

INFLUENCE OF LADDER TRAINING ON MOTOR COORDINATION IN BASKETBALL PLAYERS

INFLUÊNCIA DO TREINAMENTO DE ESCADA NA COORDENAÇÃO MOTORA DOS JOGADORES DE BASQUETEBOL

INFLUENCIA DEL ENTRENAMIENTO DE ESCALERA EN LA COORDINACIÓN MOTORA DE LOS JUGADORES DE BALONCESTO



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ABSTRACT

Introduction: The ladder training method was implemented in the USA in the late 20th century to train the agility the motor coordination of athletes in the United States. It is believed that this exercise can be a beneficial addition to the training of basketball players. **Objective:** Study the ladder training method's influences on basketball players' sensitivity. **Methods:** Following the parameters of the current scientific literature, an experimental ladder training protocol was designed. Basketball players aged 10-12 years in sports schools were selected as volunteers for the experiment. The influence of motor coordination qualities was measured pre and post-test. The collected data were statistically analyzed and discussed. **Results:** The experimental group had significant differences in the activities of running for 30 meters, and vertical jump. Very significant changes were also found in the cross jump repeated in 20 seconds, cross quadrant jump, and 5-meter triangular slide. **Conclusion:** Ladder training beneficially influenced the motor coordination of young basketball players, implementing general and sport-specific agility. Combining it with standardized training is recommended for further promotion of motor quality in young basketball players. **Level of evidence II; Therapeutic studies - investigation of treatment outcomes.**

Keywords: Physical Education and Training; Basketball; Psychomotor Performance.

RESUMO

Introdução: O método de treinamento por escada foi implementado nos EUA no final do século 20 para treinar a agilidade a coordenação motora dos atletas nos Estados Unidos. Acredita que esse exercício possa ser um complemento benéfico aos treinamentos dos jogadores de basquetebol. **Objetivo:** Estudar as influências do método de treinamento com escada na sensibilidade dos jogadores de basquetebol. **Métodos:** Seguindo os parâmetros da literatura científica atual, foi elaborado um protocolo experimental de treinamento de escada. Esportistas de basquetebol entre 10 a 12 anos nas escolas esportivas foram selecionados como voluntários para o experimento. Aferiu-se a influência das qualidades relativas à coordenação motora pré e pós teste. Os dados coletados foram analisados estatisticamente e discutidos. **Resultados:** O grupo experimental teve diferenças significativas nas atividades de corrida por 30 metros e salto vertical, alterações muito significativas também foram encontradas no salto cruzado repetido em 20 segundos, salto em quadrante cruzado e deslizamento triangular de 5 metros. **Conclusão:** O treinamento de escada influenciou benéficamente na coordenação motora dos jovens jogadores de basquetebol, implementando a agilidade geral e específica dos esportistas. Recomenda-se a sua combinação ao treinamento padronizado para maior promoção da qualidade motora nos jovens jogadores de basquetebol. **Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.**

Descritores: Educação Física e Treinamento; Basquetebol; Desempenho Psicomotor.

RESUMEN

Introducción: El método de entrenamiento en escalera se implantó en Estados Unidos a finales del siglo XX para entrenar la agilidad la coordinación motriz de los atletas en Estados Unidos. Se cree que este ejercicio puede ser un complemento beneficioso para los entrenamientos de los jugadores de baloncesto. **Objetivo:** Estudiar las influencias del método de entrenamiento en escalera sobre la sensibilidad de los jugadores de baloncesto. **Métodos:** Siguiendo los parámetros de la literatura científica actual, se elaboró un protocolo experimental de entrenamiento en escalera. Se seleccionaron como voluntarios para el experimento jugadores de baloncesto de entre 10 y 12 años de las escuelas deportivas. La influencia de las cualidades relacionadas con la coordinación motriz se midió antes y después de la prueba. Los datos recogidos se analizaron y discutieron estadísticamente. **Resultados:** El grupo experimental tuvo diferencias significativas en las actividades de carrera de 30 metros y salto vertical, también se encontraron cambios muy significativos en el salto cruzado repetido en 20 segundos, salto en cuadrante cruzado y deslizamiento triangular de 5 metros. **Conclusión:** El entrenamiento en escalera ha influido beneficiosamente en la coordinación motriz de los jóvenes jugadores de baloncesto, implementando la agilidad general y específica



Descriptores: Educación y Entrenamiento Físico; Baloncesto; Desempeño Psicomotor.

