2019 World Table Tennis Championships (AN Jaehyun) Statistical Analysis of Four Technical Indicators

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ABSTRACT. This paper observed and counted the main technical indicators of Korean table tennis athlete AN Jaehyun in the three games of the 2019 World Table Tennis Championships by using the literature method, video statistics method, four-stage index evaluation method and other research methods. According to the research, AN Jaehyun mainly uses high toss service and reverse pendulum service, and the placement is concentrated on the opponent's near-net center forehand, his service scoring ability is strong, he has a strong scoring ability in the third board and achieves an excellent level; the usage rate of attack after receive in the service round is high but it is unstable. In attack after receive, AN Jaehyun has a lot of methods to receive and serve the ball, he can score directly by drop shot, causes the opponent to make a mistake or create attack opportunities for his fourth board, which has a certain threat. However, his judgment for ball landing point and spin judgment is not accurate enough, and lose points more; uses the backhand to return backhand ball better in the fourth board, and the effect of using the forehand to return the ball is poor sideways. The usage rate of the attack after receive in the receive is evaluated as medium. In the stalemate stage, AN Jaehyun has a low usage rate in the first stalemate stage, active stalemate scoring ability is strong, and his counter-attack ability is poor; the usage rate is unstable in the second stalemate stage. A Jaehyun has the highest contribution rate in the attack after serve, contribution rate is the lowest in the second stalemate stage. It shows that AN Jaehyun's attack after serve is the main scoring method of the game, and his stalemate ability is weak. Table tennis is a dominant event for the Chinese Olympic Games to win gold. China has long been in a dominant position in the international table tennis. At the table tennis arena of 2020 Tokyo Olympic Games, the Chinese table tennis team will accept the challenges of outstanding table tennis players from other countries again. As can be seen from the men's singles competition in the 2109 World Table Tennis Championships, South Korean table tennis athlete AN Jaehyun overcame all the difficulties in the way and entered into the men's single semi-final, he has become a potential opponent of the Chinese table tennis team in Tokyo Olympic Games. By looking at the database of academic journals such as CNKI, Wanfang, and Weipu, there are few studies on South Korean athlete AN Jaehyun. This paper intends to use the "table tennis four-stage index evaluation method", 1: "contribution rate", 2: counts the main technologies of AN Jaehyun, analyzes his

tactical characteristics, and provides data support and theoretical reference for the 2020 Tokyo Olympic Games.

1. Research Objects

The three games of AN Jaehyun in 2019 World Table Tennis Championships are selected as the research objects, and the main technical indicators of AN Jaehyun are counted and analyzed.

2. Research Methods

2.1 Literature method

Combined with the needs of this research, through the database of CNKI, Wanfang, Weipu and other databases, we search the literature related to table tennis in the past 10 years and consult books related to table tennis techniques and tactics.

2.2 Video Statistics

We watch the 3 games of AN Jaehyun in the 2019 World Table Tennis Championships through CCTV5 official website, and watch the video and count data repeatedly by using the four-stage index evaluation method.

Table 1 Score and opponent information

serial number	opponent	score	opponent world ranking
1	HARIMOTO Tomokazu	4:2	4
2	Jang woojin	4:3	10
3	FALCK Mattias	3:4	16

2.3 Table tennis four stage index evaluation method

On the basis of the original three stage statistical method, Yang Qing and Zhang Hui proposed a four stage evaluation method for table tennis through a large number of data analysis and experimental research. The four stages are divided into the attack after serve (serve, lose points in the third board and the fifth board), attack after receive (receive the ball, the fourth board), stalemate 1 stage (the fifth board score and the seventh board and later), the stalemate 2 stage (the sixth board and later) 1.

Table 2 Men's singles competition score evaluation table

scoring rate %	excellent	good	pass	fail
attack after serve	≥54.32	(54.32,46.43]	(46.43,36.95]	<36.95
attack after receive	≥58.33	(58.33,50.00]	(50.00,42.04]	<42.04
stalemate 1 stage	≥72.19	(72.19,56.25]	(56.25,43.39]	<43.39
stalemate 2 stage	≥51.05	(51.05,37.50]	(37.05,23.08]	<23.08

Table 3 Evaluation criteria for the usage rate of men's singles

usage rate %	high	medium	low
attack after serve	≥72.22	(72.22,57.07)	<57.07
attack after receive	≥73.86	(73.86,57.02)	<57.02
stalemate 1 stage	≥42.93	(42.93,27.78)	<27.78
stalemate 2 stage	≥42.98	(42.98,26.14)	<26.14

