EFFECTS OF STRETCHING ON LOWER LIMB STRENGTH IN BASKETBALL ATHLETES

EFEITOS DO ALONGAMENTO SOBRE A FORÇA DOS MEMBROS INFERIORES NOS ATLETAS DE BASQUETEBOL

EFECTOS DE LOS ESTIRAMIENTOS EN LA FUERZA DE LAS EXTREMIDADES INFERIORES EN ATLETAS DE BALONCESTO

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ABSTRACT

Introduction: Basketball players depend on excellent explosive power in the lower limbs for training and competition activities such as starting, braking, accelerating, decelerating, running, and jumping instantly and quickly. The level of Chinese athletes in this aspect is lower than world powers, and formulating training focused on explosive strength can enhance the training of these athletes. Objective: Study the effects of stretching on lower limb strength in basketball athletes. Methods: 20 young male basketball players selected as volunteers for the research were randomly divided into an experimental and control group, with 10 people in each group for retrospective analysis. The effect of rapid stretching compound training on the explosive power of lower limbs in basketball players was evaluated using the comparative method of literature data, expert interviews, experimental methods, and mathematical statistics. Results: After 8 weeks of training, the scores of each test index in the control group were significantly improved, including the standing jump and long-distance scores ($P < 0.01$). Unipodal takeoff and post-run long-range scores were significantly improved ($P < 0.05$). Conclusion: Both traditional resistance and compound lower limb stretching training can improve explosive power in young basketball players, but compound training showed more prominent results. ***Level of evidence II; Therapeutic studies - investigation of treatment outcomes.***

Keywords: Physical Education and Training; Basketball; Lower Extremity; Muscle Strength.

RESUMO

Introdução: Os jogadores de basquetebol dependem de um excelente poder explosivo nos membros inferiores para as atividades de treinamento e competição como iniciar, frear, acelerar, desacelerar, correr e pular instantânea e rapidamente. O nível dos atletas chineses neste aspecto é inferior ao de potências mundiais e a formulação de um treinamento focado em força explosiva pode aprimorar o treinamento desses atletas. Objetivo: Estudar os efeitos do alongamento sobre a força dos membros inferiores nos atletas de basquetebol. Métodos: 20 jovens jogadores de basquete masculino selecionados como voluntários para a pesquisa foram divididos aleatoriamente em grupo experimental e grupo de controle, com 10 pessoas em cada grupo para análise retrospectiva. O efeito do treinamento composto de alongamento rápido sobre o poder explosivo dos membros inferiores dos jogadores de basquetebol foi avaliado usando o método comparativo de dados da literatura, entrevistas com especialistas, métodos experimentais e estatísticas matemáticas. Resultados: Após 8 semanas de treinamento, as pontuações de cada índice de teste no grupo de controle foram significantemente aprimoradas, incluindo o salto em pé e as pontuações de longa distância ($P < 0,01$). A decolagem unipodal e as pontuações de longo alcance pós corrida foram significativamente melhoradas ($P<0.05$). Conclusão: Tanto o treinamento tradicional de resistência quanto o treinamento composto de alongamento dos membros inferiores podem melhorar o poder explosivo nos jovens jogadores de basquete, porém o treinamento composto apresentou maior destaque em seus resultados. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

Descritores: *Educação Física e Treinamento; Basquetebol; Extremidade Inferior; Força Muscular.*

RESUMEN

Introducción: Los jugadores de baloncesto dependen de una excelente potencia explosiva en los miembros inferiores para las actividades de entrenamiento y competición, como arrancar, frenar, acelerar, desacelerar, correr y saltar de forma instantánea y rápida. El nivel de los atletas chinos en este aspecto es inferior al de las potencias mundiales y la formulación de un entrenamiento centrado en la fuerza explosiva puede mejorar la formación de estos atletas. Objetivo: Estudiar los efectos de los estiramientos en la fuerza de las extremidades inferiores en atletas de baloncesto. Métodos: 20 jóvenes jugadores de baloncesto seleccionados como voluntarios para la investigación fueron divididos aleatoriamente en grupo experimental y grupo de control, con 10 personas en cada grupo para el análisis retrospectivo. Se evaluó el efecto del entrenamiento compuesto de estiramiento rápido sobre la potencia explosiva de las extremidades inferiores de los jugadores de baloncesto mediante el método comparativo de datos bibliográficos, entrevistas a expertos, métodos experimentales y estadística matemática. Resultados: Después de 8 semanas de entrenamiento, las puntuaciones de cada índice de prueba en el grupo de control mejoraron significativamente, incluyendo las puntuaciones de salto de pie y de larga distancia ($P < 0,01$). Las puntuaciones de despegue unipodal y de largo alcance tras la carrera mejoraron significativamente ($P < 0,05$).

