

Research on Volleyball Fluid Rehydration and Physical Fitness Optimization from the Perspective of Multiple Positions

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Abstract. Volleyball players in the process of training and competition need timely fluid to maintain good physical fitness and excellent performance. In volleyball, players at different positions have different tasks and performance and energy expenditure. There are different roles on the volleyball court, including attack, side attack, setter, receiver and free man. At present, the amount of research on sports fluid replenishment of volleyball players is relatively less than other sports. In view of the development trend of "full, high, fast, turn and change" in modern volleyball and the present situation of the various roles of volleyball players, this paper puts forward some thoughts on the design of fluid replenishment plan for volleyball players and the design of fluid replenishment plan according to the position of volleyball players on the court. In order to solve the above problem, this paper analyzed and summarized the sports rehydration research, explore the formation of volleyball athletes sport fatigue mechanism, and based on the special movement quality and physiology characteristics of volleyball players from each department job position classification under the new Angle of view put forward the corresponding requirement of the volleyball players movement rehydration and focus, targeted to help the volleyball coach team to design and improve the rehydration solution of athletes in each department job position and rehydration regulation, so as to improve the level of the whole movement of volleyball sports teams, promote the development of volleyball and volleyball sports in our country.

Keywords: Position; volleyball player; sports rehydration; physical recovery.

1. Introduction

During training and competition, volleyball players consume a lot of energy and sweat a lot, which will cause the loss of water, electrolytes and other nutrients in athletes' bodies. In order to alleviate the current fatigue of athletes, restore their physical function, ensure that sports performance to achieve the ideal effect, volleyball coach team through the means of sports rehydration to help athletes in the whole exercise cycle can timely fill back the lost water and nutrients to maintain the following process of the game[1].And then help volleyball teams to achieve the desired training effect, ensure efficient training, to improve the overall level of sports competition, so as to obtain excellent sports results, to achieve the established training objectives and competition objectives.

Through consulting the relevant literature, it is found that the number of articles on the study of volleyball athletes' sports rehydration is less than that of other sports. And the lack of a new perspective (such as: field position Angle) starting from the volleyball players to discuss the study. Based on this, this paper aims to study the sports rehydration of volleyball players in various positions, further clarify and discuss the physiological characteristics and rehydration needs of volleyball players through the existing knowledge theory and research, and discuss the characteristics and methods of sports rehydration of volleyball players from the perspective of position. Finally, some suggestions are put forward to improve the design and control of fluid replenishment in volleyball teams. In teams to achieve the ideal effect of rehydration and the volleyball players can recover in time the good physiological status and hydration status, increase rehydration consciousness of the volleyball players and coaches, the sense of teamwork and rehydration design optimization and process control power volleyball players show more excellent performance, help team achieve expectations game, To promote the development of volleyball and volleyball in China.

2. Sports fluid supplement and its application in volleyball

Volleyball game is by many times short and fast hard ball activity and longer, low intensity ball activity and short rest composed of intermittent movement. Volleyball competition is highly confrontational and competitive. With the increase of competition time, athletes will produce energy loss, and with the increase of sweating, resulting in fluid loss. Through timely and reasonable sports rehydration can change the volleyball players due to the loss of body fluid dehydration state, is an efficient and fast nutritional intervention measures and means, its purpose is to promote the rapid recovery of athletes' body function. Volleyball is based on aerobic power, anaerobic power of sports skill dominant type of netting against type, and volleyball athletes go through a long period of time, high strength, intermittent practice or game process, the anaerobic glycolysis requires volleyball players need to have strong power and phosphoric acid original power ability, and have proper aerobic power capacity. The above energy supply characteristics will also lead to a large amount of sweat in the process of training and competition, resulting in fluid loss and athletic water loss[2]. Volleyball players will lose a large amount of water, inorganic salts, trace elements and vitamins in their bodies during training and competition, which will also cause metabolic disorders in the internal environment of the body, thus affecting the coordination of cells and molecules, tissues and organs and even the various systems of the body. In the training competition, volleyball players need to replenish water, electrolytes and other nutrients in time through sports, so that volleyball players can timely recover, relieve body fatigue, promote the athletes body rehydration.

