ISSN : 0974 - 7435 Volume 10 Issue 3

BioTechnology
An Indian Journal

FULL PAPER

BTAIJ, 10(3), 2014 [612-620]

2013 Australian open women's singles champion and runner-up technical and tactics features research based on mathematical statistic analysis

Feng Yuan[1], Xiaolin Zhang[2]*

[1]Institute of Physical Education, Changjiang Normal University, Chongqing 408100, Chongqing, (CHINA)

[2]Institute of Physical Education, Chengdu University of Technology, Chengdu 610059, Sichuan, (CHINA)

ABSTRACT

Australian Open game is one of world most prestigious tennis games, and Champion and Runner-up technical and tactics features are also symbols that lead world advanced levels. The paper adopts documents literature, expert interview and mathematical statistics method to analyze 2013 Australian Open women's singles Champion and Runner-up game process technical and tactics indicators, in the hope of making world tennis women's singles technical advanced features clear. At first it analyzes 2013 Australian Open women's singles generated champion Victoria Azarenka and silver medal Champion Li Na previous standings, in the hope of providing references for problems' researching values, and gets two technical and tactics ability are world top levels that has very high researching values, the next, by analyzing tennis women's singles events competition rules, it provides basis for extracting indicators that reflect athletes technical and tactics features, and then in the paper, it respectively carries out mathematical statistic analysis of Victoria Azarenka and Li Na seven rounds games' technical and tactics indicators in the game, it gets the two athletes' respectively exist advantages and disadvantages, which provides base for the two comparative analysis, finally carries out comparative analysis of Champion and Runner-up this finals generated data, it gets two each link gap by comparison, and makes feasible suggestions for Li Na's technical development.

KEYWORDS

Technical and tactics indicators;
Mathematical statistics;
Variance analysis;
Australian Open women's singles;
Data standardization.

INTRODUCTION

Every session Australian Open generated Champion and Runner-up, their techniques are leading world top levels, in order to provide more reasonable route for tennis technical development, it is necessary to research on Champion and Runner-up technical and tactics features, the paper makes analysis of 2013 Australian Open women's singles whole game process technical and tactics indicators, in the hope of making world tennis women's singles technical features advancements clear.

For 2013 Australian Open game technical and tactics indicators analyses, lots of people have made state-

ments and proposed corresponding conclusions, which provided scientific planning for future tennis development planning, from which:Du Lin etc.(2013)made analysis of 2013 Australian Open game Li Na's seven singles games, she got the player's competitive advantages showed in service, receiving and other technical aspects, and provided improvements directions for her shortcomings[1]; Zhi Yuan-Chun etc.(2013) carried out technical and tactics analysis of Victoria Azarenka participating 2013 Australian Open game status, and got her winning reasons[2]; Jiang Quan etc.(2013) did technical and tactics analysis of 2013

Australian women's singles finals players, got each player technical features reflected merits, and revealed current tennis excellent women technical and tactics features trends[3].

The paper on the basis of previous research, applies descriptive statistics method, variance analysis method, data standardization method and comparative reasoning method analyzing 2013 Australian Open women's singles generated Champion and Runner-up, in the hope of making contributions to tennis women's singles technical world top levels features clarified process.

RESEARCH OBJECTS AND RESEARCH METHODS

Research objects

The paper takes 2013 Australian Open game Champion Victoria Azarenka and runner-up Li Na game process official statistical indicators to make analysis, in the hope of exploring the two technical and tactics features.

Research method

Document literature

Consult web of knowledge regarding tennis women's singles game process technical and tactics in-

TABLE 1 : Australian open women's singles champion victoria azarenka standings in 2013