Conclusión: Tanto el entrenamiento de resistencia tradicional como el entrenamiento compuesto de estiramiento de las extremidades inferiores pueden mejorar la potencia explosiva en jóvenes jugadores de baloncesto, pero el entrenamiento compuesto mostró mayor protagonismo en sus resultados. ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

Descriptores: *Educación y Entrenamiento Físico; Baloncesto; Extremidad Inferior; Fuerza Muscular.*

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INTRODUCTION

With the rapid development of modern basketball, the requirements for athletes' physical quality, technical level, tactical quality and psychological quality are getting higher and higher, a good basketball player must have super strong and comprehensive physical fitness and excellent athletic ability.[1] Possess superb basketball skills, outstanding running and jumping ability, strong body, and always maintain strong aggression on both the offensive and defensive ends, in order to gain advantages in time and space in fierce competitions. Basketball has its unique special competitive characteristics and requires athletes to have a good level of strength, especially fast strength, the physical talent level of Chinese basketball players in this regard is far less than that of world powers such as Europe and the United States.[2]

Therefore, the author wants to formulate a reasonable training plan and training load through a comparative study, comparing the effects of fast-stretching compound training and traditional resistance training on the explosive power of lower extremities, the effect of rapid-stretching compound training in lower extremity explosive power training was proved through experimental research.

RESEARCH OBJECTS AND METHODS

The research object

A retrospective analysis was conducted on 20 young men's basketball players, randomly divided into control group and experimental group, 10 people in each group, all subjects were required to have no serious injury to their lower limbs, during the experiment, it is strictly forbidden to take any drugs and sports nutrition products that can enhance exercise ability, and it is forbidden to participate in any other form of strenuous exercise outside the normal training class.[3] There was no significant difference between the experimental group and the control group in terms of age, height, weight, and training years (P>0.05), the basic information of the research subjects is shown in Table 1.

Research method

Before the author's experiment, the subjects in the control group must first evaluate the strength of the lower limbs, because the control group uses traditional resistance training, so each subject must be able to know the maximum strength of his lower limbs, in this way, you can avoid injuries and better protect yourself during training. Evaluation of maximum strength: Each subject was tested for the maximum strength of the lower limbs, and the test method was squatting with weight behind the neck.[4]

1. The action methods of each training content in the experimental group are broken down in detail as follows:

(1) Rocket jump

How to do it: Start in a comfortable standing position, with your feet open, shoulder-width apart, and your arms close to your body. Then start the exercise, in a half squat position, then bounce as high as you can. The entire body fully stretched, stretch up as far as possible.

(2)Single-leg jump

Action method: Take the take-off of the right leg as an example, the athlete bends the left leg and lifts the knee, the right leg jumps out with the forefoot, the foot of the right leg touches the ground, and the take-off leg bends the knee.

(3) Jump hurdles of different heights

Action method: 10 hurdles are placed in the order of 25cm, 15cm, and 30cm, the athlete's legs are shoulder-width apart, knees are bent, and 10 hurdles are continuously jumped to form a group.

2. The essentials of the training method of the control group are as follows:

(1) Squat with weight behind the neck

Action method: Stand with your feet shoulder-width apart, hold your head up, chest straight, waist and back straight, knees slightly bent and slowly squat until your thighs are parallel to the ground, pause for a while and then exert force on your legs and then squat up, during this process, keep the center of gravity stable.

(2) Quick squat and jump

Action method: Stand with your feet shoulder-width apart, squat or half squat down with your knees bent, and swing your arms back. Then quickly stretch both legs, and at the same time, throw out your arms forward, when you are about to take off, use your toes to lift off the ground, quickly jump up, and when you fall, use your forefoot to touch the ground while bending your knees to cushion, and then jump up again. This exercise develops leg muscle strength and ankle strength, and improves explosiveness.[5] The muscles that work and strengthen are the quadriceps and gluteus maximus.

Before and after the 8-week training intervention, all subjects were tested for lower limb explosive power, including standing long jump, double-leg take-off and high-reaching, approach-running, single-leg take-off and high-reaching, "T"-shaped return running, and 30m sprint running, a total of 5 evaluation indicators, the lower extremity abilities of forward jumping, vertical upward jumping, fast pedaling force, fast initiation of direction change and fast running were evaluated. Each subject took each test three times, and the best score was taken as the final score.

Table 1. Basic information of the research object.

Group	N	Age(y)	Height(cm)	Weight(kg)
control group	10	19.2±1.4	190.6±3.7	87.5±5.3
test group	10	17.4±3.5	193.3±4.2	88.2±5.5

Statistics method

EXCEL and SPSS17.0 are used for statistical analysis of experimental data, independent sample T test is used after the two groups of experiments, and paired sample T test is used before and after each group of experiments, and $p<0.05$ indicates that there is a significant difference, $p<0.01$ Description has a very significant difference.

ETHICAL COMPLIANCE

Research experiments conducted in this article with animals or humans were approved by the Ethical Committee and responsible authorities of University of South China following all guidelines, regulations, legal, and ethical standards as required for humans or animals.