3. The mechanism of volleyball athletes' sports fatigue and the characteristics of special physical equipment and special duties

3.1 Mechanism of volleyball players' sports fatigue

Volleyball has various forms, including running, jumping, straddling, rushing, falling and other movements, and most of them are completed under the conditions of mutual confrontation. The intensity of muscle activity varies widely, so fatigue can easily result. In the process of volleyball games, the two sides fight fiercely, especially in the continuous many rounds of competition in the athletes' body under the load intensity is very large, so that the anaerobic metabolite lactic acid in the body rose significantly, resulting in a decrease in muscle PH value resulting in fatigue. There is a constant exchange of matter and energy between human bodies and their environment. According to the characteristics of volleyball games, a game is very long, because of the long time sports in the brain increase r-aminobutyric acid, protective inhibition enhancement, so that the excitability of the brain is reduced. In addition, the blood glucose concentration in athletes decreased significantly, and the consumption of glycogen increased, resulting in central nervous fatigue[3]. In addition, the athletes' body temperature increases and perspiration increases during the competition, resulting in dehydration and electrolyte metabolism disorder, resulting in fatigue.

3.2 Characteristics of special positions of volleyball players

Through literature review, it can be seen that different ball games have different forms, intensity and duration of activities[4]. In terms of physical development and technical movements of volleyball players, due to their different positions on the court, the physical development requirements and special technical ratio of volleyball players are also different, as shown in Table 1 and Table 2.

Through the systematic induction of the fatigue generation and special physiological characteristics of volleyball players, it is found that volleyball players have special differences in physical development characteristics such as body shape and body function due to their different positions on the court. In order to promote the immediate and effective recovery of body fatigue, improve the volleyball players can perform their respective duties and show their excellent sports performance, it is necessary to subdivide the rehydration, targeted to guide the coach team according to the physiological characteristics of volleyball players and special physical characteristics carefully

formulated sports rehydration plan, And guide the nutritionists and coaches with the team to supervise the effective implementation of the replenishment process and the replenishment effect of volleyball players.

Table 1. The physical quality requirements of volleyball players in different positions

Factor Position	Strength	Speed	Patience	Sensitive	Flexible	Jump Ability
Spiker	The waist abdomen strength Leg ankle strength Arm strength	Reaction speed Movement speed Takeoff speed Handwaving speed	The displacement of endurance Speed endurance	Coordination and flexibility of legs, waist, abdomen and neck and arms	It requires high flexibility of the shoulders, hips, arms, knees and ankles.	Run-up bounce
Assistant Spiker	The waist abdomen strength Leg ankle strength Finger wrist strength	Reaction speed Movement speed Takeoff speed Handwaving speed	Bounce endurance The displacement of endurance	Coordination and flexibility of legs, waist, abdomen and neck and arms	It requires high flexibility on the shoulders, hips, wrists, knees and ankles of athletes.	Jumping in place and continuous jumping
Setter/ Assistant Setter	The waist abdomen strength Finger wrist strength Arm strength	Reaction speed Takeoff speed	Bounce endurance	Coordination and flexibility of legs, waist, abdomen and neck and arms	It requires high flexibility on the shoulders, hips, wrists, knees and ankles of athletes.	Jumping in place and continuous jumping
Libero	The waist abdomen strength Leg ankle strength Arm strength	Reaction speed Movement speed	The displacement of endurance	Coordination and flexibility of legs, waist, abdomen and neck and arms	It requires high flexibility of the shoulders, hips, arms, knees and ankles.	Jumping in place (Demand less)

Table 2. Statistics of the importance of the common technical movements of volleyball players

Factors Position	Serve	reserve	Attack	Spike	Rear Atteck	Block	Rear defence	Prepare posture and movement
Spiker	√	√	×	*√ (4)	√	√	√	*√
Assistant Spiker	√	√	×	*√ (3)	√	*√	√	*√
Setter/ Assistant Setter	√	×	√	×	×	√	*√	√
Libero	×	*√	×	×	×	×	*√	*√

Note. * is "important technical action for division members"; √ means "the team members have high requirements in the special skills"; (N) indicates that the volleyball players of the division mainly use the spiking technique at position 4 or 3 in the front row; This technique is rarely used in training or competition.