Year	Australian Open	Roland-Garros	Wimbledon	US Open	ATP World Tour Finals	Great Slam win and lose game
2007	The third round	The first round	The third round	The fourth round	/	Win seven games lose four games
2008	The third round	The fourth round	The third round	The third round	/	Win nine games lose four games
2009	The fourth round	Top eight	Top eight	The third round	Group game	Win thirteen games lose four games
2010	Top eight	The first round	The third round	The second round	Group game	Win seven games lose four games
2011	The fourth round	Top eight	Top four	The third round	Runner-up	Win fourteen games lose four games
2012	Champion	The fourth round	Top four	Runner-up	Top four	Win twenty-one games lose three games
2013	Champion	Top four	The second round	Runner-up	Group game	Win twenty-five games lose four games
Win and lose game	Win thirty-two games lose seven games	Win twenty games lose eight games	Win twenty-one games lose eight games	Win 24 games lose eight games	Win eight games lose 10games	Win 97 games lose 31 games

dicators analyses 15 pieces and 2013 Australian Open women's singles relative researches 20 pieces, it provides basis for Champion and Runner-up technical and tactics features indicators analysis.

Mathematical statistics

In the paper, it adopts descriptive statistics method and data comparative analysis method carrying out quantitative analysis of Champion and Runner-up presented technical and tactics features.

2013 AUSTRALIAN OPEN WOMEN'S SINGLES CHAMPION AND RUNNER-UP STANDINGS ANALYSIS

Women singles champion in 2013 Australian Open is Victoria Azarenka from Russia, the athlete is one of world women professional tennis leading figures, she won the champion in Brisbane, Memphis and Miami three events tournaments in 2009, and won two champions in Stanford and Moscow two events in 2010. In order to get a clear understanding of champion Victoria Azarenka standings, the paper gets as TABLE 1 showed standings data by information consulting.

The runner-up in 2013 Australian Open women's singles is Li Na from China, the athlete is Asian first great slam singles champion winner, and also Asian Top one and world ranks top second tennis singles player, as TABLE 2 showed Li Na's standings.

From 2008 to 2013, Chinese player Li Na and the Republic of Belarus player Victoria Azarenka have 10 times fighting, as TABLE 3 showed different years' different games different fields two Champion and runner-up fighting status.

By TABLE 1,TABLE 2 and TABLE 3 data, it is clear that Champion and Runner-up standings from 2007 to 2013 are excellent, Champion in the win games aspects is 3 games more than runner-up, and in the aspect of lose game it is 2 games less than runner-up, these differences ratio is quite little in above 120 games, if it is calculated with Champion played 128 games as base, it is clear than Champion's advantage in win game is 2.344% over runner-up, in the aspect of lose game Champion's advantage in lose game is 1.563% over runner-up, so that the two differences are little, if it can make analysis of the above two technical and tactics features in 2013 Australian Open game, it even can provide evidence for tennis "Discard the dross and keep

TABLE 2 : Australian open women's singles runner-up Li Na's standings in 2013

Year	Australian Open	Roland-Garros	Wimbledon	US Open	ATP World Tour Finals	Great Slam win and lose game
2007	The fourth round	The third round	/	/	/	Win five games lose two games
2008	The third round	/	The second round	The fourth round	/	Win six games lose three games
2009	/	The fourth round	The third round	Top eight	/	Win nine games lose three games
2010	Top four	The third round	Top eight	The first round	/	Win eleven games lose four games
2011	Runner-up	Champion	The second round	The first round	Win one game lose two games	Win 15 games lose five games
2012	The fourth round	The fourth round	The second round	The third round	Win one game lose two games	Win 10 games lose five games
2013	Runner-up	The second round	Top eight	Top four	Runner-up	Win twenty games lose five games
Win and lose game	Win thirty-four games lose eight games	Win twenty games lose six games	Win seventeen games lose seven games	Win seventeen games lose eight games	Win six games lose five games	Win ninety-four games lose thirty-three games

TABLE 3 : Victoria Azarenka and Li Na previous duel result

Competition year	Competition name	Field type	Competition rounds	Champion	Score
2008	Gold coast station	Firm ground	Finals	Li Na	4-6/6-3/6-4
2009	Tokyo station	Firm ground	Quarter final	Li Na	7-6(7)/4-6/7-6(4)
2010	Rogers cup	Firm ground	The third round	Victoria Azarenka	6-3/6-3
2011	Australian Open	Red ground	The fourth round	Li Na	6-3/6-3
2011	Roland-Garros	Firm ground	Quarter final	Li Na	7-5/6-2
2011	ATP World Tour Finals	Firm ground	Group game	Victoria Azarenka	6-2/1-6/6-3
2012	Sydney station	Blue ground	Finals	Victoria Azarenka	3-6/6-3/6-3
2012	Madrid station	Firm ground	Quarter final	Victoria Azarenka	7-6(4)/6-3
2012	ATP World Tour Finals	Firm ground	Group game	Victoria Azarenka	6-4/4-6/3-6

