

Network Diagrams for Diagnosing the Spike Skill in Significance of Some Kinematical and Anthropometric Variables and the Number of Points for the Best Spiker Participating in the Olympic Volleyball of Beijing, 2008

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Abstract: This study aims to identify some of the kinematical and anthropometric variables and the most appropriate points to the spike skill in volleyball. It also aims to set benchmark levels for some kinematical and anthropometric variables, the number of hitting points for volleyball players performing the spike skill in volleyball, as well as develop a graphic network in terms of some kinematical and anthropometric variables, the number of hitting points for volleyball players performing the spike skill in volleyball. A sample of the best 10 players performing the spike skill was intentionally selected, participated in the Beijing Olympics (2008), with the highest direct number of points for spike. Successful attempts were counted to each player, the 10 players, which were valid for analysis and the choice of three attempts for each player and analyzing it in terms of time. Data regarding the players' height, age and the number of points obtained were obtained through the official website of the Beijing Olympics (2008). The author used MAXTRAQ for the time analysis for the skill in question. The author used SPSS version 16 for the following data: the mean, standard deviation, upper and lower limits, range, skewness and the equation to find the fixed amount to convert the raw scores to standard scores (Six Sigma Score). Based on the statistical treatment followed by the author, the results revealed that the scores corresponding to the percentile degrees to the player's height, ranging between 212.90 and 182.90cm, age between 36.73 and 16.47 years, weight between 113.53 and 61.07 kg, maximum height between 382.87 and 327.33 cm, total time of skill between 2.36 and 3.15 seconds, the approach time between 0.57 and 1.22 seconds, the takeoff time between 0.047 and 0.007 seconds, flight and hitting time between 1.69 and 1.47 seconds, the landing time between 0.374 and 0.152 seconds. Values of average height 197.90 cm, age 27.10 years, weight 87.30 kg, the maximum height 355.10 cm, total time 2.75 seconds and the time of each phase (approach 0.89, take off 0.027, hitting 1.58, landing 0.263) are the values appropriate to get the highest points of the spike in volleyball of the Beijing Olympics (2008).

Key words: Anthropometric • Beijing Olympics • Kinematical • Spike in volleyball

INTRODUCTION

The Olympics is the most important world-sporting event shared by most countries in the world with the best of their players in different sports to achieve athlete winning, which reflects the economic, political, cultural and social development of these States. What has been shown by China in the last session of good management and ingenuity in the organization and what shown by the other countries in the competition reflected that.

Volleyball is one of the most important games in which are competed during these international forums.

And the spike skill, which is the most important and powerful attacked skills, contributed actively in upgrading the level of the game [1, 2]. The spike skill lost much of its effectiveness because of the emergence of double and triples blocking. Thus, the mechanisms of its implementation have developed, whether what is associated with a set of biomechanical variables implementing the performance or the position of set-up in the court [3]. The anthropometric measurements play an important role in building the training framework and judging young players [4].

Research Problem: The objective study contributes to set the bases, rules and conditions suitable for achieving the best and the most appropriate skilled possible performance [5]. The length of the player indicates his weight and has a significant impact on his physical condition in terms of strength and endurance [6]. The age of the player has an effect on flexibility and the training process. The younger the player is, the more ability to understand the learning processes significantly increases. Prediction of the future of this athlete is not so easy, but it requires having accurate and continuous knowledge of the characteristics of body and its composition and the qualities of outer features of the body [7]. The criteria are used as a standard mean to identify the value of the interpretation of raw scores [8]. There were deficiencies in the performance of the Egyptian team in general and spiking in particular, which in turn led to a decline in the number of points achieved by the players in the championship, especially spiking, finishing last in this tournament [9].

Therefore, he suggests that conducting such a study may be useful to trainers in the evaluation and selection and guidance of Egyptian players to reach high levels through gathering information about the Olympic players who have an international classification and benefit from it with a scientific method.

Research Objectives: This study aim to the following:

- Identify some of the kinematical variables best suited to the spike skill in volleyball.
- Identify some of the anthropometric variables best suited to the spike skill in volleyball.
- Identify the number of points appropriate for the volleyball players performing the spike skill.
- Developing standard levels for some kinematical and anthropometric variables and the number of points of volleyball players performing the spike skill in volleyball.
- Developing a network diagram in terms of some kinematical and anthropometric variables and the number of points of volleyball players performing of the spike skill in volleyball.

Research Assumptions:

- What are the most appropriate kinematical variables of the spike skill in volleyball?
- What are the anthropometric variables best suited to the spike skill in volleyball?