4. Special quality characteristics and fluid replenishment characteristics of volleyball players in different positions

Volleyball is many high intensity ball activity, low intensity ball activity and short rest process composed of intermittent movement process[5]. In terms of physiological function, volleyball players take aerobic metabolism energy supply as the basis during no-ball period, and anaerobic metabolism energy supply as the core during each point competition. Anaerobic glycolysis energy supply system is the main source of energy supply when the number of offensive and defensive confrontation

increases, because anaerobic glycolysis energy supply will produce metabolites and form lactic acid accumulation, which also requires volleyball players to have good acid resistance. At this time can be through the way to help volleyball players adjust body fluid components, improve sports performance. However, due to the different positions of volleyball players on the court, the mechanism and methods of fluid replenishment are also different from each other, which needs detailed discussion.

The following will be based on the different position on the field, to the volleyball players to summarize the method of rehydration, and the athletes of the corresponding requirements.

4.1 Special quality characteristics and fluid replenishment characteristics of the spiker

4.1.1 Special quality characteristics of the spiker

The spikers in volleyball games may meet the main task. They need to break through the other team's collective block in difficult circumstances. The spikers are mainly in the net, the far net and the back row attack and adjust the spike attack. Therefore, volleyball technology has higher requirements on the height, strength, skills, line changes and accuracy of the main attack team. This means that the main offensive and defensive moves (e.g., spike and serve while attacking; Defense for the ball, blocking) and short intervals of off-ball movement (e.g., defensive posture and movement). In addition, the spiker also needs to have certain endurance quality. In addition to the normal interval of competition, the spiker should keep nervous in the front and back row at any time. Therefore, it is necessary to strengthen the aerobic energy supply ability to maintain the physical support of the spiker for a long time.

4.1.2 Spiker's rehydration and rehydration methods

The principle of fluid replenishment in the training period is to strengthen the functional body function of the main attack team through reasonable fluid replenishment, pay attention to the physical quality development of speed and maximum strength, and improve mobile endurance, speed endurance and jumping ability. By adjusting the body fluid of volleyball players, the joints and muscle groups of the body can exert their corresponding strength, speed and endurance quality. Strengthen volleyball player's body can help them build up the coordination and cooperation, improve its flexibility and agility quality[6]. Therefore, the training period of the dominant player fluid needs to focus on sugar and sodium intake. Spikers spend more time on the court than other volleyball players. In order to avoid the loss of body fluids caused by excessive sweating, they need to replenish water and electrolytes, mainly salt (sodium chloride), to compensate for the loss of electrolytes.

In terms of the amount of fluid rehydration, the spiker should take sufficient fluid rehydration 8 hours before exercise, and use the normal interval of the game (such as: time out, substitution, intergame) to take a small number of fluid rehydration during exercise. The sports fluid of the spiker after the exercise needs to be proportioning according to the sweating amount of each volleyball player calculated by the coaching team during the training period. On the basis of the original sports drink, the concentration was reduced, and the proportion of water was increased to reach the amount of water loss of the main offensive player, and the player was required to supplement about 200ml of quantitative sports drink every 20 minutes after the exercise[7].

4.2 The characteristics of special quality and fluid replenishment of the assistant offensive player

4.2.1 Special qualities and characteristics of blockers

The adjutant attack players mainly with fast, change, live and other offensive means to break through the other side of the block, and actively run to cover, to other attack players to create favorable conditions, but also the burden of the middle and both sides of the block task, which on the adjutant attack players in physical strength and tactics have put forward a very high demand. The special technical and tactical characteristics of the auxiliary attack team mainly consist of blocking and fast ball attack, which determines that they need to have fast athletic ability, and put forward higher

requirements for explosive force, reaction speed, movement speed, displacement speed and jumping power.