Indicator	C	O1	C	O2	C	O3	C	O4	C	O5	C	O6	C	O7
Index1	0	3	2	0	1	3	4	1	3	4	2	1	1	4
Index2	2	2	2	5	6	3	7	5	5	6	6	2	4	5
Index3	67	49	77	54	70	66	56	71	75	59	70	68	78	65
Index4	63	65	83	55	59	60	78	41	62	49	64	45	54	48
Index5	55	17	44	18	48	27	43	08	48	38	37	30	38	42
Index6	163	170	171	170	165	173	169	171	166	179	172	187	173	170
Index7	147	154	155	154	155	149	157	161	151	157	151	158	151	159
Index8	128	113	128	140	132	130	140	142	136	134	131	131	133	143
Index9	57	38	62	26	51	44	68	38	55	42	60	44	54	49

Note: C represents Champion Victoria Azarenka;O1-O7 respectively represents the first round opponent, the second round opponent, the third round opponent, eighth-finals opponent, quarter finals opponent, semifinals opponent and finals opponent;Index3, Index4, Index5 and Index9 data all is percentage(%);Index1andIndex2 unit is(pcs);Index6,Index7andIndex8 data unit is averagely(km/h).

the finer part, integrated development".

CHAMPION AND RUNNER-UP 2013 AUSTRALIAN OPEN GAME TECHNICAL AND TACTICS FEATURES ANALYSES

Champion victoria azarenka technical and tactics features statistical analysis

This paper carries out analysis of Victoria Azarenka 2013 Australian Open participated seven games official statistical technical and tactics data, as TABLE 4 showed seven games the athlete service technical indicators data and receive technical indicators data, from which service technical indicators include: Index1-ACE ball, Index2- double fault, Index3- first serve percentage, Index4- first serve win rate, Index5- second serve win rate, Index6- fastest serve speed per hour, Index7- first serve average speed per hour and Index8- second serve average speed per hour, receive indicators use Index9-receive scoring rate to reflect.

By TABLE 4 data, it is clear that Champion Victoria Azarenka first serve percentage averagely is 71.49%,

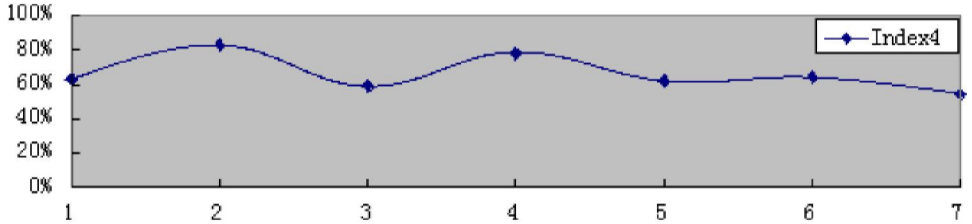

Figure 1 : Champion Victoria Azarenka in 2013 Australian Open seven games first serve winning rate distribution status

averagely first serve win rate is 75.14%, second serve win rate is averagely 44.49%, by analyzing, it is clear that Victoria Azarenka has good scoring rate in first serve aspect, and second serve scoring rate is fewer, her serve fastest speed per hour is 173km/h,average first serve speed per hour is 152.43km/h,and second serve average speed per hour is 132.57km/h,first win rate in seven games distribution status is as Figure 1 show.

By Figure 1, it is clear that second round game and eighth-finals Victoria Azarenka first win rate is the highest. Make data statistics on Victoria Azarenka in 2013 Australian Open seven games Index10- winning score, Index11- unforced errors, Index12- total scores, Index13- advance to the net times, Index14- advance to the net success times, Index15- advance to the net success rate, Index16- service break times, Index17- service break success times and Index18- service break success rate, result is as TABLE 5 show.

