groups A and B before and after the experiment.

Index	Group	Gender	Before experiment	After 8 weeks of experiment
Run up vertical jump height	A	Male	2.97±0.12	3.03±1.27
	B	Male	2.97±1.23	3.06±0.81
	A	Female	2.64±2.87	2.69±1.21
	B	Female	2.64±1.06	2.71±0.86
Jumping height in situ semi squat position	A	Male	2.77±0.35	2.82±0.77
	B	Male	2.77±0.14	2.80±1.44
	A	Female	2.21±4.12	2.26±3.41
	B	Female	2.21±2.67	2.24±3.01
In situ vertical jump height	A	Male	2.78±0.42	2.81±0.07
	B	Male	2.78±2.37	2.84±1.11
	A	Female	2.23±5.27	2.24±1.37
	B	Female	2.23±1.04	2.27±4.01

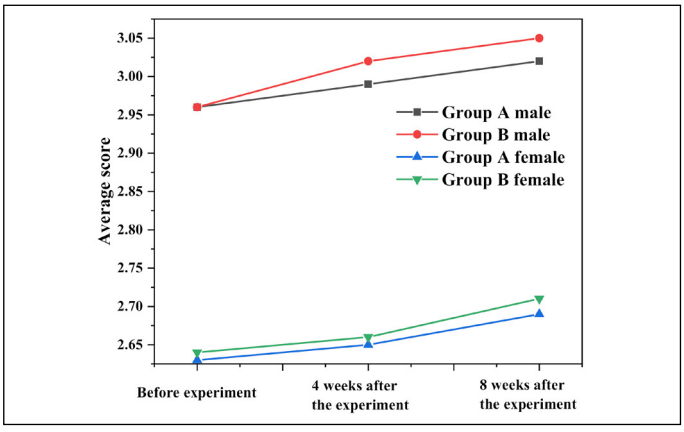

Figure 1. Average score change of run-up vertical jump height during the experiment.

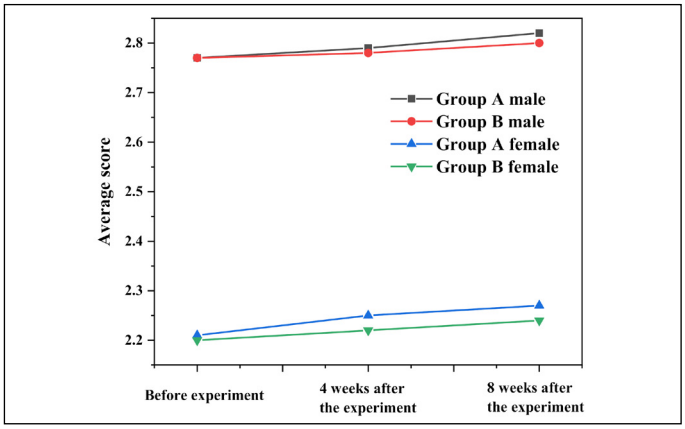

Figure 2. Change of average score of mid squat jump in the field during the experiment.

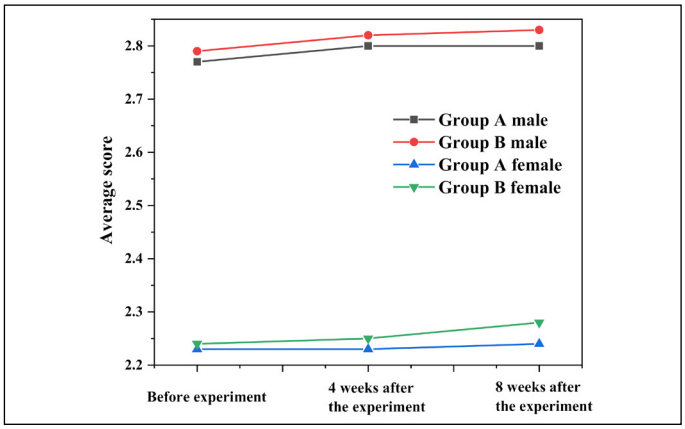

Figure 3. Average score change of ground vertical jump height in the experimental process.

