ISSN : 0974 - 7435 Volume 10 Issue 4

BioTechnology
An Indian Journal

FULL PAPER

BTAIJ, 10(4), 2014 [770-776]

Correlation research based on aerobics a-frame kind of movements

Jing Li
Shenyang Sport University, Shenyang 110102, Liaoning, (CHINA)

ABSTRACT

Aerobics is a kind of sports event that well received by mass, from which high difficulty movements are aerobics uniqueness. The paper makes analysis and researches on aerobics A-Frame kind of movements, it carries out research by applying biomechanical knowledge and mathematical statistics method as well as combine with each kind of technical movements, finally it gets No.1 athlete comprehensive overall level is the highest, the research way makes contributions to aerobics development.

KEYWORDS

Aerobics;
A-frame kind of movements;
Kinematical analysis;
Biomechanics.

INTRODUCTION

With nowadays world diversified development, distance between countries has been diminished accordingly, aerobics changes with era changing, aerobics is a kind of sports event that gathered by performing, competitiveness and body building three kinds of functions, accompanying with music rhythm, it can exhibit a ability of highly complex and coherent movements to present in people's view, and the event is fit for all groups that is favored by mass.

Among them, scholars also interest in the event, and there are many researches on aerobics, such as: Wang Fang proposed aerobics player's special technical features and evaluation system, from which its weight was obtained by adopting experts and experiences as well as other methods, which had stronger objectivity; Wang Ni created aerobics special performance evaluation model based on neural network, and applied multiple linear regression method predicting on aerobics performance, besides she also provided correct schemes for improving aerobics player's quality levels.

The paper just does research based on previous scholars, it carries out comparative analysis of A-frame kind of movements, and combines with specific examples to fully explain the model rationality, and it has extensive.

AEROBICS A-FRAME KIND OF MOVEMENTS' MODEL

Research based on aerobics can divide it as A, B, C, D four kinds, from which the paper mainly analyzes on A kind, it totally includes Capoeira kind, Helicopter kind, Flair kind, cut kind, A-Frame kind, Plio push up kind, Wenson support kind, and push up kind. Among them, A-frame kind is key point of the paper's research, A-frame's series of movements totally contains seven kinds that are respectively explosive A-frame, explosive A-frame to Wenson, explosive A-frame twist to 1/2, explosive A-frame twist to 1/2 and then to Wenson, explosive A-frame twist to 1/2

and then raise legs to Wenson, I arm explosive A-frame, I arm explosive A-frame and then to Wenson.

The paper selects sports institute four athletes that gained national prizes to do research, they have solid essential techniques so can be qualified to the task. Their explosive A-frame kind of movements' testing status is as following TABLE 1 show:

Due to difficulty is larger, we only research on explosive A-frame, explosive A-frame to Wenson, explosive A-frame and then twist 1/2, explosive A-frame twist to 1/2 Wenson these kinds. To more carefully research on A-frame each kind of motions movement status, in the following it makes respectively statements.

Athlete peak position comparative problems analysis

Hip joint is a key joint that decides A-frame kind and others series of movements' completion, hip joint movement is whole body gravity center that decides height and balance functions, besides to clearly express

TABLE 1 : Group A's explosive A-frame kind tested movement table (times)

Athlete	I arm explosive A-frame to Wenson	Explosive A-frame twist to 1/2	Explosive A-frame twist 1/2 and raise leg Wenson	Explosive A-frame twist 1/2 to Wenson	Explosive A-frame to Wenson	I arm explosive A-frame	Explosive A-frame	Total
1	0	3	3	3	3	0	3	
2	0	3	0	3	3	0	3	39
3	0	3	0	3	3	0	3	

TABLE 2 : Player hip joint parameters comparative table (unit: mm)