RESULTS

In order to judge whether there is a significant improvement in the performance of the double-leg approach, take-off and touch height test before and after the experiment, use SPSS software to test the double-leg run-up and take-off scores of the experimental group before and after the experiment, before and after the experiment, the double-legged run-up, take-off, and touch-up scores of the control group were subjected to paired-sample t-test. The results are shown in Table 2 above. The improvement rate of the experimental group was 1.63% better than that of the control group, which was 0.08%; the experimental group ($P=0.001<0.05$), the control group ($P=0.001<0.05$), it shows that both feet in the experimental group and the control group have a significant improvement in the performance of running, jumping, and reaching heights after the test.[6]

In the control group, when only common resistance training was performed, the test scores of various indicators were also improved, it can be seen that the common resistance training enhanced the explosive power level of the lower limbs of the experimental subjects. The test scores of the control group before and after the experiment are shown in Table 3.

After 8 weeks of traditional lower extremity resistance training in the control group, various explosive power test indicators were improved to a certain extent compared with those before the experiment, among them, the standing long jump increased from 2.79±0.36m before the experiment to 2.87±0.38m, an increase of 0.08m, and the difference was very significant compared with that before the experiment ($P<0.01$); The height of the in-situ jumping with both feet increased from 2.87±0.29m before the experiment to 2.94±0.41m, an increase of 0.07m, and the difference was very significant compared with that before the experiment ($P<0.01$); The single-leg take-off touch height of the approach-run was increased from 3.21±0.48m before the experiment to 3.27±0.50m, an increase of 0.06m.[7]

It can be seen from Figure 1 that in the three-dimensional force platform test, the take-off speed, flight height and flight time after the experiment increased by 0.16m/s, 0.05m, 0.03s respectively compared with those before the experiment, although the increase value is not large, but $p<0.01$, the above data shows that, the three indicators tested by the three-dimensional force platform (airborne height, airborne time, and take-off speed) have been significantly improved after fast-stretching compound training.[8]

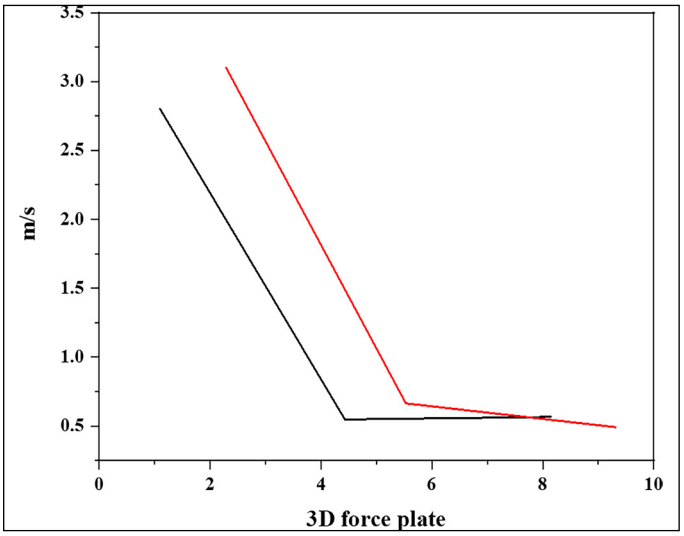

Figure 1. The comparison of the three-dimensional force platform test before and after the experiment in the experimental group.

DISCUSSION

To sum up, through the detailed analysis of common resistance training and fast-stretching compound training through experiments, testing data, collecting data and analyzing data at the end: First, the fast-scaling compound training method applied by the experimental group has a relatively obvious improvement effect on the test indicators selected in this experiment.[9] Common resistance training also has an effect on the improvement of lower extremity explosive power, but the effect of improvement is not as significant as that of fast-stretching compound training; Second, the fast-stretching compound training method applied by the experimental group has advantages over some basic strength training methods used in the control group. And fast-stretching compound training can not only improve the explosive power level of the lower limbs, but also enhance the coordination and sensitivity of the body to a certain extent, therefore, quick-stretching compound training is more effective than common resistance training in improving the explosive power level of lower limbs, and the improvement speed is faster.[10]

Table 2. The comparison table between the experimental group and the control group before and after the experiment.

Group	Pre-test	Post test	Mean difference	Rate of change	T
test group	3. 09±0. 214	3.35±0.131	0.042	1. 53%	-5. 480
control group	3. 12±0. 192	3.14±0.079	0.036	0.7%	-4.451

Table 3. Comparison of lower extremity explosive strength test results before and after the experiment in the control group.

	Standing long jump(m)	Take off with both feet in place(m)	Run-up jump(m)
Before experiment	2.79±0.36	2.87±0.29	3.21±0.48
After the experiment	2.87±0.38**	2.94±0.41**	3.27±0.50*

CONCLUSION

Rapid stretching compound training is a training method that can effectively develop the explosive power of the lower limbs of basketball players and improve their jumping ability, and the training effect is more significant than traditional resistance training. In the research on improving the explosive power of the lower limbs, in daily teaching, the training method combining rapid stretching compound training and traditional resistance training can be used, for example, squatting at 70% of maximum strength first, followed by a set of deep jump training, will achieve better training results than a single training method.

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