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## The comparative analysis on the age height spiking and blocking between Chinese and foreign women volleyball players

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### ABSTRACT

As a kind of competitive sports, the volleyball has strict requirements on the physical fitness of players, such as, age, height, etc. In the women's volleyball sport competition, the height of spike and block is the key to the offence and defense of both sides in events. Our women volleyball team has a better performance in international competitions, but it still has strong opponents of Cuba and Russia, in particular, the Cuban team has been the long-term holder of the title in international women volleyball competitions, the age and height of its players are deserved to study. The study selects 108 members of women volleyball team in six countries as the research subjects, including Cuba, China, Russia, the United States, Germany and Brazil., and it makes statistics and comparative analysis on their age, height, spike height and block height. It is believed that recruiting and training the team players with a higher height can improve the block air supremacy in the competition, thereby creating a basic condition to win the race; the appropriate age structure can provide the back-up guarantee for winning the game and the long-term development ; the spike height and block height are related to the factors like age, height, and also the most critical factors determining the strength of a volleyball team. In order to get the initiative and gain more score points in the game, Chinese women's volleyball team can learn the experience and lessons from the building and training of international top teams like Cuban, thus constantly improving its own strength and promoting the long-term development of Chinese women's volleyball team. Through the method of comparative study, this study can provide some useful inspiration based on quantitative analysis for the construction of Chinese women's volleyball team.

### KEYWORDS

Competitive sports; Volleyball; Chinese and foreign women volleyball team; Initiative of game.



## INTRODUCTION

Women 's volleyball is an important part of Chinese sports events, and it is also important to support China to participate in international sporting events. The factors including players height, age, height of spiking and blocking play an important decision role in the match performance of women's volleyball players. What are the characteristics of foreign strong team and Chinese women's volleyball players in these factors? In these areas, what advantages do Chinese women's volleyball players have? And what weaknesses do they have? How to adopt targeted measures to optimize and train our women's volleyball team.? For these problems, in the following this paper will apply the right amount of data for quantitative research, and put forward some feasible suggestions. The entry point of this study is very clear, and the research method is appropriate. It has some certain guidance value for optimizing the structure of our athletes.

## OBJECT AND METHOD OF STUDY

### Object of study

This study selects 108 athletes as a research base data, and these players come from six national team, including China, Russia, Cuba, Germany, the United States and Brazil. To reach the balance of research data, each national team selects 18 in-service players.

### Method of study

In this study, it mainly uses three methods. They are comparative analysis, mathematical statistics and literature analysis. Among of them, the literature analysis method is used to collect the data of women's volleyball players needed in the study, including age, height and spiking, etc. While mathematical statistics method is used to test the data statistical characteristics, thus providing data support for comparative analysis. In fact, the application of the three research methods runs through the entire study, and they are not completely separated.

## STUDY RESULTS AND ANALYSIS

### The comparison on the height of female volleyball players

For volleyball sports, the height is an important condition to obtain competition advantage. In the volleyball sporting, the serve, blocking and attacking targets are directly related to result of the competition, especially under the current integral system of "each ball scores", the height of athlete is particularly important. For example, in the case of the same take-off ability, the player who dominates in the height is able to touch the volleyball with a higher altitude, and get more scores. In volleyball, blocking is an important means to counter the opponent. And the team who has the higher height is easier to hit the volleyball back to the opposite court in the net dividing line. Under the current women's volleyball competition system, blocking allows the hands of players to have over-net movement, which make the blocking advantage with height play obviously. Because of these reasons, each country attaches great importance to the control of female volleyball team's height. As shown in TABLE 1, in the World Cup competition, the average height of women's volleyball players in each country since 1981 has been constantly rising, and it exceeded 185cm in 2012.

**TABLE 1 : The average height growth of all previous World Cup women's volleyball competition**

time	1981	1986	1992	1998	2004	2009	2010	2011	2012
height (cm)	176	178.3	178.9	180.3	182.5	183.2	183.9	184.3	185.1

Throughout the women's volleyball strong teams in World Cup competition or the Olympic Games, the height of all their members is more than 190 cm. As shown in TABLE 2, in 2012 World Cup competition, there were total 28 team members whose height was more than 190cm in the women's volleyball national teams, including China, Russia, the United States, Germany and Cuba. Whereas there were only 12 members with the same data in 1008. It is clear that the increase speed was beyond imagination. As the other conditions are the same, the female volleyball player who has a higher height will occupy more spiking and blocking advantages, thus making more scores than the opponent team. This conclusion is consistent with the results of competition. As for the women's volleyball team in the study, the average height of Russian team players was highest. There were 9 members whose height was more than 190 cm, accounting for 32.14% of the total sample. And this number accounted for 50.00% in the team. The height advantage of team players was obvious. Furthermore, this national team won the title at 2012 Female Volleyball World Championship, and the success mainly benefited from the height of players. For other female volleyball national teams, the height of German and American female volleyball players were higher, in which there were 7 players whose height was more than 190 cm in German team, while there were 5 players whose height was more than 190 cm in American team. The height of their team members was basically consistent with the competition result, because that year the two teams won the second place and third place respectively in the female volleyball World Championship. For the Chinese team, there were 2 members whose height was more than 190 cm, which was the same with Brazil, and equally matched with Cuba. Among them, the height of the player Zhao Ruirui was 198 cm. From the point of view of average height, the average height of Russian team was 188 cm, which was much higher than the Chinese team in the same period. To some extent, this explains why the Russian team is always the world strong team of female volleyball. What's more, the height of Chinese female volleyball team members is also rising, which cause a constantly increase of competition result in Chinese team. And it won the champion in 2006 and 2008 Female Volleyball World

