INFLUENCE OF COMPOUND TRAINING ON PHYSICAL FITNESS IN BADMINTON ATHLETES

INFLUÊNCIA DO TREINAMENTO COMPOSTO SOBRE A APTIDÃO FÍSICA EM ATLETAS DE BADMINTON

INFLUENCIA DEL ENTRENAMIENTO COMPUESTO EN LA APTITUD FÍSICA DE LOS ATLETAS DE BÁDMINTON

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ABSTRACT

Introduction: Currently, compound rapid stretching training has been explored by sports researchers. However, most research focuses on soccer, basketball, volleyball, and other sports that require vertical jump fitness, but little attention is paid to badminton. Objective: Study the influence of compound rapid stretching training on fitness in professional badminton athletes. Methods: By experimental and statistical methods, 16 outstanding college badminton players were randomly divided into composite training and control groups. The sports performance test (T-shaped run) and short-distance mobility test (5-10-5), were evaluated and compared before and after the intervention, adding a specific rapid stretching training protocol to the composite group. Results: Comparatively, the T-run and hexagonal jump tests were significantly improved in the composite group (P<0.01). The time required to complete the 5-10-5 moving test progressed from 3.980s to 3.763s, significantly longer than the control group (P<0.05). Conclusion: 6-week training with rapid stretching was shown to significantly improve the fitness of college badminton athletes. ***Level of evidence II; Therapeutic studies - investigation of treatment outcomes.***

Keywords: Physical Education and Training; Racquet Sports; Physical Fitness.

RESUMO

Introdução: Atualmente, o treinamento composto de alongamento rápido tem sido explorado por pesquisadores esportivos, no entanto, a maioria das pesquisas se concentra no futebol, basquete, vôlei e outros esportes que exigem aptidão física de salto vertical, porém pouca atenção é dada ao badminton. Objetivo: Estudar a influência do treinamento composto de alongamento rápido sobre a aptidão física nos atletas profissionais de badminton. Métodos: Pelos métodos experimental e estatístico, um total de 16 jogadores de badminton universitários de destaque foram divididos aleatoriamente em grupos de treinamento composto e controle. O teste de desempenho esportivo (corrida em forma de T) e de mobilidade de curta distância (5-10-5), foram avaliados e comparados antes e após a intervenção, que consistiu na adição de um protocolo específico de treinamento de alongamento rápido ao grupo composto. Resultados: Comparativamente, os testes de corrida em T e de salto hexagonal foram significativamente aprimorados no grupo composto (P<0,01). O tempo necessário para completar o teste móvel de 5-10-5 progrediu de 3.980s para 3.763s, o que foi significativamente maior que o do grupo controle (P<0.05). Conclusão: O treinamento de 6 semanas com alongamento rápido demonstrou melhorar significativamente a aptidão física dos atletas universitários de badminton. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

Descritores: *Educação Física e Treinamento; Esportes com Raquete; Aptidão Física.*

RESUMEN

Introducción: En la actualidad, el entrenamiento compuesto de estiramiento rápido ha sido explorado por los investigadores deportivos, sin embargo, la mayoría de las investigaciones se centran en el fútbol, el baloncesto, el voleibol y otros deportes que requieren la aptitud de salto vertical, sin embargo, se presta poca atención al bádminton. Objetivo: Estudiar la influencia del entrenamiento de estiramientos rápidos compuestos en la condición física de los atletas profesionales de bádminton. Métodos: Mediante métodos experimentales y estadísticos, un total de 16 destacados jugadores universitarios de bádminton fueron divididos aleatoriamente en grupos de entrenamiento compuesto y de control. La prueba de rendimiento deportivo (carrera en forma de T) y la prueba de movilidad en distancias cortas (5-10-5), fueron evaluadas y comparadas antes y después de la intervención, que consistió en añadir un protocolo específico de entrenamiento de estiramiento rápido al grupo compuesto. Resultados: Comparativamente, las pruebas de carrera en T y de salto hexagonal mejoraron significativamente en el grupo compuesto (P<0,01). El tiempo requerido para completar la prueba de movimiento 5-10-5 pasó de 3,980s a 3,763s, lo que fue significativamente mayor que el del grupo de control (P<0,05). Conclusión: Se demostró que un entrenamiento de 6 semanas con estiramientos rápidos mejora significativamente la forma física de los atletas universitarios de bádminton. ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

Descriptores: *Educación y Entrenamiento Físico; Deportes de Raqueta; Aptitud Física.*

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INTRODUCTION

As we all know, the agility of badminton players is as important as other physical qualities such as strength, speed, and endurance. In particular, the ability to suddenly start, brake, change direction and re--accelerate in the game.[1] At present, fast-stretching compound training has been widely concerned by sports researchers at home and abroad, and a large number of related experimental studies have been done, however, most of the research focuses on football, basketball, volleyball and other sports that have special needs for vertical jumping ability, and relatively little attention is paid to badminton.[2]

