Analytical study for some offensive skills for advanced level junior players in the ITTF pro-tour Egypt 2008.

Yasser Kamal M. S. Ghoneim 1, Ahmed Soubhy Salem 2

1 Department of sports games training, the faculty of sports education "for men" – Alexandria university – Egypt
yasserghoneim@hotmail.com
2 Department of games training, the faculty of sports education "for men" – Alexandria university – Egypt
ahmed_22_23@yahoo.com

The research aims for studying some of the offensive skills for table tennis advanced level juniors in the ITTF pro-tour championship that was held in Egypt 2008 using the descriptive survey method on a sample of (1760) strokes in (15) matches starting from the semi-quarter finals.

The most important results can be summarized as follows:
- The most efficient stroke was the smash stroke, comes after the spin stroke then the counter stroke.
- The most efficient smash strokes were the ones dropped into areas 4, 5, 6.
- The most efficient spin strokes were the ones dropped into areas 7, 8, 9.
- The presence of significant increase in the efficiency of offensive smashes and spin and counter stroke in the second game.

Key words: Analysis – efficiency - offensive skills – advanced level - juniors.

Introduction:

Table tennis is a sport that is characterized with severe competition between players especially if they belonged to the high level standard which makes the winning opportunities very rare, and then the player who is mentally and tactically well-prepared will be always the closer to win due to the very special nature of this sport which is characterized with a small high speed moving ball and the varied and complicated playing situations that always change according to the level of the opponent's technical and tactical skills and his physical abilities.

Add to this dealing with a fast moving small ball and several strokes that differ in speed, spin, direction and strength. Here we figure out the great need of very special physical, technical, tactical and mental abilities to face the challenges of competition in this furious game. (1:2)

In table tennis Match Analysis Systems became a basic tool to prepare and analyze performance for competitions besides being a very important coaching tool that aims for enhancing the player's performance. (5:94)

Match analysis in table tennis can be defined as the process of monitoring and recording the technical and tactical performance for players for the aim of analyzing this performance afterwards to point out the points of strength and the points of weakness.

Analysis can be divided into 2 types: Quantitative and Qualitative. The first type "quantitative" is applied during competitions, but the qualitative is applied after competitions to determine the weakness points and try to make necessary performance corrections to avoid falling in the same mistakes in the coming events. (16:104)

Table tennis is also characterized with a fast dynamic performance and both players always shift the offensive and defensive situations which explains the need to master several offensive and defensive skills in addition to the ability to choose the most appropriate skill in the most appropriate time and the most appropriate game situation (12:6)

Also many researchers clarified the importance of match analysis in table tennis as a prominent tool for defining the most modern technical and tactical performance aspects and their effect on the final match result. Analysis helps also in defining 2 important elements:

1- Evaluation and anticipation.
2- Systemizing the process of decision making in coming events. (5) (17) (18) (7)

The researchers assume that as a result of the great progress and development in the technical and tactical performance in table tennis, the offensive skills became more efficient in scoring more points and winning more championships. All the players' results depend on their technical and tactical level of performance that is applied in competition and differs as well between the beginnings of the game than the middle than before its end.

And as the main problem in this research lies in defining the efficiency of some offensive skills for high level table tennis juniors which pushed the researchers to establish a connection between the offensive tactical performance and the technical

performance and determining the degree of efficiency for each stroke, the used bat face, the direction of the stroke and the time of using this stroke. This will give us the necessary information to build up the required training programs and employ these programs into effective offensive processes which will help in determining the points of strength or weakness and how to work on developing them.
Former researches performed in the same field:
Due to the importance of the offensive strokes in table tennis and their effect on the final results of matches, the researchers used some scientific researches that wer performed in a field that is related fo the research topic as:
-All these studies confirmed the importance of studying the offensive skills in table tennis; also the researchers were benefited through using these researches in performing the research procedures in this study.