Championship. It is visible that recruiting and training the players who has the higher height can improve the net air control of the team in the game, thereby creating the basic condition for winning competition.

**TABLE 2 : The number of top six national team members whose height is more than 190cm in 2012 female volleyball world championship**

Name of the team	Number	The accounting percentage within the national team (%)	The accounting percentage in the sample (%)
China	2	11.11	7.14
Brazil	2	11.11	7.14
the United States	5	27.78	17.86
Germany	7	38.89	25.00
Cuba	3	16.67	10.72
Russia	9	50.00	32.14
Total	28		100.00

### The comparison on the spike height of female volleyball players

Spike is an important means to counter the opponent and get score in volleyball, so the volleyball training process particularly focus on the spiking skill training of players. Spike height is the key to spiking skills. As shown in TABLE 3, in the sample of six national team selected in this study, the average spiking height of the Cuban team players is highest, and it is 321.6cm. Whereas the team with the lowest average spiking height is the Brazil, and it is 300.3cm, which is much lower than the Cuban team. In this research, the descending order with average spiking height of volleyball players in other countries is the Chinese national team, the Russian national team, the German national team and the U.S. national team. Through the comparison test on the difference P with the average spiking height of Chinese female volleyball players and other national teams, it is found that P value of 5 groups is less than 0.01. This indicates that the difference of data is very significant. If the physical fitness, psychological quality, error rate and tactical skill of each national team are all the same or similar, the average spiking height of game players will directly determine the competition results. In 2012 Female Volleyball World Championship, the average spiking height of the Cuban players was 321.6cm, even the spiking height of three players reached 340cm, which was obviously higher than the Chinese players with 315.2cm height. But the maximum height of spiking was only 331.6cm, and only one player reached this level. In this case, if the Chinese team encounters the Cuban team in the race, it will face the condescending pressure brought by the Cuban. In fact, in the competition between the Chinese team and Cuban team in 2012 Female Volleyball World Championship, the Chinese team had been in a state of passive defense, and it was difficult to attack, the defense appeared to be weak. Although the Chinese team played an indomitable fighting spirit, it still did not get the domination result.

There are a lot of factors affecting the spiking height. Except the acquired jumping training, the factors like the innate arch height, arm length, length of Achilles tendon, palm width, leg length and leg jumping ability will form the basic impact on the competition skills of volleyball players. Although the average height of Chinese athletes is higher than the Cuban, the latter's waist and abdominal strength are stronger than the Chinese team. Thus, the latter's spiking strength and height is much stronger. This allows the Cuban team to occupy many advantages in the previous women's volleyball World Championships, which makes it get eight consecutive, and it plays a decisive role in the ranking of international women's volleyball.

**TABLE 3 : The spiking height and relevant analysis of each national team in 2012 female volleyball world championship**

Nme of team	X ± S	Difference value	T	P
China	315.2 ± 6.0	6.9	3.372	<0.01
Russia	308.3 ± 6.5			
China	315.2 ± 6.0	7.4	3.042	<0.01
United States	307.8 ± 8.5			
China	315.2 ± 6.0	14.9	6.773	<0.01
Brazil	300.3 ± 7.2			
China	315.2 ± 6.0	-6.4	3.135	<0.01
Cuba	321.6 ± 5.6			
China	315.2 ± 6.0	7.2	2.88	<0.01
Germany	308.0 ± 9.0			

### The comparison on the block height of female volleyball players

In volleyball, the main measures of defense is to reduce the pressure caused by the opponent serve by blocking. According to the statistics, blocking is an important observation point to get scores in volleyball sports, it usually accounts

for 30%. Even nearly half scores of some strong defensive teams are obtained by blocking. For a volleyball team, if its block height is significantly lower than the opponent, then the game state will be very passive, and its defense capability is hard to withstand the opponent's attack. As shown in TABLE 4, the block height P value of the Chinese team and the other national teams is less than 0.01, the difference is remarkable. Therefore, it is considered that the Cuban team is the most outstanding team for the block height of each national women's volleyball team, then it is followed by the Chinese team, the Brazil ranks the last one. Although the block height of the Chinese team ranks the second place, and it is higher than the Russia, Germany, the United States and Brazil team, its average block height of 6.8cm is significantly lower than the Cuban team.

