UNSTABLE PLATFORM TRAINING IN TENNIS PLAYERS

TREINAMENTO EM PLATAFORMA INSTÁVEL EM TENISTAS

ENTRENAMIENTO EN PLATAFORMA INESTABLE EN TENISTAS

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ABSTRACT

Introduction: The constant maintenance of muscular strength is a highly relevant care in training for tennis practice. The unstable platform is developed with the improvement of modern and technological resources, and the need to verify its effects on the athletes' physical fitness is requested. Objective: Study the effect of unstable platform training on tennis players' balance ability and assertiveness. Methods: 12 male tennis-practicing students of the Beijing Sports University School of Education 2020 class were randomly selected as research volunteers. Through a literature search, data statistics, and other methods, they were randomly divided into an experimental group and a control group. After 6 weeks of traditional training in the control group and the addition of unstable platform balance training in the experimental group, the results were compared. Results: The ability to stand with eyes open on the dominant leg was significantly improved in the experimental group. After routine training and balance training, the athletes in the experimental group had a great improvement in the assertiveness of passes (P<0.05), and the stability of the service was also improved (P<0.05). Conclusion: After training, all physical abilities were improved. The unstable platform training is a valid resource to improve athletes' balance and assertiveness ability. ***Level of evidence II; Therapeutic studies - investigation of treatment outcomes.***

Keywords: Tennis; Postural Balance; Physical Education and Training.

RESUMO

*Introdução: A constante manutenção da força muscular é um cuidado altamente relevante no treinamento para a prática do tênis. A plataforma instável é desenvolvida com o aperfeiçoamento de recursos modernos e tecnológicos e a necessidade de verificar os seus efeitos sobre a aptidão física dos atletas é requisitada. Objetivo: Estudar o efeito do treinamento em plataforma instável sobre a capacidade de equilíbrio e assertividade dos tenistas. Métodos: Um total de 12 estudantes masculinos praticantes de tênis da classe 2020 da Escola de Educação da Universidade Esportiva de Beijing foram selecionados aleatoriamente como voluntários de pesquisa. Através de pesquisas bibliográficas, estatísticas de dados e outros métodos, eles foram divididos aleatoriamente em grupo experimental e grupo controle. Após 6 semanas de treinamento tradicional ao grupo controle e a adição de um treinamento de equilíbrio em plataforma instável no grupo experimental, comparou-se os resultados. Resultados: A capacidade de ficar em pé com os olhos abertos sobre a perna dominante foram significativamente aprimorados no grupo experimental. Após o treinamento de rotina e o treinamento de equilíbrio, os atletas do grupo experimental tiveram uma grande melhora na assertividade dos passes (P<0,05), e a estabilidade do saque também foi aprimorada(P<0,05). Conclusão: Após o treinamento, todas as habilidades físicas foram melhoradas. O treinamento em plataforma instável é um recurso válido para aprimorar a capacidade de equilíbrio e assertividade dos atletas. **Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

Descritores: *Tênis; Equilíbrio Postural; Educação Física e Treinamento.*

RESUMEN

*Introducción: El mantenimiento constante de la fuerza muscular es un cuidado muy relevante en el entrenamiento para la práctica del tenis. La plataforma inestable se desarrolla con la mejora de los recursos modernos y tecnológicos y se solicita la comprobación de sus efectos sobre la aptitud física de los deportistas. Objetivo: Estudiar el efecto del entrenamiento en plataforma inestable sobre la capacidad de equilibrio y asertividad de los tenistas. Métodos: Un total de 12 estudiantes varones practicantes de tenis de la clase 2020 de la Escuela de Educación de la Universidad de Deportes de Pekín fueron seleccionados al azar como voluntarios para la investigación. Mediante la búsqueda de literatura, la estadística de datos y otros métodos, se dividieron aleatoriamente en grupo experimental y grupo de control. Tras 6 semanas de entrenamiento tradicional en el grupo de control y la adición del entrenamiento de equilibrio en plataforma inestable en el grupo experimental, se compararon los resultados. Resultados: La capacidad de mantenerse en pie con los ojos abiertos sobre la pierna dominante mejoró significativamente en el grupo experimental. Después del entrenamiento de rutina y del entrenamiento de equilibrio, los atletas del grupo experimental tuvieron una gran mejora en el asertividad de los pases (P<0,05), y también mejoró la estabilidad del saque (P<0,05). Conclusión: Tras el entrenamiento, todas las capacidades físicas mejoraron. El entrenamiento en plataforma inestable es un recurso válido para mejorar la capacidad de equilibrio y asertividad de los deportistas. **Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

Descriptores: *Tenis; Equilibrio Postural; Educación y Entrenamiento Físico.*

INTRODUCTION

With the enhancement of modern tennis players in terms of technology, physical fitness and speed, there are more and more strength athletes, both male and female, therefore, tennis players must have strong muscle strength, good body balance and stability in order to withstand and withstand the opponent's strong attack, the players themselves also have to have a certain explosive power and speed to be able to fight back strongly.[1]