Research aims:

The research aims for studying some of the offensive skills for table tennis advanced level juniors through performing the following duties:

1- Identifying the efficiency degree of each type of the offensive strokes as a research sample according to the zone on the opponent's side.
2- Identifying the efficiency degree of each type of the offensive strokes as a research sample according to the order of performing the stroke inside the same point.
3- Identifying the efficiency degree of each type of the offensive strokes as a research sample according to the face of the bat used in performing the stroke.
4- Identifying the efficiency degree of each type of the offensive strokes as a research sample according to performing the stroke in each game inside the match.

Research questions:

1- What is the appropriate zone for directing the most efficient stroke?
2- What is the order of the most efficient stroke inside the same point?
3- What is the bat face used for performing the offensive strokes in the research samples?
4- What are the most effective offensive strokes used in each game inside the match?

Related researches:

Due to the importance of offensive strokes in table tennis and its effect on matches' results, the researchers used some scientific related researches as: Safwat Ali 1994 (11), Sherif Saleh 2001 (12), Sherif Saleh 2002 (13), Khaled Hegazy 2003 (6), Sun Qi Lin et Al 2003 (15), Hazem El-Shalakany 2006 (4), Wu Xiao Zhu el Al 2007 (16), Yasser Ghoneim and Ahmed Soubhy 2008 (18).

All these researchers confirmed the importance of studying and analyzing the offensive strokes in table tennis, also these reearches helped in setting up the procedures of this current research.

Research procedures:

Research Method:

The descriptive method with the survey technique was used for its suitability to the research nature.

Research Sample:

15 games were monitored starting from the qualification for the quarter finals during the ITTF pro tour that was held in Mubarak Arena – Alexandria – Egypt "from 2 to 5 April, 2008", were 1760 point were recorded and monitored and 97 points were ignored for the reason of the player's presence in the ball way or for bad shooting.

Table (1): Research samples and variables.

N=1760

Variable		Statistical significance		
		N=	Percentage %	Chi Square
Type of offensive stroke	Spin	997	56.648	448.419**
	Smash	454	25.795	
	Counter	309	17.557	
Used Racket face	Front	1146	65.114	160.809**
	Back	614	34.886	
Performance Order of Offensive stroke	1st	894	50.795	251.814**
	2nd	378	21.477	
	3rd	488	27.727	
Offensive stroke dropping area	Area 1	3	0.17	747.795**
	Area 4	33	1.875	
	Area 5	32	1.818	
	Area 6	42	2.386	
	Area 7	804	45.682	
	Area 8	402	22.841	
	Area 9	444	25.227	
Offensive stroke efficiency	Point scored	278	15.795	747.795**
	Staying in Offensive mode	694	39.432	
	Rally occurrence	169	9.602	
	Switching to defense mode	309	17.557	
	Point lost from return	107	6.08	
	Losing a direct point	203	11.534	

Research variables:

In terms of the research aims, the researchers determined the technical and tactical variables as follows:

First: Playing situations and the characteristics of the offensive strokes:

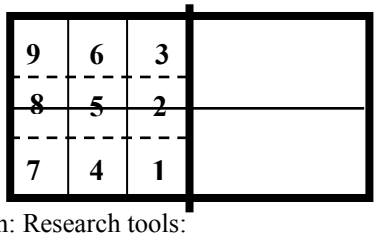
- Type of the offensive stroke
- The used face of the bat
- The order of using the offensive stroke

- The place of landing for the offensive stroke

Second: The result of the stroke where the stroke's efficiency lies according to 5 levels:

1- Scoring a point
2- Staying in the offensive situation
3- Starting a rally
4- Successful return from the opponent
5- Losing the point

Third: Dividing the table zones on the opponent's side:



Fourth: Research tools:

The researchers made a referral survey for the scientific articles and researches to determine the most suitable tools for data collection as follows:

1- Computer device "P 4" that includes a Sony DVD player.
2- 2 digital cameras "Panasonic" used for recording matches.
3- CD's and DVD's where the matches research samples are copied after recording.
4- Data recording sheet that was developed through the researchers and that was organized according to the sequence of the monitored variables and situations. (attachment no. 1)

Fifth: stability and reliability of the data recording sheet:

The data sheet was evaluated through some experts to confirm the reliability of the sheet contents.