Table 4 Score, lose point and observation points of table tennis match

round	batting	score and observation points	lose point and observation points	general code
serve round	service	opponent's faulty service (A +)	party's faulty service (A +)	A
	third board	opponent's 4th beat is faulty (B +)	party's 3rd beat is faulty (B -)	B
	fifth board	opponent's 6th beat is faulty (C +)	party's 5th beat is faulty (C-)	C
	stalemate I	opponent's 8th beat and later are faulty (D +)	party's 7th beat and later are faulty (D-)	D
receive round	receive	opponent's 3rd beat is faulty (X +)	party's receive is faulty (X -)	X
	fourth board	opponent's 5th beat is faulty (Y +)	party's 4th beat is faulty (Y -)	Y
	stalemate II	opponent's 7th beat and later are faulty (Z +)	party's 6th beat and later are faulty (Z -)	Z

2.3.1 Calculation formula of scoring rate and usage rate for each stage

Scoring rate of attack after serve = (A + + B +) / (A + B + C -) x 100%

Usage rate of attack after serve = (A + B + C -) / (A + B + C + D) x 100%

Scoring rate of the attack after receive = (X++Y+)/(X+Y)x100%

Usage rate of attack after receive= (X + Y) / (X + Y + Z) x 100%

Scoring rate of stalemate I = (C + +D +) / (C + +D) x 100%

Usage rate of stalemate I = (C + +D) / (A + B + C + D) x 100%

Scoring rate of stalemate II = Z + / Z x100%

Usage rate of stalemate II = Z / (X + Y + Z) x 100%

Note: contribution rate 2 = stage score (or which board score) / (total score + total lost point) x 100%.

3. Results and Analysis

3.1 Analysis of technical indicators in attack after serve of AN Jaehyun

Table 5 Statistical data of technical indicators of attack after service of AN Jaehyun's three games

opponent	HARIMOTO Tomokazu			Jang woojin			FALCK Mattias		
board number index	service	third board	lost points in fifth board	service	third board	lost points in fifth board	service	third board	lost points in fifth board
score	11	16		9	16		6	17	
lost points	2	11	2	1	10	14	0	11	9
scoring rate	64.28%			50.00%			53.49%		
assessment	excellent			good			good		
usage rate	79.24%			75.76%			76.79%		
assessment	high			high			high		

It can be found from the data in Table.5 that AN Jaehyun wins 26 points in three games and lose 2 points, it shows that AN Jaehyun has a high-quality service and threat. By observing the video of the game, it can be found that AN Jaehyun's service is mainly high toss service and back-spin, the drop point is mainly in the forehand of middle of the net, and the rotation is dominated by lower side spin and higher side spin. The scores in the third board in the attack after serve, and the scores of the three games are 59%, 61%, and 61%, respectively, all are evaluated as excellence. It shows that AN Jaehyun can create opportunities for the third board to attack through high-quality service; he has a strong sense of attack in the third board and has the ability to take the initiative to score. From the lost points of the fifth board, in the game against Jang woojin and FALCK Mattias, the lost points are 14 points and 9 points, respectively, it shows that the current three boards cannot establish an advantage, and it is easy to be inferior in the fifth board. The usage rate of attack after serve in the three games is evaluated as high, it shows that the main round of the service round is mainly concentrated on the attack after serve.

3.2 Analysis of the technical indexes of AN Jaehyun's receive and service

Table 6 Technical index statistics of AN Jaehyun's receivie and service in three games of segments

opponent	HARIMOTO Tomokazu		Jang woojin		FALCK Mattias	
board number index	receive	fourth board	receive	fourth board	receive	fourth board
score	5	14	13	12	7	14
lost point	10	11	6	13	5	16
scoring rate	47.50%		56.82%		50.00%	
assessment	pass		good		pass	
usage rate	72.73%		67.69%		71.79%	
assessment	medium		medium		medium	

It can be found From the data in Table 6 when AN Jaehyun play against Jang woojin and FALCK Mattias, the scores of receive is higher than the lost points, and the scores of receive are less than lost points when AN Jaehyun play against HARIMOTO Tomokazu. From the video of the game, it can be found that AN Jaehyun has a lot of skills in receiving the ball, including twisting, picking, and drop sjot, it has a certain threat, and it is better to screw from the forehand to the opponent's forehand edge. However, it is not accurate enough to judge the rotation and landing of the ball. When HARIMOTO Tomokazu plays against FALCK Mattias, the fourth board score is lower than the lost point, but the score is close to 50%. Through the video of the game, it can be found that in the fourth board, the backhand topspin has a good scoring effect, and the forehand side back counterattacks the backhand position has more errors. From overall scoring rate and usage rate, the two assessments are passed, one assessment is good, and the three competition usage rates are all evaluated as medium. It shows that AN Jaehyun has a certain scoring ability in receiving the ball, but it is not stable enough in the game, has outstanding features and obvious loopholes.