Player	*A* L	*A* R	*B* L	*B* R	*C* L	*C* R	*D* L	*D* R	*AN*	*BN*	*CN*	*DN*
1	1052.014	1099.452	1061.124	1092.592	964.195	974.147	936.252	958.544	1110.213	1088.413	984.528	968.223
2	1062.333	1052.126	944.64	1045.124	955.785	1014.224	956.787	977.475	1065.148	1029.852	1038.451	1015.974
3	950.656	964.152	884.152	978.154	884.147	896.256	907.263	948.753	987.473	958.256	958.256	968.257

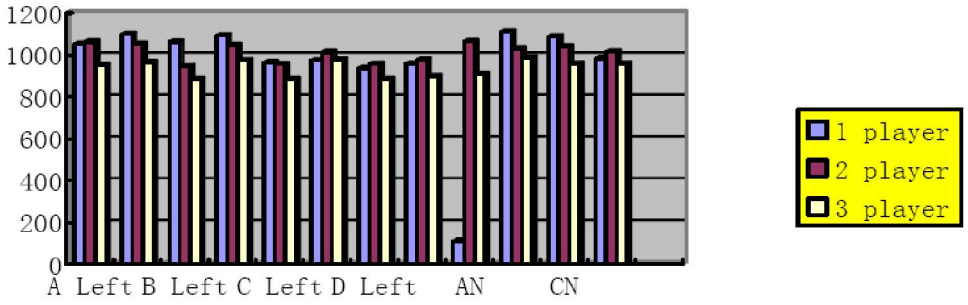

Figure 1 : Appearances with the corresponding graph

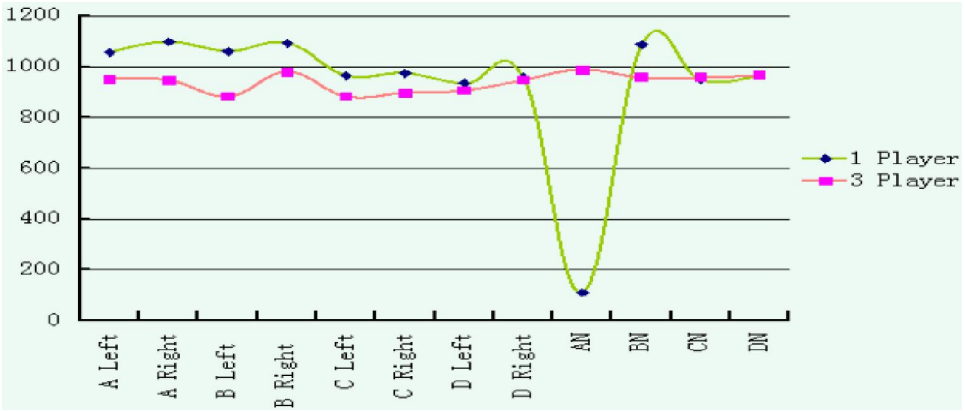

Figure 2 : Appearances with the corresponding

FULL PAPER

TABLE 3 : No.1 and No.3 players' hip joint highest coordinates comparative table (unit: mm)

Player	No.1	No.3
	$\bar{x} \pm SD$	$\bar{x} \pm SD$
A left	1052.014 ± 1.845	950.656 ± 7.145
A right	1099.452 ± 4.258	964.152 ± 5.034
B left	1061.124 ± 10.998	884.152 ± 26.145
B right	1092.592 ± 18.987	978.154 ± 8.129
C left	964.195 ± 26.789	884.147 ± 19.047
C right	974.147 ± 2.048	896.256 ± 16.425
D left	936.252 ± 6.124	907.263 ± 10.554
D right	958.544 ± 6.481	948.753 ± 10.841
AN	1110.213 ± 6.458	987.473 ± 6.125
BN	1088.413 ± 18.642	958.256 ± 17.109
CN	984.528 ± 22.967	958.256 ± 18.648
DN	968.223 ± 4.514	968.257 ± 5.314

TABLE 4 : No.1 and No.2 players' hip joint highest coordinates comparative table (unit: mm)

