PHYSICAL FITNESS IMPROVEMENTS IN FEMALE VOLLEYBALL PLAYERS

APRIMORAMENTOS DA APTIDÃO FÍSICA NAS JOGADORAS DE VOLEIBOL

MEJORAS EN LA CONDICIÓN FÍSICA DE LAS JUGADORAS DE VOLEIBOL

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ABSTRACT

Introduction: Volleyball is a competitive sport demanding the athlete's excellent physical fitness because the execution of its movements requires flexibility and agility. Objective: Analyze the effects of a specific training protocol on physical fitness at a competitive level on volleyball players. Methods: This paper selects 12 female volleyball players as volunteers for research subjects. The athletes' agility quality was examined for intellectual efficiency, psychological susceptibility, and flexibility, among other indicators. The mathematical statistical analysis program SPSS13.0 was used to analyze and process female volleyball players' sensitivity and characteristics of fitness quality. Results: The responsiveness of Chinese female volleyball players is mainly reflected in athletes' intellectual agility and kinetic adaptations. The characteristics of technology for protection are practical, diverse, and economical. Transmission technology is characterized by high speed and quick thinking. The sensitivity and quality of the volleyball players are high. Conclusion: The sensitivity of volleyball players is produced in response to changes in the sports court environment. The use of various tactics and auxiliary equipment in volleyball will cause changes in the court situation. The quality of sensitivity is critical in the physical training of volleyball players. *Level of evidence II; Therapeutic studies - investigation of treatment outcomes.*

Keywords: Volleyball; Physical Education and Training; Physical Fitness.

RESUMO

Introdução: O voleibol é um esporte de competição, exigindo dos atletas uma excelente condição física pois a execução de seus movimentos requere flexibilidade e agilidade. Objetivo: Analisar os efeitos de um protocolo específico de treino sobre a aptidão física em nível competitivo sobre os jogadores de voleibol. Métodos: Este artigo seleciona 12 jogadoras de voleibol como voluntárias para objetos de pesquisa. Examinou-se a qualidade da agilidade das atletas para avaliação da eficiência intelectual, suscetibilidade psicológica, flexibilidade, entre outros indicadores. Utilizou-se o programa de análise estatística matemática SPSS13.0 para analisar e processar a sensibilidade e características da qualidade da aptidão física sobre as jogadoras de voleibol. Resultados: A capacidade de reação das jogadoras chinesas no vôlei feminino reflete-se principalmente na agilidade intelectual e nas adaptações cinéticas das esportistas. As características de tecnologia para proteção são práticas, diversificadas e econômicas. A tecnologia de transmissão é caracterizada pela alta velocidade e raciocínio rápido. A sensibilidade e qualidade das jogadoras de voleibol são altas. Conclusão: A sensibilidade dos jogadores de voleibol é produzida em resposta às mudanças no ambiente da quadra esportiva. O uso de várias táticas e equipamentos auxiliares no voleibol provocará alterações da situação na quadra. A qualidade da sensibilidade é crítica no treinamento físico das jogadoras de voleibol. *Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.*

Descritores: Voleibol; Educação Física e Treinamento; Aptidão Física.

RESUMEN

Introducción: El voleibol es un deporte de competición, que exige de los atletas una excelente aptitud física porque la ejecución de sus movimientos requiere flexibilidad y agilidad. Objetivo: Analizar los efectos de un protocolo de entrenamiento específico sobre la aptitud física a nivel competitivo en jugadores de voleibol. Métodos: En este trabajo se seleccionan 12 jugadoras de voleibol como voluntarias para los objetos de la investigación. Se examinó la calidad de la agilidad de los atletas para evaluar la eficiencia intelectual, la susceptibilidad psicológica, la flexibilidad, entre otros indicadores. Se utilizó el programa de análisis estadístico SPSS13.0 para analizar y procesar la sensibilidad y las características de la calidad de la aptitud física en las jugadoras de voleibol. Resultados: La capacidad de respuesta de las jugadoras de voleibol chinas se refleja principalmente en la agilidad intelectual y las adaptaciones cinéticas de las atletas. Las características de la tecnología para la protección son prácticas, diversas y económicas. La tecnología de transmisión se caracteriza por su alta velocidad y rapidez de reacción. La sensibilidad y la calidad de los jugadores de voleibol son altas. Conclusión: La sensibilidad de los jugadores de voleibol se produce en respuesta a los cambios en el entorno de la pista deportiva. El uso de diversas tácticas y equipos auxiliares en el voleibol provocará cambios en la situación de la cancha. La calidad de la sensibilidad es fundamental en la formación física de los jugadores de voleibol. *Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.*

Descritores: Voleibol; Educación y Entrenamiento Físico; Aptitud Física.