- What is the number of points appropriate for the volleyball players performing the spike skill in volleyball?
- What is the network diagram to diagnose the spike skill in volleyball in terms of some kinematical and anthropometric variables and the number of points of volleyball players?

MATERIALS AND METHODS

Research Methodology: Author uses the descriptive approach due to its relevance to the nature and research procedures.

Sample: The author used the intentional way in the selection the research sample for the best players performing the spike skill, who participated in the Olympics (2008) Beijing, obtained a number of direct points for spiking, their number reached (10) players (Table 1). Successful attempts suitable for the analysis were limited to each player and the choice of three attempts for each player were time-analyzed by using Maxtraq.

Table 1 shows that the number of direct points of striking was between the 116 and 50 points, the number of wrong strikes was between 38 and 13 and the number of correct strikes without a point ranged between 92 and 23. In addition, the total attempts ranged between 237 and 98 strikes and the proportion of the impact of the spike skill to the top ten players taking place in Beijing 2010 ranged between 63.50% and 43.85%.

Methods of Collecting Data: The age of the player and the number of points he/she obtained were gotten through the following:

- The Official Website of the Beijing Olympics (2008).
- Federation International of Volleyball (FIVB) [10].

Statistical Treatments: The author used the statistical program SPSS to extract the following:

Arithmetic mean / standard deviation / lower and upper limits / range / skewness

- The equation of getting the constant amount to interpret raw scores to standard ones (Six Sigma Score) [11].

$$\text{Constant} = \frac{3(\text{S.D})}{50}$$

Table 1: The number of direct points of hitting and the number of wrong hitting and the number of correct ones without a point and the total attempts and the proportion of the impact of the spike skill to the top ten players taking place in Beijing Championship 2008

Order	Number	Player's name	State	Direct Point	Wrong Hitting	Without a point	Total Attempts	proportion of the impact
1	13	Swiderski Sebastian	POL	56	19	23	98	57.14
2	6	Kaziyski Matey	BUL	87	27	59	137	63.50
3	11	Nikolov Vladimir	BUL	89	28	62	179	49.72
4	17	MikhayloV Maxim	RUS	105	30	86	221	47.51
5	13	Stanley Clayton	USA	116	38	83	237	48.94
Order	Number	Player's name	State	Direct Point	Wrong Hitting	Without a point	Total Attempts	proportion of the impact
6	8	Cisolla Alberto	ITA	75	20	73	168	44.64
7	8	Endres Murilo	BRA	50	13	51	114	43.85
8	10	Wlazly Mariusz	POL	95	27	92	214	44.39
9	2	Winiarski Michal	POL	67	23	54	144	46.52
10	8	Priddy William	USA	93	31	82	206	45.14

RESULTS AND DISCUSSION

Both Tables 2 and 3 explain the arithmetic mean, standard deviation and the lowest and highest limits and the extent and percentile degrees of the height, age and weight variables and the maximum height and the total time and phase time of (approach, takeoff, hitting and landing) the number of spiking points of the best players participating in the Beijing Olympics (2008). Fig. 1 also shows the network diagram of the best players in the Olympics (2008) Beijing.

Table 2 indicates that each of height, age and weight and the maximum height and the total time and time phase of (approach and takeoff, hitting and landing) the number of spiking points of the best players in the Olympics

(2008) Beijing is close to the normal distribution. This means that the sample individuals are homogeneous in the variables under study, where the skewness coefficient swings between 0.938- and 0.434). They are values less than ± 3 .

Table 3 and Fig. 1 show that the corresponding degrees to the percentile degree of the player's height, ranging from 212.90 and 182.90 cm, age between 37.73 and 16.47 years old, weight between 113.53 and 61.07 kg and the maximum height 382.87 and 327.33 cm, total time of the skill between 3.15 and 2.36 seconds, the time approach between 1.22 and 0.57 seconds, the time of takeoff between -0.047 and 0.007 seconds, time of fly, hitting between 1.69 and 1.47 seconds and the time of landing between 0.374 and 0.152 seconds.