4.2.2 Dispensing and rehydration methods of the blocker

The auxiliary attack team focuses on anaerobic phosphoric acid and anaerobic glycolysis. In terms of sports fluid supply, phosphorus and calcium need to be added to maintain the excitability of volleyball players' neuromuscular system and promote the rapid contraction of muscles[8]. In addition, autogenic recovery after exercise can help reduce the accumulation of fast muscle lactic acid in volleyball players and maintain their acid-base balance. Blockers in the middle and late period of the movement before the need for a small number of appropriate fluid. 50% of the total amount should be replenished before the match according to the special technical and tactical characteristics of blockers and the rules of getting on and off the field during the match. During the match, the rest during the normal interval and free agent replacement should be used for fluid replenishment. And the fluid replenishment amount accounts for about 30% of the total amount. Drink the remaining 20% or so of the sports drink in equal amounts, every 20 minutes, after full relaxation and recovery.

4.3 Characteristics of special quality and fluid replenishment of setter and receiver

4.3.1 Special quality characteristics of setter and assistant setter

As the core of tactical attack, the setter should organize various attacks reasonably and carry out the intention of the coach actively according to the situation on the spot. An excellent setter plays an important role in uniting the whole team, inspiring morale and achieving good results[6]. In addition, the overall control and application of the skills and tactics of the relay setter is highly required, and it plays an important role in volleyball teams. Not only should he be able to set up tactical attacks like a setter, but he should also be able to defend and attack alternately from front to back[9]. To sum up, both the setter and the assistant setter need tactical organization ability and on-the-spot strain ability, and have high requirements in terms of physical strength in terms of jumping ability, reaction speed, movement speed, displacement speed and the application of fast movement.

4.3.2 Dispensing and replenishing methods of the setter and assistant setter

Compared with other volleyball players, the setter and assistant setter have the longest time on the court. The whole training process and competition period is dominated by aerobic oxidation, glycolysis as the main source of energy, plus the support of anaerobic phosphate. Therefore, it is necessary to increase the proportion of water in the sports drink of setter and assistant setter. Ensure that the sugar content of the drink is about 10%, and there is an appropriate amount of potassium and sodium to make the osmotic pressure of the drink lower than the osmotic pressure of the athletes' blood, which is conducive to the water and other nutrients in the sports drink through the stomach as soon as possible for the setter and assistant setter to absorb.

The method of fluid replenishment is 300-500ml of fluid replenishment 30-60 minutes before exercise to ensure the body fluid balance between the setter and assistant setter. During training and competition, the regulation should be carried out according to the interval of competition as far as possible. The principle is to replenish 120-240ml fluid every 15-20 minutes, and the amount of fluid per hour should not exceed 800ml [3]. Timely fluid replenishment after exercise is needed to change dehydration caused by long-term competition and speed up its functional recovery.

4.4 Special qualities and fluid replenishment characteristics of libero

4.4.1 Special qualities of libero

The free man is specialized in receiving the serve and defending the back row, and only needs to go through the process of serving once between the ups and downs. It can greatly improve the defensive level of the whole team to choose the players with excellent defensive skills in receiving serve and back row as free agents[6]. Libero can play in the front row, and when the blockers are

physically weak and need to rest and turn to the back row, so as to increase the team's first pass rate and promote the improvement of the team's offensive ability.

4.4.2 Rehydration and rehydration methods for libero

Libero use anaerobic phosphoric acid and glycolysis for energy during games, with 6% sugar and 0.5-0.7% sodium chloride in the mix of sports drinks. Because they need to enter the working state quickly in the competition, they have high requirements for movement, and they spend less time on the court, so they need to carry out sufficient sports fluid replenishment before exercise. Supplement 200-400ml sports drink 2-3 hours before the race, drink 100-200ml sports drink every time in the off-court waiting field and during the normal race, and supplement 150-200ml sports drink every 20-30 minutes after the race.