By TABLE 5, it is clear that Champion winning score totally is 146 pieces, averagely 20.86 piece per match, and opponent winning score totally is 149 pieces, thereupon Champion win the game relies on baseline stalemate capacity and higher stability, Champion's unforced errors are 161 pieces, averagely 23 pieces per match, and opponent's total such event indicator arrives at 266 pieces, averagely 38 pieces per match, therefore Victoria Azarenka unforced error is far fewer than the opponent.

By TABLE 5 advance to net times and advance to net success rate data, it is clear that Champion advance to net times totally is 93 times, averagely 13.29 times per match, and she has averagely 75.29% advance to net scoring rate, and opponent keeps great paces with Champion in the three indicators, therefore high efficient net approaching is helpful for athletes dominating in the game and letting opponent be in passive situation.

In TABLE 5, indicator 16,17 and 18 reflects fighting process Victoria Azarenka break point mastering capacity, the break point in tennis game refers to in the game that opponent service game, if one can get one more score and then can win the game, such one score is called break point, which is also key score as always talking, Victoria Azarenka average per match break success rate is 66.43%,according to probability calculation, it is that if averagely appear three times breaking each time, the athlete can manage to get two times breaking.

Runner-up Li Na technical and tactics features statistical analysis

In order to easier research, the section takes 2013 Australian Open Women's singles event, runner-up Li Na seven rounds game ten technical indicators, and lists Li Na and opponent represented values in the 10 indicators that are used for analyzing tennis game Li Na technical and tactics features, the 10 indicators as following show:

Index1—ACE ball

Index2—Double fault

Index3— First serve scoring rate

Index4— Second serve scoring rate

TABLE 5 : Victoria Azarenka other indicators besides service and receive techniques data statistical result

Indicator	C	O1	C	O2	C	O3	C	O4	C	O5	C	O6	C	O7
Index10	23	14	21	7	17	41	20	12	26	25	21	14	18	36
Index11	22	31	13	20	28	47	13	26	26	43	31	42	28	57
Index12	65	43	52	24	100	87	58	31	95	72	79	57	100	92
Index13	18	17	7	5	8	14	5	7	22	12	19	11	14	11
Index14	14	10	7	5	7	10	4	4	11	11	14	8	8	6
Index15	78	59	100	100	88	71	80	57	50	92	74	73	57	55
Index16	8	6	8	3	13	16	7	1	10	4	11	6	12	18
Index17	5	2	5	0	7	5	6	1	6	2	7	3	9	7
Index18	63	33	63	0	54	31	86	100	60	50	64	50	75	39

Note: C represents Champion Victoria Azarenka;O1-O7 respectively represents the first round opponent, the second round opponent, the third round opponent, eighth-finals opponent, quarter finals opponent, semifinals opponent and finals opponent;Index15 and Index18 data all is percentage(%); other indicators units(times).

TABLE 6 : Runner-up Li Na 2013 Australian Open seven rounds fighting key technical indicators data statistics

Indicator	R	O1	R	O2	R	O3	R	O4	R	O5	R	O6	R	O7
Index1	1	1	4	0	1	1	6	0	2	1	2	3	4	1
Index2	1	6	2	5	6	3	4	4	2	2	1	6	5	4
Index3	74	8	66	50	66	37	73	62	51	47	62	62	48	54
Index4	59	30	50	43	36	35	50	35	56	33	63	25	42	38
Index5	21	6	26	10	12	9	16	9	32	10	21	17	36	18
Index6	31	19	30	22	27	24	16	22	40	21	18	32	57	28
Index7	8	4	6	10	10	6	5	5	7	10	10	7	18	12
Index8	4	0	5	2	7	3	5	2	6	4	5	1	7	9
Index9	50	0	83	20	70	50	100	40	87	40	50	14	39	75
Index10	70	48	69	50	61	43	68	50	74	62	74	58	92	100