Wang J Unsteady training refers to the use of unstable platforms, engage in weight-bearing training to induce the adaptability of action learning to achieve dynamic balance and strength output, and perform different degrees of non-fixed support exercise training on unstable equipment or equipment to promote balance and musculoskeletal exercise capacity, that is to simulate the technical characteristics of each project.[2] Research by Eshmawey H states: Let the test subjects lie on the resistance ball and on the bench, respectively, and perform 60% maximum muscle strength dumbbell presses, during the process, the EMG signals of the rectus abdominis, transverse abdominis/internal oblique, pectoralis major, triceps and anterior deltoid were collected.[3] Nan W pointed out in the article that "6 weeks of balance training can improve athletes' static balance ability and the body's ability to adjust dynamic balance, and 9 weeks of balance training can improve the ability to control direction, consolidate the effect of balance training.[4]

This study is a test that reflects the stability of hitting the ball, and two tests are selected for the forehand and backhand baseline accuracy and service accuracy in the ITN test system.

METHOD

Research object

The author selects a total of 12 tennis students in the 2020 class of the School of Education, Beijing Sport University as the research objects, all of whom are male athletes and have professional training backgrounds in track and field, aerobics and other specialties, age 20.2±0.9 years old, height 178.9±2.5cm, weight 69.8±5.1kg, BMI 21.8±1.7, training years 2.5±1.0 years, the subjects were randomly divided into 6 people in the control group D group and 6 people in the experimental group S group, all the subjects were in good health and willing to participate in the experiment of this research.[5,6] The basic information of the experimental group and the control group of the research subjects is shown in Table 1.

Documentation method

The relevant documents, theses and materials needed for this research were collected by consulting electronic resources such as CNKI, China Journal Network, China Master's and Doctoral Dissertation Network, Beijing Sport University Library, as well as newspapers and magazines related to the thesis; Check the relevant professional textbooks, check the evaluation methods and systems of different special balance ability, understand the research status and related theories of balance training and tennis technique and tactics training, and provide a theoretical basis for this research.[7]

Table 1. Comparison of the basic situation of the subjects in the experimental group and the control group.

Basic situation	Test group (n=6)	Control group (n=6)	T-test P value
Age (years)	20.2±0.9	20.3±0.7	0.93
Age (cm)	175.7±2.5	182.2±3.0	0.75
Weight (Kg)	66.3±5.1	73.3±5.1	0.92
Body mass index (kg/m2)	21.6±1.7	22.1±1.1	0.51
Years of training (years)	2.2±0.7	2.8±1.3	0.27

Experimental method

From September 2021 to November 2021, a 6-week experiment was conducted on 12 tennis-specialized male athletes of the 2020 class of the School of Education, Beijing Sport University. First, perform balance ability test and tennis shot stability test for all athletes, that is, ITN forehand and backhand baseline accuracy and serve accuracy test to obtain data; 12 people were randomly divided into S group (experimental group) 6 people and D group (control group) 6 people, both groups received the same regular tennis special training three times a week, on this basis, the S group underwent 6 weeks of balance ability training; After 6 weeks, the ITN accuracy and balance ability of all subjects were tested,[8] the test data and the data obtained before the experiment were compared and analyzed to draw conclusions.

Mathematical Statistics

The data recorded in this research experiment were analyzed and processed using Microsoft Excel 2007 and SPSS statistical software, firstly, Microsoft Excel was used to summarize, count and calculate the experimental results, and each index of the obtained results was expressed as mean ± standard deviation (Mean ± SD).[9] Then use SPSS software to conduct variance analysis and sample T-test statistical analysis on the data of the two measured results before and after the experiment, when the P value is less than 0.05, there is a significant difference, and when the P value is less than 0.01, there is a very significant difference.[10]

Ethical Compliance

Research experiments conducted in this article with animals or humans were approved by the Ethical Committee and responsible authorities of Institute of Physical Education, Liaoning Normal University and Junior High School Research and Training Center, Dalian Institute of Education following all guidelines, regulations, legal, and ethical standards as required for humans or animals.

RESULTS

Comparison of the results of stability test (LOS) between the experimental group and the control group

It can be seen from Table 2 that the control ability of the S group (experimental group) in each average direction showed an overall upward trend, the average directional control capability (DC) of Group S increased in the second stability test measured, the test P value of DC higher than the first test in group S was <0.01, and was significantly higher than that of the second test in group D (control group), with P value <0.05. RDC is the right control capability, LDC is the left control capability, from the experimental results, after 6 weeks of balance training

Table 2. Comparison of control ability in all directions and the time to complete LOS random target tracking.