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INTRODUCTION

With the maturity of basketball technology, the requirements for basketball players' agile qualities are also increasing, for college basketball players who are in the best stage of developing agile qualities, how to use flexible and age-appropriate agility training methods, received widespread attention. The ladder training method is the end of the 20th century, the State Sports General Administration introduced the most cutting-edge training methods for training athletes' agility and coordination qualities from the United States. However, whether the flexible ladder training method, an emerging agile quality training method, can be reasonably applied to college basketball players, and whether it can bring breakthroughs to the athletes' performance, needs further verification.¹

Kong Y et al. believe that the sensitive quality is the sensation of stimuli of the limbs in a specific sports scene, and the ability to quickly change direction or change actions as needed.² Du L believes that agility refers to the ability of a person to quickly, coordinate and accurately change the body posture in a complex and changeable environment.³ Garcia F used the ladder training to conduct a comparative experiment between the ladder training and the traditional agility training for 30 football fans from China University of Mining and Technology.⁴ Among the four tests in the final test results, three test results show that the ladder training can improve the agility of ordinary college students more than the traditional agility training. Berri D J conducted research on the responsiveness of collective ball games.⁵ The definition of sensitive quality for the special characteristics of collective ball games is proposed: The ability of the player's body to change its own displacement trajectory by adjusting the direction and speed quickly according to the external stimulus signal. Yin L et al validated the validity, objectivity, and reliability of the Canadian Agility and Motor Skills Assessment CAMSA in Canadian children aged 8 to 12 years, a detailed analysis of the assessment methods of the Canadian dexterity and motor skills assessment was carried out.⁶ Lu BY conducted agility training on first-level boxing athletes and national champions, and found that after agility training, not only the level of agility has been improved, but also the number of athletes' use of techniques and tactics in the competition.⁷ Pandu S B listed the training methods of special agility qualities commonly used by basketball players, including changing direction and variable speed running, rope ladder training, small ball agility coordination training, rope skipping training, etc. It provides certain methodological guidance for basketball special agility training.⁸ Marshall D C conducted a research on special agility training for young women's basketball players in Shandong Province, and found that basketball players' agility can be effectively improved through special agility training. At the same time, it was found that special agility training can effectively improve athletes' balance and overall coordination sex, it has a significant effect on athletes in mastering technical movements and avoiding the occurrence of injuries.⁹

It is because the ladder training is mainly for lower limb footwork exercises, excessive weight bearing may cause unnecessary sports injuries, choose appropriate weight bearing to avoid the occurrence of lower limb joints or waist, the injury of the hip joint should also be considered accordingly, the weight-bearing range of weight-bearing training is between 5% and 20% of the body weight, if it is too light, the effect

will not be good, and if it is too heavy, it is easy to cause sports injuries. According to different training purposes, determining the appropriate training weight is one of the focuses of research.

METHOD

Research object

The author takes teenage basketball players aged 10-12 in a sports school as the research object.

Research methods

Documentation Law

Using "soft training", "young basketball players", "sensitive quality" as key words to search in CNKI, VIP Chinese journal database and Wanfang Chinese journal database, extensive reading of journal literature, master's and doctoral theses and books on the training of ladders provides theoretical support for this research.

Experimental Method

The authors take teenage basketball players aged 10-12 from a sports school as experimental subjects. With the cooperation of school leaders and physical education teachers, the author selected a total of 20 youth basketball players (10 boys and 10 girls) aged 10-12, they were divided into an experimental group and a control group, there were 10 experimental groups (5 boys and 5 girls), and the control group was the same, before the test, two groups of subjects were tested before the test, including shape (height, weight), physical fitness (30m running, standing long jump), general agility test (20s repeated cross jump, cross-quadrant jump) and special agility test Test (four-line reentry run, 5m triangle slide). Statistical analysis was performed on the basic conditions of the two groups before the test, and it was found that the data of the male athletes in the experimental group and the male athletes in the control group were compared ($P \geq 0.05$), there was no significant difference between the female athletes in the experimental group and the female athletes in the control group ($P \geq 0.05$). See Tables 1 and 2.

Mathematical Statistics

All experimental data were substituted by the statistical software SPSS21.0. The experimental data are expressed as mean \pm standard deviation ($x \pm s$), $P \leq 0.05$ indicates a significant difference, $P \leq 0.01$ indicates a very significant difference, and $P \geq 0.05$ indicates no significant difference.¹⁰

Table 1. Statistics of each index of the two groups of male athletes before the experiment.

Test indicators	Before the control group $x \pm s$	Before the experimental group $x \pm s$	P
Height (cm)	171.2 \pm 0.3	171.3 \pm 1.3	≥ 0.05
Weight (kg)	62.5 \pm 2.6	62.8 \pm 1.2	≥ 0.05
30m (s)	5.5 \pm 0.3	5.4 \pm 0.1	≥ 0.05
Vertical jump in place (cm)	33.7 \pm 3.5	35.2 \pm 3.8	≥ 0.05
20s repeated across jumps (times)	36.0 \pm 2.5	36.3 \pm 2.3	≥ 0.05
Cross quadrant jump (times)	25.3 \pm 2.3	25.3 \pm 3.0	≥ 0.05
Approach height (cm)	292.1 \pm 8.0	293.8 \pm 8.4	≥ 0.05
5m triangle slide (s)	10.0 \pm 0.7	10.1 \pm 0.6	≥ 0.05

Table 2. Statistics of the indicators of the two groups of female athletes before the experiment.