Note: R represents runner-up Li Na;O1-O7 respectively represents the first round opponent, the second round opponent, the third round opponent, eighth-finals opponent, quarter finals opponent, semifinals opponent and finals opponent;Index3, Index4 and Index9 data are all percentage(%);Index1 and Index2 unit is (piece); Other indicators represent times

TABLE 7 : Runner-up Li Na before finals six games each indicator variance analysis result

Statistics	Index1	Index2	Index3	Index4	Index5	Index6	Index7	Index8	Index9	Index10
Sig.	0.100	0.141	0.090	【0.002】	【0.006】	0.390	0.628	【0.001】	【0.002】	【0.000】
R (average value)	2.67	2.67	0.65	0.52	21.3	27	7.67	5.33	0.73	69.3
O (average value)	1	4.33	0.54	0.34	10.2	23.3	7	2	0.27	51.8

Note:sig represents difference significance test value; R represents runner-up Li Na;O represents opponent; 【】Represents significance test value less than 0.01 corresponding significance degree is very significant

TABLE 8 : Victoria Azarenka and Li Na each technical indicator variance analysis result table

Statistics	Index1	Index2	Index3	Index4	Index5	Index6	Index7	Index8	Index9	Index10
Sig.	0.272	0.166	0.547	0.141	0.466	0.190	0.706	0.232	0.837	0.558
C(Average value)	1.86	4.57	0.66	0.44	20.86	23	9.86	6.43	0.66	77.86
R(average value)	2.86	3	0.63	0.51	23.43	31.29	9.14	5.57	0.68	72.57

Note:sig represents difference significance test value;C represents Champion Victoria Azarenka;R represents runner-up Li Na.

Index5—Winning score
Index6—unforced errors
Index7—Service breaking opportunity
Index8—Service breaking times
Index9—Service breaking rate
Index10—Total score

Reason for selecting above ten indicators is because Champion Victoria Azarenka technical indicators analysis defines other unimportant technical factors, the section selects more effective and comprehensive technical indicator system, from which indicator 1to 4 represents service link technical indicators, indicator 5 and indicator 10 represents scoring link, indicator 6 represents fault link, and indicator 7 to 9 represents key score link technical features, as TABLE 6 showed above 10 indicators seven rounds games data status.

TABLE 6 former six rounds each indicator variance analysis is as TABLE 7 show.

By TABLE 7 data indicating, Index1, Index2, Index3, Index6 and Index7 these five indicators have no significant differences in statistics, Li Na's average value in excellent high indicator ACE ball, first serve scoring rate and service breaking opportunity is higher than that of opponent, in excellent low indicator double fault, Li Na is lower than opponent, and she is higher than opponent in unforced errors, therefore Li Na has advantages over opponent in ACE ball, first serve scoring rate, service breaking opportunity and double fault indicators, but no obvious gaps, and she has no advantages in unforced errors aspect.

FULL PAPER

Index4, Index5, Index8, Index9 and Index10 these five indictors data have significant differences in statistics, the above five indicators are excellent high indicators, and Li Na is superior to opponent in these five indicators factors that above five indicators are Li Na's advantages to advance to the finals.

Champion and runner-up technical and tactics features comparative analysis

As TABLE 8 showed finals Champion and Runner-up point 5.2 ten indicators variance analysis result.

By TABLE 8 data, it is clear that champion and runner-up have no statistical significant differences in above ten indicators factors data, that is to say, there is no great difference between the two overall technical and tactics features, it is relative similar, they are well-matched in strength; in order to make microanalysis of the two technical and tactics features, it can start from single item indicators micro differences, in the following it makes comparative analysis from each link different single item indicators features.

In order to more intuitional reflect 2013 Australian Open women's singles champion and runner-up technical and tactics features differences, the section carries out data comparison from service technique six indicators, receive technique three indicators, front of midfield technique three indicators and grasping service point capacity three indicators, and makes corresponding standardization data comparison Figure 2, data standardization formula is as formula (1) show.

$$X_1^* = \frac{X_1}{X_1 + X_2} \times 100, X_2^* = \frac{X_2}{X_1 + X_2} \times 100 \quad (1)$$

In formula(1), X_1^* represents champion Victoria Azarenka corresponding indicators data after standardization, X_2^* represents runner-up Li Na corresponding indicators data after standardization, X_1 represents champion Victoria Azarenka corresponding indicators original data, X_2 represents runner-up Li Na corresponding indicators original data, as TABLE 9 and Figure 2 show.