Table 2: Arithmetic mean, standard deviation and the lowest and highest limits and the extent of the height, age, weight and maximum height and the total time and phase time of (the approach and takeoff, hitting and landing) the number of spiking points of the best players in the Olympics (2008) Beijing n = 10

Statement	Measure Unite	M	SD	Lowest Limit	Highest Limit	Range	Skewness
Height	CM	197.90	4.99	190	205	15	.266-
Age	Year	27.10	3.54	20	31	11	.834-
Weight	KG	87.3	8.74	75	104	29	.382
Maximum Height	CM	355.10	9.26	343	370	27	.260
Total Time	Second	2.753	.131	2.49	2.90	41	.906-
Approach Time	Second	.892	.107	0.70	1.01	.31	.938-
Takeoff Time	Second	.027	.006	0.02	04.	02.	.434
Hitting Time	Second	1.581	.036	1.52	1.63	.11	.726-
Landing time	Second	.263	.037	.20	.32	12	.165-
Points	Point	83.30	21.097	50	116	66	0.211-

Table 3: Percentile degrees of the variables of height and age, weight and the maximum height and total time and time of each stage (approach, takeoff, hitting, landing) and the number of points n = 10

Percentile Degree	Height (cm)	Age (Year)	Weight (Kg)	Maximum Height (cm)	Total Time (second)	Approach Time	Takeoff Time	Fly, Hitting Time	Landing Time
100	212.90	37.73	113.53	382.87	3.15	1.22	0.047	1.69	0.374
90	209.90	35.60	108.29	377.31	3.07	1.15	0.043	1.67	0.352
80	206.90	33.48	103.04	371.76	2.99	1.09	0.039	1.65	0.330
70	203.90	31.35	97.79	366.21	2.91	1.02	0.035	1.63	0.308
60	200.90	29.23	92.55	360.65	2.83	0.96	0.031	1.60	0.285
50	197.90	27.10	87.30	355.10	2.75	0.89	0.027	1.58	0.263
40	194.90	24.97	82.05	349.55	2.67	0.83	0.023	1.56	0.241
30	191.90	22.85	76.81	343.99	2.60	0.76	0.019	1.54	0.218
20	188.90	20.72	71.56	338.44	2.52	0.70	0.015	1.51	0.196
10	185.90	18.60	66.31	332.89	2.44	0.63	0.011	1.49	0.174
0	182.90	16.47	61.07	327.33	2.36	0.57	0.007	1.47	0.152

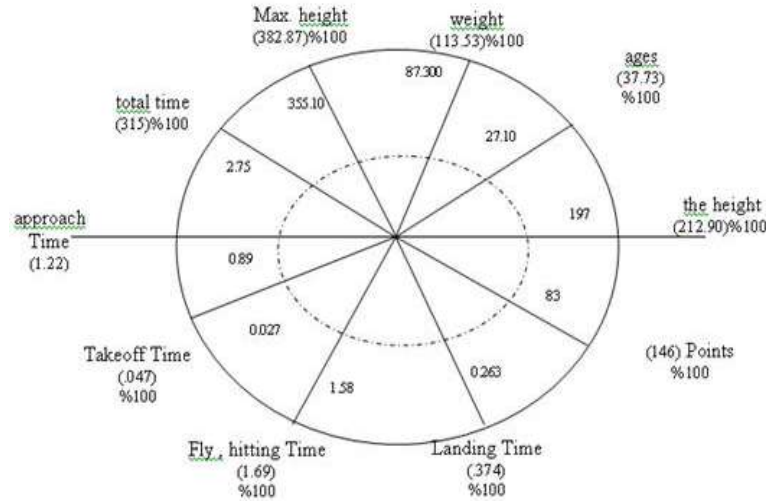


Fig. 1: Network diagrams for diagnosing the spike skill in volleyball

DISCUSSION

Studying Table 3 and Fig. 1, it is clear that the arithmetic mean of the players' height is 197.90 cm with a standard deviation of ± 4.99 cm, the highest percentile degree corresponding to the height is (212.90 cm) and the least percentile degree corresponding to the height is 182.90 cm. This is consistent with the study conducted by each of Kuhlmann *et al.* [12] and Chen and Huang [13]. While the average age of players is 27.10 years with a standard deviation of ± 3.54 , the highest percentile degree corresponding to the age is 37.73 years and the least percentile degree corresponding to the age is 16:47 years. While the weight average of the players is 3087 kg with a standard deviation of ± 8.74 , the highest percentile

degree corresponding to the player's weight is 113.53 a year and the least percentile degree corresponding to the player's weight is 61.07 years. While the average of maximum height is 355.10 cm with a standard deviation of ± 9.26 , the highest percentile degree corresponding to the maximum height is 382.87 cm and the least percentile degree corresponding to the maximum height is 332.89 cm. This is consistent with the study conducted by prior studies [12-14].