Player	No.1	No.2
	$\bar{x} \pm SD$	$\bar{x} \pm SD$
A left	1052.014 ± 1.845	1062.333 ± 1.852
A right	1099.452 ± 4.258	1052.126 ± 20.451
B left	1061.124 ± 10.998	944.64 ± 10.624
B right	1092.592 ± 18.987	1045.124 ± 4.014
C left	964.195 ± 26.789	955.785 ± 14.123
C right	974.147 ± 2.048	1014.224 ± 11.33
D left	936.252 ± 6.124	956.787 ± 2.451
D right	958.544 ± 6.481	977.475 ± 18.26517.451
AN	1110.213 ± 6.458	1065.148 ± 11.561
BN	1088.413 ± 18.642	1029.852 ± 11.575
CN	984.528 ± 22.967	1038.451 ± 10.746
DN	968.223 ± 4.514	1015.974 ± 7.546

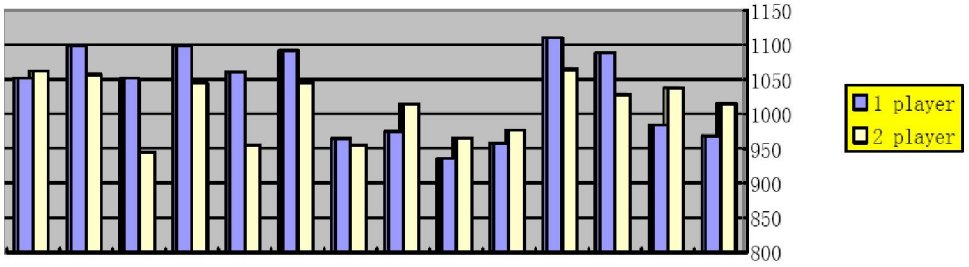

Figure 3 : Appearances with the corresponding

table, we use A to represent Wenson posture, then use B to represent explosive A-frame twist to 1/2 posture, use C to represent explosive A-frame to Wenson and then rotate to 1/2, use D to represent explosive A-frame posture, besides we also use AN, BN, CN, DN to respectively express above four groups' left and right hip joints central point positions. Three players' hip joints Z axis positions' relative parameters are as following TABLE 2 show:

Above table corresponding graph is as following show:

By above Figure 1, we can get: in above three players, in explosive A-frame twist 1/2 to Wenson posture and explosive A-frame twist to 1/2 these two movements, No.3 player is best and No. l and No.2 player follows him; No.1 player is best both in explosive A-frame to Wenson and explosive A-frame two movements' $3D$ coordinates and Z axis, and No. 3 and No.2 players' follow him. No.1 and No. 3 players' peak position hip joints comparative status is as TABLE 3 show:

Above table corresponding graph is as following

TABLE 5 : Three players' completing group A's explosive A-frame kind difficulty movements completely time features

Parameters	1-1	3-1	2-1	1-2	3-2	2-2	1-3	3-3	2-3	1-4	3-4	2-4
T1	1.22	1.35	1.36	1.32	2.25	1.22	1.30	1.52	1.30	1.20	1.42	1.10
T2	1.25	1.40	1.51	1.24	1.52	1.42	1.18	1.44	1.28	1.36	1.36	1.60
T3	1.29	1.34	1.23	1.30	1.50	1.55	1.02	1.33	1.29	1.34	1.35	1.58
Average value	1.27	1.37	1.37	1.28	1.67	1.41	1.13	1.42	1.29	1.32	1.38	1.43

Figure 2 show:

By above Figure 2, we know that when No.1 and No.3 players complete AB two groups of movements, there are no big differences between No.1 and No.3 players, which proves the two complete the two kind of movements have no difference; and CD two groups of movements exist obvious differences, in hip joint spring height aspect, No.1 player is far higher than No.3 player. Regarding No.1 and No.2 players' peak hip joints comparison is as following TABLE 4 show:

Above table corresponding graph is as following Figure 3 show:

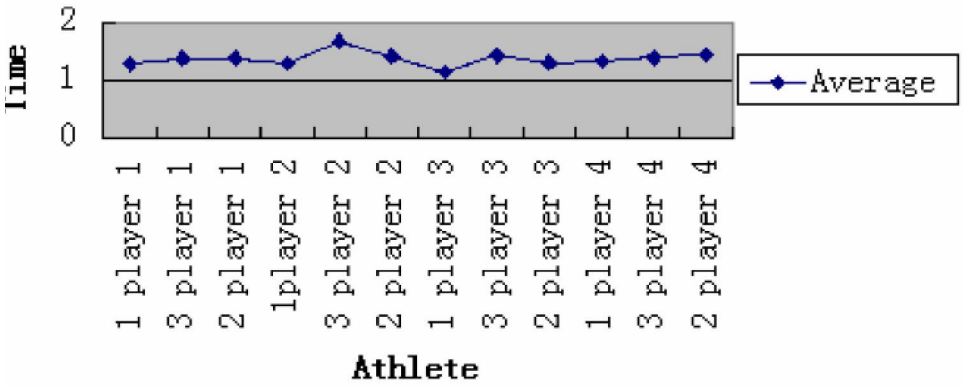

Figure 4 : Appearances with the corresponding

TABLE 6 : Three athletes' explosive A-frame kind of movements from push up to spring to peak completion time features

Parameters	1-1	3-1	2-1	1-2	3-2	2-2	1-3	3-3	2-3	1-4	3-4	2-4
T1	0.55	0.65	0.60	0.59	0.68	0.66	0.56	0.70	0.72	0.51	0.70	0.62
T2	0.63	0.64	0.62	0.64	0.67	0.67	0.50	0.70	0.71	0.48	0.74	0.66
T3	0.65	0.63	0.64	0.67	0.69	0.68	0.48	0.70	0.70	0.46	0.66	0.70
Average value	0.61	0.64	0.62	0.64	0.68	0.67	0.51	0.70	0.71	0.48	0.70	0.63

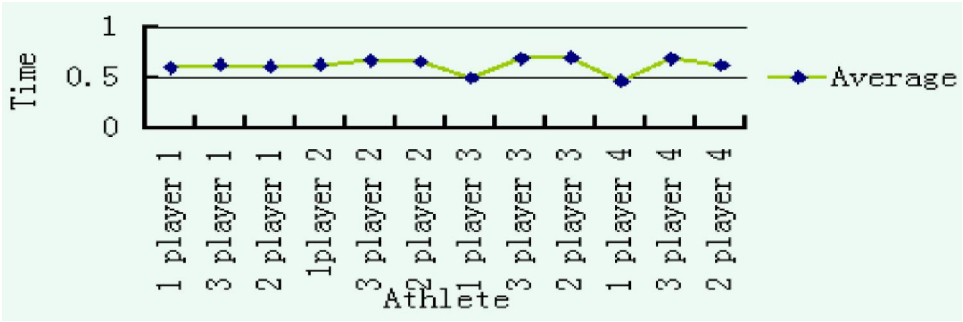

Figure 5 : Appearances with the corresponding

TABLE 7 : Starting moment should joint angles parameters (three times average value) (unit: degree)

Athlete	A left	A right	B left	B right	C left	C right	D left	D right
1	68.51	64.21	68.71	64.59	72.42	65.45	66.24	62.71
2	82.12	78.05	79.40	76.27	78.56	76.11	78.12	74.64
3	69.14	65.12	63.10	66.47	62.45	62.66	63.52	56.78

TABLE 8 : Ending moment should joint angles parameters (three times average value) (unit: degree)

	A left	A right	B left	B right	C left	C right	D left	D right
No.1 athlete	77.56	65.28	59.80	58.40	64.10	50.95	58.60	56.90
No.2 athlete	76.00	82.10	82.60	56.82	76.12	75.84	86.96	54.06
No.3 athlete	75.12	74.23	61.70	67.80	49.55	52.86	54.23	58.54