3.3 Analysis of stalemate 1 technical index of AN Jaehyun

Table 7 Technical indicators statistics of stalemate 1 of AN Jaehyun's three matches

opponent	HARIMOTO Tomokazu		Jang woojin		FALCK Mattias	
board number index	fifth board score	seventh board and after seventh board	fifth board score	seventh board and after seventh board	fifth board score	seventh board and after seventh board
score	2	4	3	8	4	4
lost point		5		5		5
scoring rate	54.55%		68.75%		61.54%	
assessment	pass		good		good	
usage rate	20.75%		24.24%		23.21%	
assessment	low		low		low	

It can be found from the data in Table 7 that there are two games evaluated as good, one pass, and the usage rate is evaluated as low. It shows that the score and lost points of AN Jaehyun's service is concentrated in the attack after serve, and the number of games that enter the stalemate 1 stage are less, and the stalemate ability is not strong. Through the video of the game, it can be found that the active stalemate scoring ability is strong, he has a strong scoring ability in the fifth board, and the lost pontis of anti-turn attack is more.

3.4 Analysis of technical indicators of AN Jaehyun in stalemate 2 stage

Table 8 Technical indicators statistics in stalemate 2 of three games of AN Jaehyun

opponent	HARIMOTO Tomokazu	Jang woojin	FALCK Mattias
board number index	sixth board and after seventh board	sixth board and after seventh board	sixth board and after seventh board
score	3	8	6
lost point	12	13	11
scoring rate	25.00%	30.10%	65.29%
assessment	fail	pass	excellent
usage rate	27.27%	32.31%	28.81%
assessment	medium	medium	medium

It can be found from Table.8 that the scores of the three games are failing, passing, and excellent; the usage rate is evaluated as medium. It shows that AN Jaehyun's receive enter into the stalemate 2 fewer, which is unstable. Through the video of the game, it can be found that the game enters into the stalemate 2 rounds, the score is concentrated on the sixth board, and the lost points are concentrated after the sixth board.

3.5 Four-stage contribution rate analysis of AN Jaehyun

Table 9 List of contribution rates of each stage of AN Jaehyun's three games

Stage opponent	attack after serve	attack after receive	stalemate 1	stalemate 2
HARIMOTO Tomokazu	25.00%	17.59%	5.56%	2.78%
Jang woojin	19.08%	19.08%	8.40%	6.11%
FALCK Mattias	20.00%	18.26%	6.96%	5.22%

According to the data in Table 9, AN Jaehyun has the highest attack after serve contribution rate in the three games, and contribution rate is lowest in the stalemate 2. It shows that AN Jaehyun's attack after serve is the main scoring method of the game, and the stalemate ability t is weak.

4. Conclusion

1) In the attack after serve, AN Jaehyun mainly serves with high toss service and reverse rotation, and the landing point is concentrated on the opponent's near-net midway forehand, direct service scoring ability is strong; the scoring ability in the third board is strong, reach an excellent level; the attack after serve has a high usage rate but unstable.

2) In the attack after receive, AN Jaehyun has abundant means of receive, he can win point directly by twisting and pulling, or by drop short, which can cause the other side to make mistakes or create opportunities for his fourth board attack, which has a certain threat. However, the judgment of the landing point and rotation of the incoming ball is not accurate enough, and there are many points lost, the fourth board uses backhand to return the backhand position, and the side uses forehand to return the incoming ball less effective, the usage rate of attack after receive in service round is assessed as medium.

3) In stalemate, usage rate of AN Jaehyun in stalemate 1 is low, active stalemate scoring ability is strong, counterattack ability is poor; usage rate in stalemate 2 is medium, which unstable.

4) Contribution rate, AN Jaehyun's contribution rate is the highest in attack after serve, while the contribution rate of stalemate 2 is the lowest. It shows that AN Jaehyun's attacks after serve are the main scoring means in the competition, and the stalemate ability is weak.

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