While the average of total time is 2.75 seconds with a standard deviation of ± 0.13 , the highest percentile degree corresponding to the total time is 3.15 seconds and the least percentile degree corresponding to the total time is 2.36 seconds. While the average time of the approach stage is 0.89 seconds with a standard deviation ± 0.11 , the

highest percentile degree corresponding to the time of approach stage is 1.22 seconds and the least percentile degree corresponding to the time of approach stage is 0.57 seconds. While the average time of takeoff stage is 0.027 seconds with a standard deviation of ± 0.01 , the highest percentile degree corresponding to the time of takeoff stage is 0.047 seconds and the least percentile degree corresponding to the time of takeoff stage is 0.007 seconds. While the average time of fly and hitting stage is 1.58 seconds with a standard deviation of ± 0.04 , the highest percentile degree corresponding to the time of fly and hitting stage is 1.69 seconds and the least percentile degree corresponding to the time of fly and hitting stage is 1.47 seconds, Corrêa *et al.* [15]. While the average time of the landing phase is 0.263 seconds with a standard deviation of ± 0.04 , the highest percentile degree corresponding to the time of the landing phase is 0.374 seconds and the least percentile degree corresponding to the time of the landing phase is 0.152 seconds. While the average number of points obtained by the player is (83.3) points with a standard deviation of ± 21.10 , the highest percentile degree corresponding to the number of points is 146 points and the least percentile degree corresponding to points is 20. These values of the average height 200 cm, age 29.08, weight 89.30, the maximum height 350 cm, total time 2.799 seconds, time of each phase (approach 0.994, takeoff 0.037, hitting 1.494, landing 0.285) are the most appropriate values to get the highest points of the spike [15].

CONCLUSION

Through the research sample, its results and discussion, the following could be concluded:

- Determine the height and age, weight and maximum height and the total time and time of each stage (approach, takeoff, hitting and landing) and the number of points best suited to the spike skill in volleyball.
- Achieve standard levels for the variables of each height and age, weight and maximum height and the total time and time of each stage (approach, takeoff, hitting and landing).
- Develop network diagrams for the variables of height and age, weight and maximum height and the total time and time of each stage (approach, takeoff, hitting and landing) from which to choose and direct and evaluate players.

REFERENCES

1. Suleiman, H.A., 1995. A Study of Some Biomechanical Variables for the Spike From Back Line and its Relationship to Accuracy. Faculty of Physical Education, Zagazig University, Egypt, pp: 218 (In Arabic).
2. Al-Hefnawi, M.A., 2001. Determination of the Quantitative Differences of Dynamic Properties During the Fly Phase, Hitting for Serving and Spike Skills in Volleyball. The Scientific J., 2: 285. (In Arabic).
3. Nour-Aldin, H., 1999. Dynamic Analysis of the Spike Skill From the Back Line in Volleyball. Faculty of Physical Education for Boys, Suez Canal University, Port Said, Egypt, pp: 4. (In Arabic).
4. Al-Khudary, H., 1990. A Study of Some of Body Components for the Female Students of Faculty of Physical Education at the 25m Crawl Performance Time. J. Theories and Applications, 10: 222. (In Arabic).
5. Ali, A.A., 1998. Biomechanics and Integration Between Theory and Application in the Sports Field. Markaz El-Ketab for Publishing, second edition, Cairo, pp: 13. (In Arabic).
6. Ali, A.A. and E. A. Abdul Baseer, 2003. The Relationship of Weight and Height with the Outcomes of Some Physical Tests for Men. The Scientific J. Research and Studies in Physical Education, 12: 234. (In Arabic).
7. Al-Samadie, L., 1987. Biomechanics and Sports. Ministry of Higher Education and Scientific Research, University of Mosul, Mosul, Iraq, pp: 365. (In Arabic).
8. Robison, S.E. and M.E. Stafford, 2006. Testing and Measurement, A User-Friendly Guide. Sage Publications, Inc., USA, pp: 77.
9. <http://en.beijing2008.cn/>.
10. <http://www.fivb.org/>.
11. Barrow, H.M. and R.M.C. Gee, 1976. A Practical Approach to Measurement in Physical Education. Lea & Febiger, second edition, USA, pp: 80.
12. Kuhlmann, C., K. Roemer and T.L. Milani, 2007. Aspects of a Three Dimensional Motion Analysis of the Volleyball Spike in High Level Competition. ISBS Symposium, Ouro Preto, Brazil, pp: 47-50.

13. Chen, Y.C. and C.F. Huang, 2008. Kinematical Analysis of Female Volleyball Spike. Conference, Seoul, Korea, pp: 617-620.
14. Masumura, M., W.Q. Marquez and T. Endo, 2008. A Biomechanical Analysis of Pipe Spike Motion for Elite Male Volleyball Players in Official Games ISBS. Conference, Seoul, Korea, pp: 723-726.
15. Corrêa, S., R. Menezes and R. Paiano, 2006. Kinematic Analysis of Volleyball Spike. XXIV ISBS Symposium, Salzburg, Austria, pp: 1.