In view of service link, first serve success rate and first serve scoring rate of Li Na are obvious lower than that of Victoria Azarenka,in the aspect of second serve, Li Na success rate and scoring rate are slightly higher than that of Victoria Azarenka,which proves that once Victoria Azarenka appears first serve fault, she will generate larger danger than Li Na in second serve; In the aspects of ACE ball and double fault, Li Na ACE ball has four pieces, and Victoria Azarenka only one, the two basic have same double fault, which conforms to experts evaluation "Azarenka's service is her weakness"; in the whole finals, Li Na service drop point always shallower, so that sabotages Li Na first serve scoring aspect advantages.

In view of receive link, Li Na playing is relative active, when receiving, she beats down Victoria Azarenka, but in game Li Na receive is not stable, such instability reflects in receiving moment twenty unforced errors completely offsets advantages from fourteen receive aces, and Victoria Azarenka six receive unforced errors and six receiving aces data are very balanced, Li Na receiving total scoring rate is only 49% that is smaller than Victoria Azarenka's 54% by comparing; in the two duel, Li Na service ability is stronger than Victoria Azarenka,but when receiving capacity y cannot form into earlier overhand service advantage to suppress Victoria Azarenka, champion powerful attach rhythm will generate threat to Li Na.

From baseline stroke technical comparison analysis, it is clear that active scores qualities reflect athletes active attacking consciousness and active scoring capacity in one game, Li Na is stronger than Victoria Azarenka in the link,which clearly reflects from Li Na active score as 36 and Victoria Azarenka active score as 18;during baseline stroke process, it not only exists active score but also exists unforced errors, seen from unforced errors such excellent low indicators values, Victoria Azarenka is28,and Li Na is 57,which is also the reason that Li Na finally defeated by Victoria Azarenka, therefore Li Na pays attention to attacking, meanwhile she should also reduce unforced errors.

From front of midfield technical and tactics analysis, it is clear in whole game, Li Na net scoring capacity has some drawbacks by comparing to Victoria Azarenka, but Li Na plays large angle winning ball, no matter from paces transferring or returning angle, she has greatly promotion, which changes her previous cautious advancing to net tactics.

From comparison of grasping service breaking point capacity, it is clear in the beginning of game Li Na's

TABLE 9 : 2013 Australian Open women's singles champion and runner-up each link indicators data standardization and comparison statistical result

Indicator type	Indicator symbol	Indicator content	X_1	X_2	X_1^*	X_2^*
Service technique A	A1	First serve success rate	78%	65%	54.55	45.45
	A2	First serve scoring rate	54%	48%	52.94	47.06
	A3	Second serve success rate	84%	87%	49.12	50.88
	A4	Second serve scoring rate	38%	42%	47.50	52.50
	A5	ACE ball	1	4	20.00	80.00
	A6	Double fault	4	5	44.44	55.56
Receive technique B	B1	Receive unforced errors	6	20	23.08	76.92
	B2	Receive ace	6	14	30.00	70.00
	B3	Receive scoring rate	54%	49%	52.43	47.57
Front of midfield technique C	C1	Success times	8	6	57.14	42.86
	C2	Advance to net times	14	11	56.00	44.00
	C3	Net scoring rate	57%	55%	50.89	49.11
Grasp service breaking point capacity D	D1	Service breaking point success times	9	7	56.25	43.75
	D2	Service breaking point opportunities times	12	18	40.00	60.00
	D3	Service breaking success rate	75%	39%	65.79	34.21