5. The general principle of rehydration for volleyball players

5.1 Promote the body of volleyball players to quickly rehydrate, supplement the lost nutrients in sports

For volleyball players, sports rehydration can promote rapid body rehydration. The principle of rehydration is to make up for the lost water, and to make up for a certain proportion of sugar, salt and low concentration of liquid for a small number of times. Sugar intake can help athletes make up for the direct energy supply source in time, and help athletes obtain glucose direct energy supply to promote sports performance and performance. The physiological function of inorganic salt is reflected in maintaining the capacity of the fluid inside and outside the athletes' cells, promoting the composition of some coenzymes and maintaining the normal excitability of nerve and muscle cells, so in the process of volleyball athletes' sports fluid intake should also pay attention to the right amount of inorganic salt[10]. In the process of rehydration volleyball athletes with the team nutritionists and coaches should pay attention to the effect of rehydration and nutrition intake of volleyball athletes in the process of sports training, in addition to sugar and inorganic salts should also pay attention to the intake of vitamins and other nutrients, and constantly monitor the volleyball athletes' performance and body feedback.

5.2 Pay attention to the taste, taste and temperature control of sports drinks for volleyball players

In terms of rehydration taste and temperature control, volleyball players in various positions need to add appropriate flavor to make sports drink taste better, such as: appropriate citric acid, sweetener and so on. In the training period and competition period can choose mild and appropriate taste to change to stimulate the taste buds of volleyball players, through the taste of the new experience to promote athletes active and positive fluid, improve the recovery rate of nutrition. In addition, should avoid the department position volleyball players drinking sports drinks containing carbonate gas, to avoid carbonate gas stomach filling feeling increased and intense exercise brought by the body discomfort, affect the performance of volleyball players [3]. In terms of temperature regulation, the temperature of sports drinks should be adjusted according to the competition period and season. Under normal circumstances, ensure the input of normal temperature (20-25°C) liquid. The weather is hot and the indoor temperature is high. It is recommended to drink sports drinks at room temperature. In winter, warm (25-42°C) pure water can be used as the base for sports replenishment preparation. The prepared sports drinks need to be dressed in graduated thermos cups and marked with notes to distinguish the sports drinks of volleyball players in the same position with the same color label[11].

6. Conclusion and suggestions

6.1 Conclusion

Through the review of relevant literature, it is found that the amount of research papers on sports fluid rehydration of volleyball players is less than that of other sports, and there is a temporary lack of research on sports fluid rehydration of volleyball players from a new perspective, such as the position of the department.

Sports fluid replenishment can promote volleyball players to quickly rehydrate, help athletes make up for the direct energy source of the body in time, and promote their sports performance and play. However, in the practice of fluid replenishment, teams lack of specific design and regulation of fluid replenishment for volleyball players in different positions.

Each department job position of volleyball players physiological function and the special quality of movement are different, through the study found that the volleyball movement with same rehydration method rehydration has certain drawbacks, need volleyball players from each department job position Angle respectively for thinning methods and emphasis the rehydration and optimization are discussed.

6.2 Suggestions and Prospects

Coach design team volleyball players rehydration solutions available from the department job location characters of the athletes, according to the actual circumstance of the team to build up a complete and intuitive rehydration and monitoring system is designed to help the volleyball sports teams to improve the core competitiveness, boost volleyball players energy recovery and sports nutrition requirements in a timely manner.

Volleyball players in different positions have different requirements for fluid rehydration, so the principle of differential treatment should be followed. The coaching team should design and improve the rehydration plan according to their roles and positions on the field.

Trainers and nutritionists can be measured by each department job position of volleyball athletes sweat loss amount to movement monitoring, every time to secondhand the athletes in training of the loss of water and electrolyte loss, master volleyball players and to control each department job position and characteristics of fluids, and lay a foundation for perfect and improve the follow-up rehydration plan.

Nutritionists and coaches of each volleyball team should adjust and improve the sports fluid replacement plans of athletes in different positions according to the actual situation of the team, so as to guide the athletes to make reasonable fluid replacement and supervise their effective fluid replacement. Assist volleyball sports team scientific fluid allocation, effect monitoring, improvement and optimization, and then promote volleyball players body metabolism balance and sports fatigue recovery, promote the overall development of their competitive ability.

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