FULL PAPER

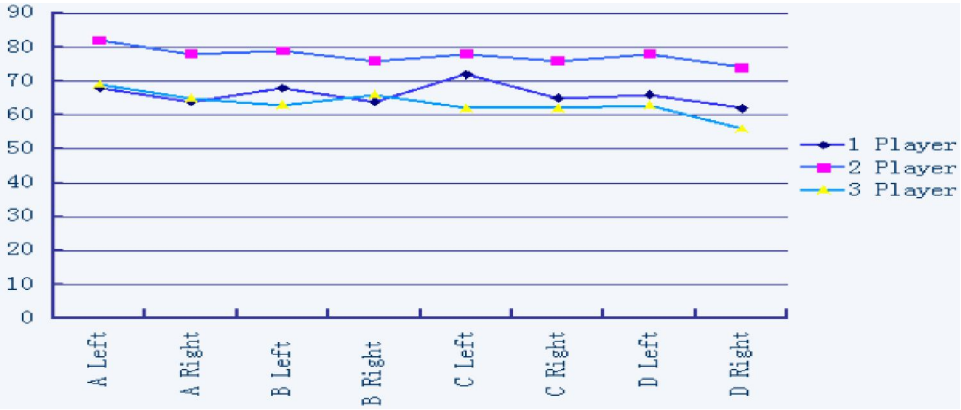

Figure 6 : Appearances with the corresponding

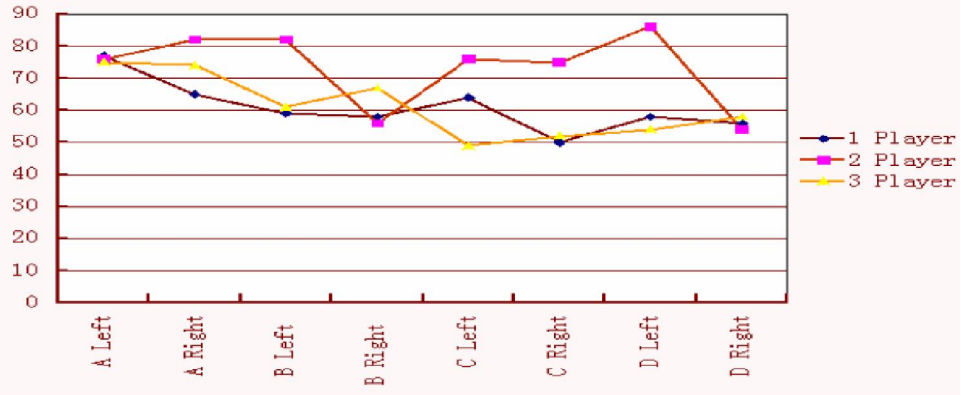

Figure 7 : Appearances with the corresponding

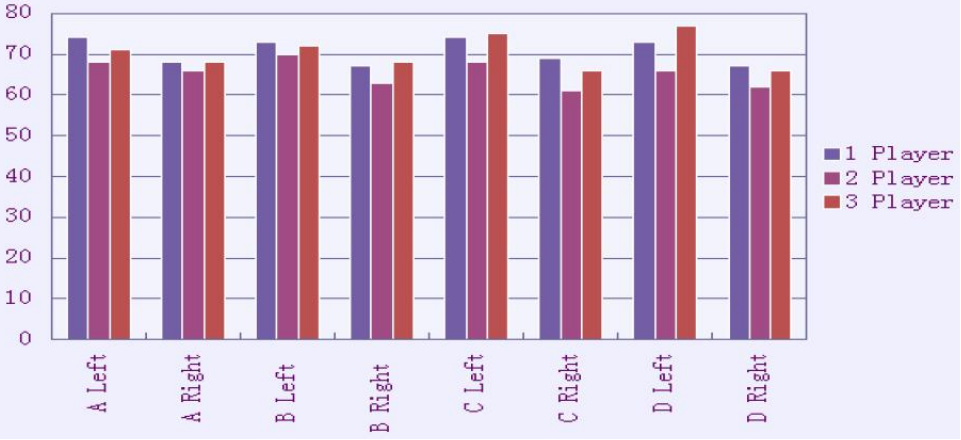

Figure 8: Appearances with the corresponding

TABLE 9 : Starting moment elbow joint angle coefficient (three times average value) (unit: degree)