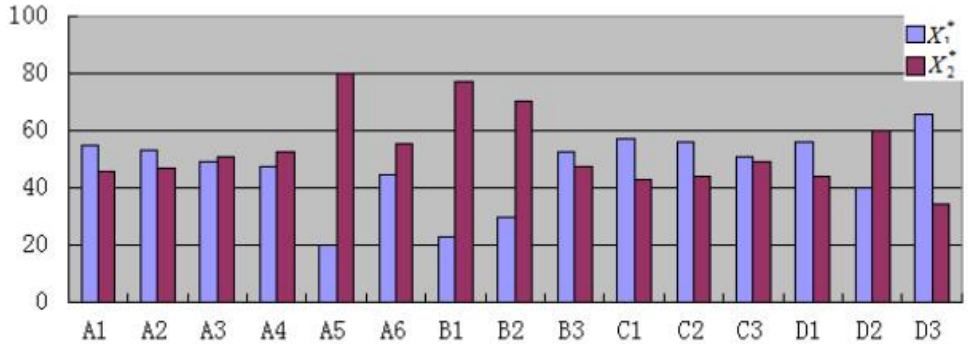

Figure 2 : Champion and runner-up technical and tactics indicators data after standardization comparative statistical graph

service game is broke, in the following Victoria Azarenka continuously three service games are also broke; during the whole game Li Na is broke seven games, and Victoria is broke nine games, data indicates that Li Na totally has 18 service breaking points, she only grasps seven, her breaking rate is 39%;while Victoria Azarenka breaking rate arrives at 73%, from this point,it can also see that Li Na service breaking point capacity has great shortcomings by comparing to Victoria Azarenka, Li Na should makes improvements in service breaking points grasping so as to win Victoria Azarenka again.

CONCLUSIONS

The paper firstly analyzes 2013 Australian Open women's singles championship Victoria Azarenka and Li Na previous standings; it gets the two overall strengths are in similar levels, the two strengths will strengthen with attending more games; in order to extract representative tennis women's singles technical indicators, the paper introduces the game rules, and analyzes rules key points, which provides basis for important indicators extracting; apply mathematical statistics method list-

ing champion Victoria Azarenka and runner-up Li Na technical and tactics indicators data in 2013 Australian Open women's singles event whole game process, and respectively analyze the two technical and tactics features in the whole game, which provides basis for the two comparative analysis; apply data standardization and descriptive statistics way making comparative analysis of finals champion and runner-up technical and tactics features from service technique, receive technique, front of midfield technique and grasping service breaking capacity these four links, it gets the two advantages and disadvantages, and provides effective schemes for Li Na technical development.

ACKNOWLEDGMENT

This paper is supported by cultivating programmed of Middle-aged backbone teachers of Chengdu university of technology

REFERENCES

[1] Du Lin, Guo Xiao-Zheng, Liu Shen; Analysis on the Competitive Ability of Lina in 2013 Australia Open[J]. Fujian Sports Science and Technology, **2**, 38-40 **(2013)**.

[2] Wang Kai-Jun, Dong Qu-Sheng; Cultural Analysis of Four World Tennis Open Matches[J]. Journal of Xi'an Institute of Physical Education, **25(6)**, **(2008)**.

[3] Cai Xiaohong, Wu Guogui; Comparative Study on Technical Characteristics of Woman' s Single Champion in France Open in 2011[J]. Journal of Shenyang Sport University, **31(2)**, 112-114 **(2012)**.

[4] Tao Quan; Winning Factors of Hard Court Competition of World Excellent Women Single Tennis[J]. Journal of Sports Adult Education, **29(1)**, 70-73 **(2013)**.

[5] Wu Ye, Hu Kai; Analysis on Winning Factors of Mens Single Tennis Players on Red Clay Court[J]. Bulletin of Sport Science & Technology, **21(3)**, 43-45, 50 **(2013)**.

[6] Wang Hua-Feng, Huang Rong; Statistics and Countermeasures, Research of Playing Tactics of Beijing Olympic Games Tennis Women''s Singles-Analysis of the Gap between Li Na and Dinara Safina[J]. China science and technology information, **2**, **(2009)**.

[7] Guo Li-Ya, Yuan Yi, Guan Xiao-Yan, Chen Ma-Qiang; A Research on the Key Technique of the World Top Tennis Players in the Men's Singles[J]. Journal of Beijing Sport University, **2**, **(2010)**.