2. Squat in place jump performance analysis. The results of men in experimental group a in-situ semi squat position and vertical jump increased by 16% and 11% respectively. There was significant difference between the two groups ($P = 0.047$ ($0.01 < p < 0.05$)); The results of female run-up and high jump in experimental group a increased by 1.5% and that in experimental group B increased by 12%. There was significant difference between the two groups ($P = 0.040$ ($0.01 < p < 0.05$)). This shows that the combined training method of experimental group A is more effective than the combined training method of experimental group B in improving the performance of sports dance in-situ semi squat jump.[10] Studies have shown that the jumping in situ semi squat position mainly depends on the ability of the central nervous system to release impulses and the rapid recruitment of motor units. The training intensity of the training method of group A (85% ~ 100% IRM squat) was significantly stronger than that of group B (75% ~ 85% IRM squat), which effectively stimulated the central nervous system and accelerated the instantaneous muscle contraction speed, so as to more effectively improve the performance of jumping in situ squat position.

3. Performance analysis of standing vertical jump and high jump. The results of men's in-situ vertical jump height jump in experimental group a increased by 10%, and the results of men's approach vertical jump height jump in experimental group B increased by 17%. There was significant difference between the two groups ($P = 0.041$ ($0.01 < p < 0.05$)); The results of female run-up vertical jump height in experimental group a increased by 1.2%, and the results of female run-up vertical jump height in experimental group B increased by 15%. There was significant difference between the two groups ($P = 0.031$ ($0.01 < p < 0.05$)). This shows that the combined training method of experimental group B is more effective than the combined training method of experimental group A in improving the performance of sports dance in-situ vertical jump and high jump. This is the same as the principle of run-up vertical jump height, which belongs to the project with high requirements for muscle centrifugal force. Therefore, if you want to improve the performance of in-situ squat jump, you need to not only improve the maximum strength of the muscle, but also improve the flexibility and coordination of the muscle.

DISCUSSION

Practice shows that strength quality is the most core quality among the physical qualities of sports dancers. Good strength quality can not only avoid dancers' injuries in sports and prolong their sports life, but also promote dancers to learn faster, master correct dance skills and give full play to their technical level in the competition. From the training of Chinese sports dancers in recent years, many coaches and athletes do not understand the importance of special strength training, and know little about the principles and methods. In the minds of some sports dancers, including high-level players, there is even no concept of special strength training (which is unimaginable in other competitive events); From the performance of Chinese sports dancers in international sports dance competitions, their technical level and dance expressiveness have made great progress. However, compared with European and American players, there is still a large gap in physical reserves, especially special strength. The normal play of competition level is often affected by insufficient movement strength, insufficient physical reserves, or unreasonable physical distribution. Therefore, we should pay more attention to the special strength training of dancers, and carefully summarize our experience and lessons in training and competition in the past, constantly understand the movement law of the project, innovate training methods, and form our own set of effective physical training content and method system.

CONCLUSION

General physical training and special physical training are different in the task, content and function of training. Traditional physical training mainly pursues a certain sports quality, and does not pay enough attention to the training of players' overall sports ability, long-time and high-intensity anti fatigue ability and tenacious psychological quality. Special physical training is a special need to improve special sports performance, and directly serves to create excellent special sports performance. The main factors affecting special physical fitness include special strength, special endurance, special speed, special flexibility and special coordination; Other factors affecting special physical fitness include control ability, cooperation ability and expressiveness. Sports dance coaches must understand the main factors affecting the special physical fitness of sports dance, which is a necessary prerequisite for the innovation and continuous improvement of special physical fitness training. Only when theory guides practical training and practice enriches theoretical innovation can we constantly explore new contents in the special physical fitness training of sports dance.

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AUTHORS' CONTRIBUTIONS: The author made significant contributions to this manuscript. RL: writing, data analysis, article review and intellectual concept of the article.

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