The researchers used the application and reapplication after a specific time range after setting up the terms and conditions of data collection on a number of 100 points from the Pro Tour championship that was help in Egypt 2008 that were excluded from the points of the research sample. After 3 days the sheet was reapplied on the same number of points. Then statistical processing was applied to clarify the relation between each variable in both applications, then the arithmetic mean was calculated (0.97) as a significant difference to prove the stability of the data sheet.

Also another expert analyzed the same number of points that was compared to the second application to confirm the reliability of the data sheet and the simple correlation factor was (0.95) that was enough to confirm both of the stability and reliability of the data collection sheet.

Steps of performing the research:

After designing the data collection sheet the researchers analyzed the variables that are related to the offensive skills through the DVD player on the PC where the sample points were viewed and analyzed through:

1- Normal motion
2- Slow motion
3- Frame by frame
4- Stop cadre

After data collection the results were statistically processed through Cross tabulation for calculating the percentage and the repetitions of the efficient offensive strokes using the following equation:

Efficiency degree:

$$\frac{\text{Total of the repetitions below the efficiency level x the adjacent degree for the efficiency level}}{\text{Total number of repetitions}}$$

Results Discussions:

Table (2) offensive stroke efficiency as per dropping area
n = 1760

Offensive stoke type	Dropping area	Statistical indicators	Offensive stroke efficiency						Total	Efficiency
			Point scored	Staying in Offensive mode	Rally Occurrence	Switching to defensive mode	Point Lost from return	Losing a direct point		
Spin	Area 7	N=	55	177	60	137	52	64	545	2.732
		Percentage %	5.517	17.753	6.018	13.741	5.216	6.419	54.664	2.732
	Area 8	N=	29	68	22	41	23	36	219	2.685
		Percentage %	2.909	6.82	2.207	4.112	2.307	3.611	21.966	2.685
	Area 9	N=	27	57	36	51	22	40	233	2.554
		Percentage %	2.708	5.717	3.611	5.115	2.207	4.012	23.37	2.554
Total		N=	111	302	118	229	97	140	997	2.68
		Percentage %	11.133	30.291	11.836	22.969	9.729	14.042	100	2.68
Smash	Area 1	N=	3						3	5
		Percentage %	0.661						0.661	5
	Area 4	N=	30	3					33	4.909
		Percentage %	6.608	0.661					7.269	4.909
	Area 5	N=	29	3					32	4.906
		Percentage %	6.388	0.661					7.048	4.907
	Area 6	N=	42						42	5
		Percentage %	9.251						9.251	5
	Area 7	N=	7	125					132	4.053
		Percentage %	1.542	27.533					29.075	4.053
	Area 8	N=	4	100					104	4.038
		Percentage %	0.881	22.026					22.907	4.038
	Area 9	N=	8	97			3		108	3.991
		Percentage %	1.762	21.366			0.661		23.789	3.991
Total		N=	123	328			3		454	4.251
		Percentage %	27.093	72.247			0.661		100	4.251
Counter	Area 7	N=	20	27	21	27	4	28	127	2.591
		Percentage %	6.472	8.738	6.796	8.738	1.294	9.061	41.1	2.591
	Area 8	N=	8	13	15	25		18	79	2.367
		Percentage %	2.589	4.207	4.854	8.091		5.825	25.566	2.367
	Area 9	N=	16	24	15	28	3	17	103	2.718
		Percentage %	5.178	7.767	4.854	9.061	0.971	5.502	33.333	2.718
Total		N=	44	64	51	80	7	63	309	2.576
		Percentage %	14.239	20.712	16.505	25.89	2.265	20.388	100	2.576