Athlete	A left	A right	B left	B right	C left	C right	D left	D right
1	74.21	68.69	73.24	67.40	74.56	69.30	73.56	67.25
2	68.40	66.25	70.21	63.25	68.20	61.92	66.23	62.05
3	71.23	68.22	72.78	68.84	75.84	66.89	77.23	66.78

By above Figure 3, we can see that in comparison between No.1 and No.2 players, there are obviously differences from previous table, two people have very big differences in coordinate position, and in hip joint peak, No.1 player is higher than No.2 player but it is not especially obvious.

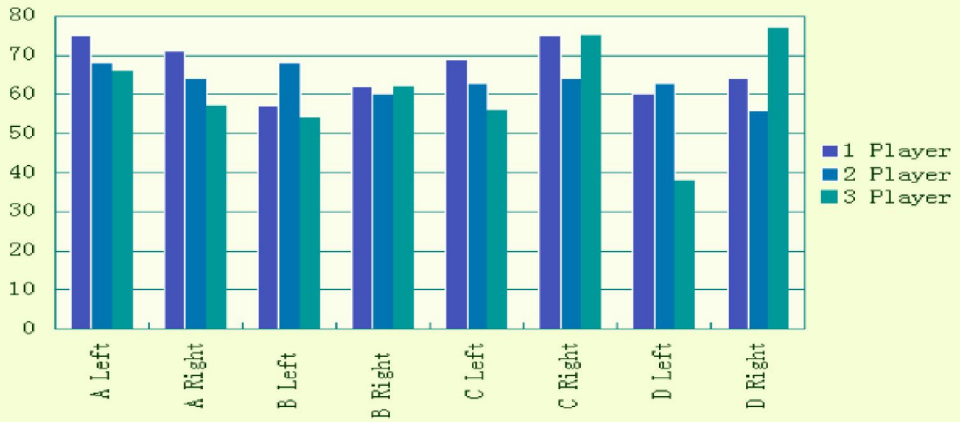

Figure 9: Appearances with the corresponding

ANALYSIS OF COMPLETION MOVEMENT THREE PLAYERS' FEATURES IN TIME

The three players except for making comparison in peak, they can be analyzed by time, as following TABLE 5:

Above TABLE 5 corresponding time average value graph is as following Figure 4 show:

Above TABLE 5 shows difficulty movements' A-frame kind completion time features, three athletes' three times A-frame kind of movements completion total complete time, from which athlete's explosive A-frame twist 1/2 to Wenson posture, explosive A-frame twist to 1/2, explosive A-frame to Wenson, explosive A-frame such four kinds of postures are respectively using 1, 2, 3, 4 to express. To further analyze, make a summary of three athletes' explosive A-frame each phase time into following TABLE 6:

Above TABLE 6 corresponding time average value graph is as following Figure 5 show:

By above two time tables average values, we can know that No.1 athlete's whole movement completion process consumed time always is the shortest, but No.2 athlete is relative slower, No.3 athlete is the slowest one. Besides, we also conclude that in explosive A-frame to Wenson and difficulty coefficient relative lower's explosive A-frame, three athletes' differences are not so big, and after proceeding with relative difficulty movements, the differenced among the three is prominent. So the movement completion time long or short can be regarded as the athlete movement one of standard indicators.