INTRODUCTION

Volleyball is a team-based sport. In volleyball, the offensive and defensive transitions of both sides of the confrontation are realized by the cooperation between the players. High-intensity confrontation and the use of flexible skills are the fundamental characteristics of volleyball. Athletes must follow the basic principles of moderation, periodicity, and the overall effect when performing physical training. Athletes need a full range of exercises in terms of strength, speed, endurance, and agility. In this way, a solid foundation can be laid for improving the overall body quality of volleyball players.[1] China's volleyball has entered the international arena. The techniques and strategies of Chinese volleyball training are often used for reference by other countries. Based on this research background, this paper makes an in-depth analysis and research on Chinese volleyball players' sensitivity and quality characteristics.

METHOD

Research objects

This paper selects 12 volleyball players as the research object. There were no significant differences in the athletes' height, weight, age, and training years. (Table 1)

Questionnaire survey

This paper analyzes the volleyball player's ability composition model from the aspects of physical fitness, technology, tactics, psychology, and intelligence. Nine major physical parameters were determined herein. The contents include height, upper limb length, lower limb length, BMI, blood pressure difference, resting heart rate, vital capacity, blood testosterone, and maximum oxygen uptake. Measure 5 volleyball skill items.[2] The content includes serving, padding, passing, spiking, blocking, etc. This paper measured five tactical capability indicators, including double-sided offense, three-dimensional offense, three-dimensional offense, double-blocking coordination, and multi-person blocking coordination.

Extraction of start and end feature points of volleyball spiking posture

This paper visualizes the feature image of the volleyball spiking pose. This paper converts the spiking pose feature image into a 3D modeling corresponding to human motion.[3] The formula for the image degradation mode $\eta(\alpha, \beta)$ of the spiking pose of a volleyball player is as follows:

$$\eta(\alpha,\beta) = \lambda(\alpha,\beta) + \sigma(\alpha,\beta) \qquad (1)$$

$\lambda(\alpha, \beta)$, $\sigma(\alpha, \beta)$ is a 3D distribution map of volleyball players' spiking postures in the high-dimensional information distribution area. Assume that the spiking pose image of the top p player is r. In this paper, the characteristic movement markers of volleyball players' spiking posture are obtained by reconstructing the eigenvalues of the contour distribution. In this paper, it is combined with the window to obtain the eigenvalue $l^{ij}_{AB}(\alpha, \beta)$ of the image block with the size of c x c window.

$$L^{ij}_{AB}(\alpha,\beta) = \begin{cases} \dfrac{\partial\varphi}{\partial t}\dfrac{\sum_{\mu=-c}^{+c}\sqrt{\theta^{ij}_A(\alpha+\mu,\beta+\mu)^2+\theta^{ij}_B(\alpha+\mu,\beta+\mu)^2}}{\eta(\alpha,\beta)}, & A \neq B \\ 0, & A = B \end{cases} \qquad (2)$$

Table 1. Basic information on subjects.

Average height	Average buckle	Average age	Average training years
1.95±0.06	3.28±0.05	25.79±2.35	12.72±2.69

A and B are pictures of volleyball players in spike poses. i and j are the pixel coding order of the volleyball player's spiking pose θ. This paper performs a kinematic fusion of volleyball players' spiking poses in a uniform low-dimensional plane. In this way, this paper obtains an image edge $Int(C)$ extraction method based on the following formula:

$$Int(C) = \max_{r \in MST(C,E)} p(r)L^{ij}_{AB}(\alpha,\beta) \qquad (3)$$

This paper investigates automatic tracking and fusion based on motion feature markers by extracting the image data of volleyball players' spiking posture.[4] In this way, this paper constructs a three-dimensional image of the spiking pose image.

Data Analysis

This paper uses the mathematical analysis program of SPSS13.0 to process the collected data about the sensitivity and quality of volleyball.

Ethical Compliance

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

RESULTS

Analysis of physical fitness characteristics of volleyball players

The mean BMI of the volleyball players was 26.08±3.81. The average resting heartbeat of volleyball players was 69.83±6.76 beats per minute.[5] The mean lung volume was 3539.4±299.16 ml. The mean blood testosterone level was 617.89±337.89 ng/ml. The mean maximum oxygen intake was 65.55 ± 3.72 ml/kg (Table 2). Volleyball players are tall and well-proportioned, with low body fat and fat content. Offensive players have muscular waists and high arm speed.

Research on the technical characteristics of volleyball players

When the volleyball player jumps, the hitting point is 0.29±0.01m higher than the net. The technical characteristics of volleyball are that the server technology is fast, and the arc changes significantly.[6] The characteristics of padding technology are practical, diversified, and economical. The transmission technology is characterized by high speed and rationalization. Buckle technology is characterized by strength and efficiency. The interception technique is characterized by high altitude. (Table 3)

Table 2. Physical characteristics of volleyball players.

Physical characteristics	Average value
Height	1.95±0.06
Upper limb length	86.64±3.21
Lower limb length	94.44±4.43
BMI	26.08±3.81
Resting heart rate	69.83±6.76
Lung capacity	3539.4±299.16
Blood testosterone	617.89±337.89
VO2 max	65.55±3.72

Table 3. Skill characteristics of volleyball players.