Table (3) offensive stroke efficiency as per performance order
n = 1760

Offensive Stoke Type	Performance order	Statistical indicators	Offensive stroke efficiency						Total	Efficiency
			Point scored	Staying in Offensive mode	Rally Occurrence	Switching to defensive mode	Point Lost from return	Losing a direct point		
Spin	1st	N=	65	167	81	145	56	79	593	2.668
		Percentage %	6.52	16.75	8.124	14.544	5.617	7.924	59.478	2.668
	2nd	N=	26	58	13	31	17	18	163	2.945
		Percentage %	2.608	5.817	1.304	3.109	1.705	1.805	16.349	2.945
	3rd	N=	20	77	24	53	24	43	241	2.531
		Percentage %	2.006	7.723	2.407	5.316	2.407	4.313	24.173	2.531
Total		N=	111	302	118	229	97	140	997	2.68
		Percentage %	11.133	30.291	11.836	22.969	9.729	14.042	100	2.68
Smash	1st	N=	60	114					174	4.345
		Percentage %	13.216	25.11					38.326	4.345
	2nd	N=	19	135					154	4.123
		Percentage %	4.185	29.736					33.921	4.123
	3rd	N=	44	79			3		126	4.278
		Percentage %	9.692	17.401			0.661		27.753	4.278
Total		N=	123	328			3		454	4.251
		Percentage %	27.093	72.247			0.661		100	4.251
Counter	1st	N=	21	25	21	30	4	26	127	2.614
		Percentage %	6.796	8.091	6.796	9.709	1.294	8.414	41.1	2.614
	2nd	N=	6	9	8	22		16	61	2.197
		Percentage %	1.942	2.913	2.589	7.12		5.178	19.741	2.197
	3rd	N=	17	30	22	28	3	21	121	2.727
		Percentage %	5.502	9.709	7.12	9.061	0.971	6.796	39.159	2.727
Total		N=	44	64	51	80	7	63	309	2.576
		Percentage %	14.239	20.712	16.505	25.89	2.265	20.388	100	2.576

Table (4) offensive stroke efficiency as per racket face used
n = 1760

Offensive Stoke Type	Racket face	Statistical indicators	Offensive stroke efficiency						Total	Efficiency
			Point scored	Staying in Offensive mode	Rally Occurrence	Switching to defensive mode	Point Lost from return	Losing a direct point		
Spin	Front	N=	76	187	81	166	76	100	686	2.593
		Percentage %	7.623	18.756	8.124	16.65	7.623	10.03	68.806	2.593
	Back	N=	35	115	37	63	21	40	311	2.871
		Percentage %	3.511	11.535	3.711	6.319	2.106	4.012	31.194	2.871
Total		N=	111	302	118	229	97	140	997	2.68
		Percentage %	11.133	30.291	11.836	22.969	9.729	14.042	100	2.68
Smash	Front	N=	120	314			3		437	4.254
		Percentage %	26.432	69.163			0.661		96.256	4.254
	Back	N=	3	14					17	4.176
		Percentage %	0.661	3.084					3.744	4.178
Total		N=	123	328			3		454	4.251
		Percentage %	27.093	72.247			0.661		100	4.251
Counter	Front	N=		3	4	9		7	23	1.826
		Percentage %		0.971	1.294	2.913		2.265	7.443	1.826
	Back	N=	44	61	47	71	7	56	286	2.636
		Percentage %	14.239	19.741	15.21	22.977	2.265	18.123	92.557	2.636
Total		N=	44	64	51	80	7	63	309	2.576
		Percentage %	14.239	20.712	16.505	25.89	2.265	20.388	100	2.576