Wang J and other researchers analyzed the influencing factors of sensitive quality. The authors mainly outline that the two main components of agility are the speed of direction change and perception and decision factors.[3] M Gómez selected 16 high-level badminton male athletes, divided into the fast-stretching compound training group of 8 people (PT group) and the control group of 8 people (CG group), from the perspective of lower extremity biomechanics, the reasons for improving sensitivity before and after the training were analyzed.[4] Hassan M took 12 middle school badminton training class students as experimental subjects, divided into experimental group and control group with 6 students in each group, they adopted rapid stretching compound training and traditional explosive training respectively, after 12 weeks of experimental intervention: Compared with traditional training, fast-stretching compound training can better improve the explosive power of young badminton players.[5] Schumacher D took 42 college badminton students as the research object, and used group training to conduct fast-stretching compound training and regular training respectively, two groups of students were given a 6-week experimental training, studies have shown that the sensitive quality of the students in the optional class after the fast-stretching compound training has improved significantly, while the sensitive quality of the students after the regular training has not been significantly improved.[6] Xu Y et al. took 20 badminton players as the experimental objects, after 6 weeks of fast--stretching compound training, various sensitive monogram tests were carried out on the experimental subjects, through the analysis of results, the experimental results showed that, rapid stretch compound training has a significant effect on improving and mobilizing the body's agility.[7]

Therefore, the author takes the agility and flexibility of badminton players as well as the rapid expansion and contraction compound training as the starting point, this method is integrated into the physical training of high-level badminton players in the pre-match, and according to the characteristics of the badminton project and the characteristics of the field, innovatively designed a test method that conforms to the special sensitivity of badminton, so as to evaluate the special agility and lower limb flexibility of badminton players. The ultimate goal is to explore the effect of 6-week fast-stretching compound training on the agility of elite male college badminton players.

METHOD

Experimental method

Experimental subjects and groups

Select 16 male athletes from a high-level badminton team from a university, with more than 10 years of training, and all of them have won the top six in the National College Badminton Championships, and the 1RM squat weight was greater than 1.5 times of their own weight, and they were randomly divided into a rapid stretching compound training group of 8 people (PL group) and a control group of 8 people (CG group). All subjects had no history of lower extremity injury within half a year before the experiment, and the current competitive state was good and healthy. See Figure 1.

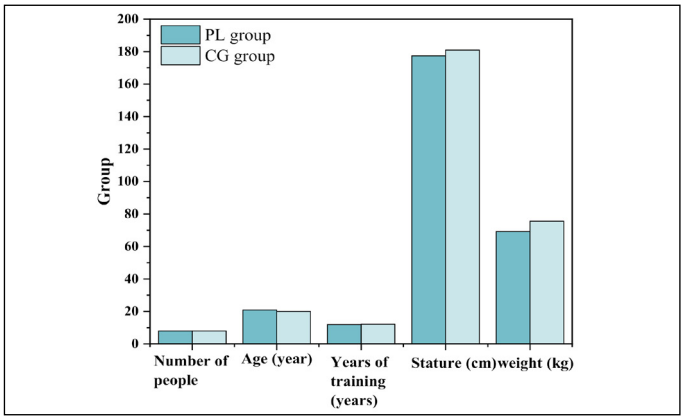

Figure 1. Basic information of subjects

Experimental process

The whole experiment consists of three parts.

①The first part, the basic power reserve stage: Before the fast--stretching compound training intervention, some regular strength training was used to help the subject achieve an optimal competitive state, so that the subject's 1RM squat weight reached at least 1.5 times his body weight. Because this type of training can reduce the risk of injury in subjects during 6 weeks of fast-stretching compound training by strengthening ligaments, tendons and bones and muscles. ②The second part is the pre-experiment test and the post-experiment test. Pre-experimental tests were conducted three days before the start of training, including badminton agility performance test (T-shaped test), short-distance agile mobility test (5-10-5 test).[8] Before each test, subjects performed 1-2 tests at submaximal intensity with the main purpose of becoming familiar with the testing process. After all the tests were completed, a 6-week fast-stretching compound training was conducted, and then a post-experiment test was conducted, the test content was the same as before the experiment. While the fast-stretching compound training was in progress, the two groups of subjects continued their regular badminton skills and tactics training. ③The third part: The PL group underwent 6-week fast-stretching compound training, and the CG group underwent 6-week basic lower limb strength training. Comparing the fast-stretching compound training program of the PL group with the basic strength training program of the lower limbs of the CG group, see Table 1.