Test indicators	Group D		Group S	
	0W	6W	0W	6W
DC(%)	44.8±14.9	52.7±11.2	57.7±15.3	61.3±16.1**☆
FDC(%)	45.8±23.4	54.8±17.2	58.7±12.7	66.0±23.4**
BDC(%)	71.5±23.2	64.2±14.8	730±26.2	77.5±17.0**
RDC(%)	69.0±14.5	63.0±19.9	66.5±24.8	71.8±14.4**
LDC(%)	62.0±12.7	64.0±14.1	70.3±17.9	72.5±14.5**
FRDC(%)	53.8±16.7	65.0±24.3	69.7±16.6	71.2±19.6*
FLDC(%)	39.0±10.6	49.0±13.3	53.7±20.0	57.2±27.3*
BRDC(%)	59.7±11.6	56.0±18.4	62.5±15.1	65.8±16.1*
BLDC(%)	57.5±18.1	70.0±19.5	55.7±10.8	69.8±15.8**
LOST(S)	39.2±18.3	33.0±7.9	33.8±7.8	27.2±6.3

* Indicates that each group is significantly different from the 0th week, P<0.05; ** means the difference is very significant, P<0.01; ☆ means the difference between the experimental group and the control group is significant, P<0.05; ☆☆ means the difference is very significant, P<0.01.

in group S, the control ability of these two directions increased significantly, compared with the first test results, there is a difference and the P value is less than 0.01, there was no statistical significance between the numerical results obtained by the second test between the S group and the D group P value>0.05.

Comparison of results between the experimental group and the control group in the tennis hitting stability test

Table 3 and Figure 1 can clearly see the hitting stability test results of Group S (experimental group) and Group D (control group), there is a slight difference between the two groups in the baseline forehand and backhand accuracy in the tennis ITN international rating test in Week 0, but there is no significant difference, P value>0.05 indicates that the level of the two groups of athletes conforms to the experimental principles and conditions of this study; The test results in the 6th week showed that group S was slightly higher than group D, and there was no difference in P value > 0.05 from a statistical point of view; Compared with the scores in the 0th week, the scores of the S group in the 6th week were significantly higher in the comparative analysis (P<0.05); Compared with the results of the second test in group D, there was no significant change (P>0.05). Experimental results show that: 6 weeks of tennis routine training and balance training can improve the stability of the player's forehand and backhand hitting, but it takes longer practice to have a more significant effect.

DISCUSSION

Tennis players' ability to stand on two feet with eyes open, stand on two feet with eyes closed, and stand on one foot with open eyes on dominant leg can be enhanced after 6 weeks of tennis balance training. At the same time, it helps to improve the ability of the athlete's body to control the direction of stability, and long-term practice can further consolidate the effect of balance training. The baseline hitting stability of the experimental group athletes after routine training plus balance training was significantly improved, especially the serving stability, which was greater than that of the athletes before the experiment and the control group; The balance ability training method is superior to the ordinary routine training method in improving the stability of the athlete's hitting.

Table 3. Comparison of ITN forehand and backhand accuracy test results between 5S group (experimental group) and D group (control group).

Test indicators	Group D		Group S	
	0W	6W	0W	6W
Forehand and backhand scores (out of 84 points)	37.5±7.7	40.3±8.4*	33.0±7.1	38.8±8.0
Serve score (out of 84 points)	40.2±15.9	48.3±3.0**	31.5±7.8	35.0±12.5

* Indicates a significant difference between each group and its 0th week, P < 0.05; ** indicates a very significant difference, P < 0.01.
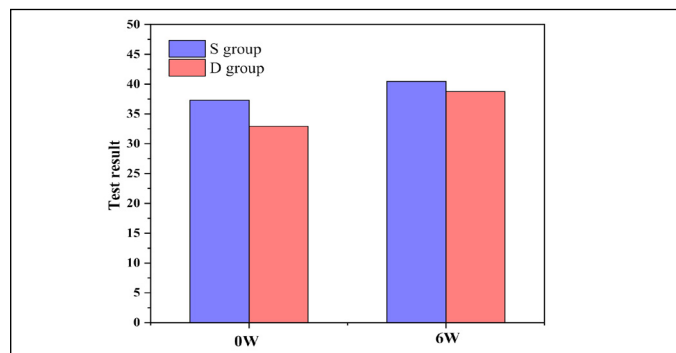
Figure 1. Comparison of the accuracy test results of ITN forehand and backhand hits between the 5S group and the D group.

CONCLUSION

Unsteady training can improve balance in tennis players. Through the analysis of experimental data, it can be seen that the static balance and dynamic balance indicators of the experimental group have reached a significant level of difference before and after the test, compared with the control group, the experimental group shows that unstable training has more obvious changes in the balance ability of young people. The control group did not engage in unstable training, although there was a certain increase in the test balance ability indicators before and after the experiment, it did not reach a statistically significant level. It can be inferred that non-stability training can effectively improve the balance ability of tennis players.

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

AUTHORS' CONTRIBUTIONS: Each author made significant individual contributions to this manuscript. Mingzhe Wang: writing; Ping Yang: data analysis; Xuejiao Zou: article review and Shibo Yu: intellectual concept of the article.

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