Skill Characteristics	Average value
Serve rate	34.00%
One pass rate	61.31%
Spike rate	47.66%
Block scoring rate	42.76%

Research on the characteristics of sensitivity and quality of volleyball players

From Table 4, it can be seen that the three-dimensional attack score attack dominates Chinese volleyball players. Both sides scored second.[7] Players using double-sided, three-dimensional, three-dimensional, and three-dimensional offense scored 11, 16, and 20, respectively. The main reason is that the three-dimensional attack makes it difficult for the opponent to intercept. (Table 4)

Research on the characteristics of sports intelligence of volleyball players

This paper uses five main indexes to reflect the sports intelligence characteristics of athletes. Its contents mainly include submissive achievement, independent achievement, intellectual efficiency, psychological receptivity, and flexibility.[8] The article takes 12 Chinese volleyball players as examples to intuitively think about the sensitivity quality of volleyball players. Athletes should intercept before attacking or defending. Due to the volleyball players' location, the players' sports intelligence characteristics were significantly different. (Table 5)

DISCUSSION

Sensitive quality refers to the ability of the human body to quickly coordinate, agile, and correctly complete actions under various sudden changes. Blocking, hitting the ball, saving the ball, passing the ball, attacking, etc., are all related to the athlete's action sensitivity quality.[9] Athletes need to make timely and correct responses according to the situation of the game, the situation on the spot, and the opponent's situation to adapt to the game's situation and make up for the lack of tactics. Athletes must use skills, body stagnation, and balance to complete the exchange between tactics, offense, and defense. This achieves the purpose of suppressing the opponent. The quality of agility is paramount in volleyball technique and tactics.[10] It is inseparable from speed, strength, coordination, and balance. Professional players and coaches with rich competition experience are very concerned about the training of sensitivity quality. Sensitivity quality not only helps athletes master skills faster, more accurately, more coordinated, and more proficiently but also helps athletes more comprehensively use their advantages to achieve excellent results in actual combat.

This paper analyzes the role of sensitivity quality in improving volleyball players. At the same time, this paper points out the importance and necessity of improving the athlete's sensitivity and quality.[11] The development of agility quality is essential to improving the function of various motor organs. In the specific teaching process, the coaches should scientifically determine their training objectives and rationally formulate teaching plans and methods according to the characteristics of volleyball. Coaches can use sports exercises or equipment to improve the complexity of technical movements. This can improve the athlete's reaction, rhythm, observation ability, balance ability, and so on. For example, training such as turning, emergency stop, and rapid rotation is added to the running and jumping training. In training various parts of the human body, athletes can take games, freehand, combined, and other methods.[12] The current volleyball unique sensitivity quality training methods can be roughly divided into four types: one is the reflection of the brain. The second is the transformation of action. The third is the change of direction. The fourth is combined training. Brain reflex training enhances the sensitivity and adaptability of thinking to grasp the situation better and carry out tactical coordination in the changing environment. Brain reflection training is generally carried out through special training or computer simulation. For example, scholars use computers to simulate sports scenes so athletes can judge and manipulate based on experience and knowledge. In addition, athletes can learn lessons from actual videos.[13]

Athletes learn good interceptions and attacks through video. Action transformation refers to the flexible change between actions and actions. Training methods include: fast backward, forward switching training, running, jumping conversion training, sprint training, reentry training, turning and jumping training, etc. Steering training is designed to improve variability in motion and thus improve a player's steering. Movement changes in the direction of movement include random throwing practice, running and catching practice, listening to the trumpet and crossing the line, running acceleration, speed practice, and hurdling practice. The comprehensive exercise aims to promote the comprehensive development of the functions of various organs of the human body and enhance the flexibility and coordination of the human body. Standard practice methods include carrying a ball, circling the body, and spinning. After such a set of special sensitivity quality training, the sensitivity quality and reaction of the players will be significantly improved.

CONCLUSION

Cultivating the sensitivity and quality of Chinese volleyball players is necessary. In physical education, coaches should strengthen the cultivation of extraordinary sensitivity and quality ability. Coaches should also carry out targeted physical education according to the characteristics of each athlete.

Table 4. Sensitivity qualities of volleyball players.

Sensitivity quality	Average value
Double Attack Score	11
3D Offensive Score	16
Three-dimensional offensive score	20
Double blocking	13
Multiplayer blocking	15

Table 5. Analysis of sports intelligence characteristics of volleyball players.

Sports intelligence features	Offensive player	Setter	Freeman
Obedience achievement	6.55±1.41	6.4±0.82	6.63±0.91
Independent achievement	7.66±0.72	7.94±0.8	7.75±1.01
Intellectual efficiency	7.43±0.88	7.71±0.97	7.6±0.78
Psychosensitivity	7.18±0.36	7.03±0.65	6.91±0.81
Flexibility	7.56±0.86	7.79±0.88	8.08±0.78

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