Mathematical statistics

SPSS17.0 statistical software package was used for data processing, and the statistical description was expressed as "mean ± standard deviation" ($x \pm s$), two-factor repeated-measures variance analysis was used for the time index of the sensitive quality test, the between-group factor was grouping (PL group, CG group), and the within-group factor was time (before training, after training); Two-factor repeated measures analysis of variance was used for kinematic indicators, the between-group factor was grouping (PL group, CG group), and the within-group factor was time (before training, after training). When the interaction effect is significant, the simple effect analysis of each factor is performed separately, when the interaction effect is not significant, only the main effect of the two factors is analyzed separately, with $P<0.05$ indicating a significant difference.[9]

Ethical Compliance

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

Table 1. Comparison of training programs between PL group and CG group.

Group	Physical training	Badminton technical training	Training time	Training time	Place	Strength and conditioning coach	Badminton technical coach
PL group	3 times a week for lower body quick-stretching compound training	3 times a week technical and tactical training	70min (including warm-up and relaxation)	same	same	same	same
CG group	Basic lower body strength training 3 times a week	3 times a week technical and tactical training	70min (including warm-up and relaxation)	same	same	same	same

*The PL group and the CG group were different except for the physical training intervention, all other contents were the same for both groups.

RESULTS

Badminton Agility Performance Ability

Statistics show that, the interaction effects of the two factors, grouping and time, on the T-shaped movement parameters were both significant (P<0.05), so a simple effect analysis was carried out for the two factors, as shown in Table 2, after 6 weeks of fast-stretching compound training, the time to complete the T-shaped movement test in the PL group increased from 7.72s to 7.12s, and the time for the CG group to complete the test did not change significantly. Compared with the CG group, the test time of completing T-shaped movement was significantly reduced in the PL group (P<0.05).

Table 2. Time variation of T-shaped movement test (`x±s).

Group	Number of people	Before experiment (s)	After the experiment (s)
PL group	8	7.72±0.51	7.12±0.26*
CG group	8	7.99±0.46	8.08±0.38

*P<0.05, indicating that the PL group was compared with the CG group.

Badminton's sensitive movement ability

The statistical results show that the interaction effects of the two factors of grouping and time on the sensitive movement parameters are significant (P<0.05), so the simple effect analysis of the two factors is carried out separately, as shown in Table 3, after a 6-week fast-stretching compound training, the PL group's time to complete the modified 5-10-5 test increased from 3.98s to 3.76s, and the CG group's test time did not change significantly. The test time in the PL group was significantly lower than that in the CG group (P<0.05).

Table 3. Improved version 5-10-5 test (`x±s).

Group	Number of people	Before experiment(s)	After experiment(s)
PL group	8	3.98±0.14	3.76±0.13*
CG group	8	3.92±0.08	3.93±0.09

*P<0.05, indicating that the PL group was compared with the CG group

After 6 weeks of fast-stretching compound training, the athletes' performance on the T-shape test of specific agility performance improved significantly from 7.72s to 7.12s. This result shows that the athletes' performance of active acceleration and deceleration in the field has improved, as well as the ability to adjust the body forward, backward, left and right, and the speed of movement in four directions and the ability to control the body have been improved.

DISCUSSION

The authors study the agility and flexibility of badminton players. Most collective sports, such as basketball, football, etc., require athletes to be able to change direction, accelerate, decelerate, and move quickly in an instant. In addition, projects that compete against nets, such as badminton and tennis, need to start in multiple directions and have the ability to quickly change direction and accelerate and then decelerate in a specified field. It is especially reflected in the sudden change of body direction, the rapid approach of the moving badminton with the correct footwork and the irregular trajectory, in particular, the athlete's sudden start, change of direction, braking and re-acceleration process in the continuous transition of offense and defense is the "motive force" of all qualities.[10] As a badminton player, moving faster than your opponent in the game means you have more time to think about the tactics of the next shot, you can take the lead in attacking, take the initiative, and even win the game. Therefore, the sports performance of short-distance special agility movement is very important for badminton players. However, except for sprinters who need straight-line and horizontal acceleration, most other events need to go through the process of starting, changing direction, accelerating, moving and decelerating, therefore, the rapid movement after the rapid change of direction is more important. Overall, the increased flexibility following fast-stretching compound training can be attributed to improved neural adaptations, particularly coordination between skeletal muscles. Previous research has also shown that proprioception is enhanced after fast-stretching compound training. In our training regimen, we also employ a single-leg lateral jump, the goal is to increase joint stability and proprioception, which is especially important when performing agility tasks when stopping and changing direction.

CONCLUSION

6-week fast-stretching compound training can improve the agile athletic performance of elite male college badminton players. 6-week fast-stretching compound training can improve the direction change and start-up ability of outstanding male college badminton players. 6-week fast-stretching compound training can improve the lower limb stride range of elite male college badminton players.

All authors declare no potential conflict of interest related to this article

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