ATHLETE JOINT ANGLE ANALYSES

Regarding athlete should joint angles research, it mainly starts and ends with push up, it is about main exertion phase in push up phase and plays balance roles, but it cannot last to movement completion, so the phase mainly analyzes joint angles' features and makes comparison, starting parameters are as following Table 7 and Figure 6 show:

Ending phase shoulder joint correlation parameters analysis is as TABLE 8:

Above TABLE 8 corresponding broken line graph is as following Figure 7 show:

By above TABLE 8, we can get in starting moment, No.1 and No.2 two athletes' shoulder angle are less than 70^0, and in ending moment No.2 shoulder angles are slightly big and No.2 left and right shoulder is not balance.

ELBOW JOINT ANALYSIS

Elbow joint in general, it doesn't participate movement completion process as shoulder joint, but it participates balance maintaining process, so carries out three athletes' comparison and analysis by following table, as following TABLE 9 show:

In order to more vividly highlight three athletes' differences problems, the paper makes use of bar chart form more clearly presenting mutual differences and connections, as following Figure 8 show:

Above Figure 8 three athletes' starting moment angles elbow joint features comparison, and use bar

FULL PAPER

TABLE 10 : Ending moment elbow joint angle coefficient (three times average value) (unit: degree)

	A left	A right	B left	B right	C left	C right	D left	D right
No.1 athlete	75.24	71.82	57.42	62.10	69.80	75.84	60.24	64.12
No.2 athlete	68.88	64.28	68.08	60.39	63.42	64.74	63.24	56.84
No.3 athlete	66.10	57.72	54.56	62.84	56.12	75.64	38.14	77.68

chart to more vividly present three athletes' existing obvious differences. After that, it carries out analysis of ending moment angle parameters; its result is as following TABLE 10 show:

To more vividly present mutual relations, it introduces bar chart, as following Figure 9:

By above TABLE 10, we can get that in ending moment, No.2 left elbow angle is quite small in B, D two groups, and No.1 and No.2 two directions' elbow joints angles are larger than that of No.3, so No.3 should contract more elbow joint angle regarding A-frame kind in starting moment.

CONCLUSIONS

The paper more clearly presents three athletes' existing differences by applying figure and table, by comparing, we can get that No. 3 and No.1 athletes' different are relative obvious, so to No.1, it needs to control should joint in 65°that is relative reasonable, and in time consumption, it summarizes that three athletes' differences will become more and more prominent with difficulty increases, meanwhile it reflects that No.1 athlete's ability is relative outstanding, by elbow joint aspect comparing, we find that No.1 is still stronger than No.2 and No.3's ability, so it proves that No.1 comprehensive strength is the strongest one.

REFERENCES

[1] Wang Kun,Wei Wen-Yi; Biomechanical Research on Specific Ability of Takeoff in Long Jump[J]. China Sport Science, **25(1)**, 42-45 **(2005)**.

[2] Li Hong-Bo,Liv Hao; Research development of special physical competence theory of aerobics[J]. Journal of Sports Adult Education, **27(2)**, 55-57 **(2011)**.

[3] Yang Fengjuan; Researches on Traumas of Competitive Aerobic Dancing Athletes[J]. Journal of Beijing Sport University, **4**, **(1998)**.

[4] Dai Li-Ping; Biomechanical Analysis on Jumping Typical Difficulty Elements in Sports Aerobics[J]. Fujian Sports Science and Technology, **31(3)**, 27-30 **(2012)**.

[5] Shan Xinhai Dai, Yusheng Cai, GuoJun, Jin Jichun; The comparison of biomechanical variables of the takeoff performances of three atheltes with different jumping abilities[J]. Sports & Science, **18(4)**, 22-26 **(1997)**.

[6] Cheng Wan-Xiang et al; Changing Character of the Ground Reaction Force and Joint Torque of Lower Limbs During Landing from Different Height[J]. Journal of Chengdu Physical Education Institute, **36(3)**, **(2010)**.