**TABLE 4 : He blocking height and relevant analysis of each national team in 2012 female volleyball world championship**

Name of team	X ± S	Difference value	T	P
China	306.2 ± 7.4	6.1	2.652	<0.05
Russia	300.1 ± 6.4			
China	306.2 ± 7.4	9.1	4.136	<0.01
United States	297.1 ± 5.8			
China	306.2 ± 7.4	20.5	7.069	<0.01
Brazil	285.7 ± 10.1			
China	306.2 ± 7.4	-6.8	3.40	<0.01
Cuba	313.0 ± 4.6			
China	306.2 ± 7.4	16.6	6.917	<0.01
Germany	389.6 ± 7.4			

#### The age structure characteristics of female volleyball players in each country

Competitive sports has the strict requirements on the age of athletes. In order to give a better play to the team combination advantage, the age structure is also increasingly being valued by the coach. According to the statistics of international volleyball sports association, the age of women's volleyball athletes ranges from 21 to 30 years old. As shown in TABLE 5, within the range of 21 to 30 years old, the proportion of all ages with volleyball athletes in each country gradually reduces. And the average age of all athletes varies from 22 to 25. It is visible that the youth constitutes the main body of women's volleyball athletes, and the proportion is usually more than 90%, of which the players between 21-year-old to 26-year-old usually account for about 60%. It is obvious that age is also an important factor constituting the strength of volleyball team. Taking the Cuban women's volleyball team for example, the average age of the team members is 22-year-old, which is far lower than 25-year-old average age of the Brazil and German team. The average age of the Chinese women's volleyball team members is 23-year-old, it is lower than the United States team, Germany team and Brazil team. This kind of age structure adds some advantages for the Chinese women's volleyball team. According to the result statistics of international female volleyball events, such as the World Championships, World Cup and Olympic Games and Asian Games, the average age of all the winning team members is less than 25 years old; even the average age of the Cuban team members is only 21 years old in 2009 World Championship. However, the statistics show that the average age of team members is not good while the age is smallest, there should be a suitable "old-middle-young" structure. The structure should be based on the "middle-aged" varying from 24 to 27 years old, accounting for about 60%; "young players" ranging from 18 to 23 years old should be the main future echelon, accounting for about 30%; as the experienced "old" players of more than 28 years old, this part should account for about 10%, and they can play a guiding and stabilizing role for the team in the training direction.

**TABLE 5 : The age structure characteristics of all the national female volleyball team members in 2012 female volleyball world championship**

Name of team	under 20 years old		21 to 23 years old		24 to 26 years old		from 27 to 29 years old		over 30 years old		average age of each team / years
	number	%	number	%	number	%	number	%	number	%	
China	3	16.67	9	50.00	3	16.67	3	16.67	-	-	23
Russia	1	5.56	8	44.44	5	27.78	4	22.22	-	-	24
United States	-	-	8	4.44	6	33.33	1	5.56	3	16.67	25
Brazil	2	11.11	7	38.89	5	7.78	-	-	4	22.22	25
Cuba	7	38.89	5	27.78	3	16.67	3	16.67	-	-	22
Germany	3	16.67	4	22.22	6	33.33	4	22.22	1	5.56	25
Total	N=16	X=14.8 2	N=41	X=37.9 6	N=28	X=25.9 3	N=15	X=13.8 9	N=8	X=7.4 1	X=24

## CONCLUSIONS AND RECOMMENDATIONS

In the female volleyball athletic competition, the athlete age, height, spike and block height have a direct decisive influence on the strength of team, and forming a fundamental impact on the competition results. In this study, 108 team players with six international female volleyball teams of China, Cuba, the United States, Germany, Brazil and Russia are selected as the study objects, through the statistics and comparative analysis about the age, height, spike height and block height of these female volleyball teams, it is found that the higher height can guarantee the initiative of game, and get more score points; the spike and block height not only brings the defensive advantages for the game, but also offensive advantages. For the female volleyball team, the higher spike height and block height can control the game rhythm, and winning the advantage for the team. In addition, the distribution of age structure is the basic factor. It not only causes the impact on a game of volleyball, but also affects the long-term development of the team. Thus, each national team needs to build a team with the reasonable age structure. By comparison, it is found that the Cuban team has the best performance in these areas, which is consistent with its previous competition results, meanwhile, it also sets a reference learning object for building the Chinese female volleyball team.

Since the implementation of reform and opening-up policy, China has been actively participating in international sporting events, and women's volleyball team ever had a brilliant performance. Now, although the Chinese team is still the international strong team, there are still many places needed to be optimized. In order to make the Chinese volleyball team become the world's top team, and maintain this advantage, we need to strengthen the exploration of training system and training method while having a good control of the age and height structure. The focus is to improve the jumping ability and counter force of athletes, thus enhancing its spike and block height, and ensuring its net control. In short, the building of an international female volleyball strong team not only needs the developing of indomitable fighting spirit, the basic conditions of age and height, but also the technical skills of spiking and blocking height are equally important. During the process, we need to constantly learn from foreign strong teams, and continue the exploration suited to own actual conditions.

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