Test indicators	Before the control group $x\pm s$	Before the experimental group $x\pm s$	P
Height (cm)	165.2±0.3	165.2±1.3	≥0.05
Weight (kg)	52.4±2.6	53.7±1.2	≥0.05
30m (s)	7.4±0.3	7.4±0.2	≥0.05
Vertical jump in place (cm)	21.6±3.5	22.0±2.5	≥0.05
20s repeated across jumps (times)	28.9±2.5	29.1±1.3	≥0.05
Cross quadrant jump (times)	18.3±2.3	17.3±4.0	≥0.05
Approach height (cm)	263.1±7.5	263.8±7.1	≥0.05
5m triangle slide (s)	14.9±0.7	15.5±0.4	≥0.05

Ethical Compliance

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

RESULTS

Comparative analysis of various indicators after the experiment between the male experimental group and the control group

As can be seen from Table 3, for the male experimental group and the control group after the experiment, the experimental group has significant differences in 30m running and vertical jump in place, there are very significant differences in the 20s repeated cross jump, the cross quadrant jump and the 5m triangle slide. No significant differences were found in the three items of height, weight, and approaching height.

Comparative analysis of the data of various indicators after the experiment between the female experimental group and the control group

From Table 4, it can be seen that the female experimental group and the control group have significant differences in the three items of 30m running, vertical jump and cross quadrant jump in the experimental group and the control group, there is a very significant difference in the 20s repeated straddle jump. No significant differences were found in the four items of height, weight, approaching reach, and 5m triangle slide.

To sum up, by analyzing the data of various indicators in the experimental group and the control group after the experiment, it is concluded that: Compared with traditional basketball training, soft ladder training can fully develop the general and special agility qualities of young basketball players, it can combine traditional basketball training with soft ladder training, and design various training methods to improve young basketball players' agility, coordination and other qualities.

DISCUSSION

As a basic and effective training method, ladder training can be combined with a variety of training methods, in addition to weight training, other methods can also be considered for training, such as training with dribbling, which can be used as a future research direction.

Table 3. The data of various indicators after the experiment in the male experimental group and the control group ($x\pm s$).

Test indicators	Before the control group $x\pm s$	Before the experimental group $x\pm s$	P
Height (cm)	171.2±1.3	171.3±1.3	≥0.05
Weight (kg)	62.7±1.3	62.8±1.2	≥0.05
30m (s)	5.4±0.3	5.4±0.1	≤0.05
Vertical jump in place (cm)	35.6±4.8	35.2±3.8	≤0.05
20s repeated across jumps (times)	36.0±2.1	36.3±2.3	≤0.01
Cross quadrant jump (times)	25.2±2.7	25.3±3.0	≤0.01
Approach height (cm)	296.8±8.4	293.8±8.4	≥0.05
5m triangle slide (s)	10.1±0.6	10.1±0.6	≤0.01

Note: $P\leq 0.05$ means there is a significant difference, $P\leq 0.01$ means there is a very significant difference, and $P\geq 0.05$ means there is no significant difference.

Table 4. The data of various indicators after the experiment of the female experimental group and the control group ($x\pm s$).

Test indicators	Before the control group $x\pm s$	Before the experimental group $x\pm s$	P
Height (cm)	165.1±1.3	165.1±1.3	≥0.05
Weight (kg)	52.7±1.0	53.8±1.2	≥0.05
30m (s)	7.4±0.3	6.6±0.3	≤0.05
Vertical jump in place (cm)	23.0±2.2	23.5±2.2	≤0.05
20s repeated across jumps (times)	29.0±1.3	31.1±2.3	≤0.01
Cross quadrant jump (times)	18.3±3.5	19.1±3.2	≤0.05
Approach height (cm)	267.8±8.1	265.1±6.1	≥0.05
5m triangle slide (s)	14.0±0.6	13.9±0.5	≥0.05

Note: $P\leq 0.05$ means there is a significant difference, $P\leq 0.01$ means there is a very significant difference, and $P\geq 0.05$ means there is no significant difference.

The author's experimental subjects are basketball players, and there is a certain gap between the sports level and professional athletes, it is recommended that follow-up studies should use higher-level athletes for verification. The age of the subjects is the best period for the development of sensitive qualities, and whether the same effect can be produced on subjects in other periods needs further verification. At the same time, when conditions permit, you can try to find a more accurate weight load percentage to achieve a better training effect.

CONCLUSION

After the 10-week experiment, through horizontal comparison, the male athletes in the experimental group had significant differences in the two items of 30m running and vertical jump in place, and in the three items of 20s repeated cross jump, cross quadrant jump and 5m triangle slide, have very significant differences. The female athletes in the experimental group had significant differences in the three items of 30m running, vertical jump in place and cross quadrant jump, and there was a very significant difference in the item of 20s repeated cross jump. The results show that the soft ladder training can fully develop the general and special agility of young basketball players, and the combination of traditional basketball training and soft ladder training can improve the agility of young basketball players.

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