Table (5) offensive stroke efficiency as per the game order
n = 1760

Offensive Stoke Type	Game Order	Statistical indicators	Offensive stroke efficiency						Total	Efficiency
			Point scored	Staying in Offensive mode	Rally occurrence	Switching to defensive mode	Point Lost from return	Losing a direct point		
Spin	1st game	N=	26	72	24	60	11	37	230	2.7
		Percentage %	2.608	7.222	2.407	6.018	1.103	3.711	23.069	2.7
	2nd game	N=	38	73	31	46	24	30	242	2.855
		Percentage %	3.811	7.322	3.109	4.614	2.407	3.009	24.273	2.855
	3rd game	N=	24	55	22	73	25	26	225	2.564
		Percentage %	2.407	5.517	2.207	7.322	2.508	2.608	22.568	2.565
	4th game	N=	20	76	37	31	19	40	223	2.673
		Percentage %	2.006	7.623	3.711	3.109	1.906	4.012	22.367	2.673
	5th game	N=	3	26	4	19	18	7	77	2.429
		Percentage %	0.301	2.608	0.401	1.906	1.805	0.702	7.723	2.429
Total		N=	111	302	118	229	97	140	997	2.68
		Percentage %	11.133	30.291	11.836	22.969	9.729	14.042	100	2.68
Smash	1st game	N=	38	97					135	4.281
		Percentage %	8.37	21.366					29.736	4.281
	2nd game	N=	30	63					93	4.323
		Percentage %	6.608	13.877					20.485	4.323
	3rd game	N=	29	83					112	4.259
		Percentage %	6.388	18.282					24.67	4.259
	4th game	N=	18	55			3		76	4.118
		Percentage %	3.965	12.115			0.661		16.74	4.119
	5th game	N=	8	30					38	4.211
		Percentage %	1.762	6.608					8.37	4.211
Total		N=	123	328			3		454	4.251
		Percentage %	27.093	72.247			0.661		100	4.251
Counter	1st game	N=	11	14	15	21		18	79	2.506
		Percentage %	3.56	4.531	4.854	6.796		5.825	25.566	2.506
	2nd game	N=	10	14	12	19	3	14	72	2.542
		Percentage %	3.236	4.531	3.883	6.149	0.971	4.531	23.301	2.542
	3rd game	N=	17	13	11	20	4	11	76	2.816
		Percentage %	5.502	4.207	3.56	6.472	1.294	3.56	24.595	2.816
	4th game	N=	3	20	6	16		10	55	2.636
		Percentage %	0.971	6.472	1.942	5.178		3.236	17.799	2.636
	5th game	N=	3	3	7	4		10	27	2.074
		Percentage %	0.971	0.971	2.265	1.294		3.236	8.738	2.074
Total		N=	44	64	51	80	7	63	309	2.576
		Percentage %	14.239	20.712	16.505	25.89	2.265	20.388	100	2.576

From table (2) we realize that the smash stroke is considered to be the highest offensive stroke in its efficiency degree 4.25, before the spin stroke with a degree of 2.57. The high efficiency degree for the smash stroke can be referred to the short flight time of the ball that is hit from a level higher than the net level opposite to other strokes that are hit form a lower level and takes a longer flight time. Also the smash stroke is performed with high strength which is confirmed in many researches (10:283) (3:115) other than the rest of the offensive strokes' strength that is defined by how low it is performed than the net level.

Also in the same table, we can figure out the high efficiency of the smash strokes that are directed into zones 1 – 6 then into zones 4 – 5 more than the remaining zones. This means that the middle zone is the most effective zone for directing the smash strokes. The researchers refer this to the high flight arc for the ball after bouncing in the opponent's side as a result of the very acute angle of bouncing which makes it too difficult for the opponent to return the stroke.

From the same table we find it clear that the spin strokes are always directed to the base zones in the opponent's side "zones 7 – 8 – 9" which proves the assumption of the researchers who agree with Sherif Saleh – 2002 (13) and Mohamed Abd Allah – 2007 (10) that the spin strokes is characterized with high ball rotation which cause the ball to confuse the opponent's decision concerning taking the best defensive action because he can not anticipate the angle of bouncing and

the direction of the ball after bouncing. And the available timing for the opponent to choose the appropriate defensive action is very small to give him the chance to deal with the amount and the direction of ball spin.

From Table 3, we can figure out that the second offensive spin stroke had the highest efficiency in comparison to the other orders of spin strokes as the first spin stroke is performed to open the table for the player in the offensive situation not to finalize the point. So the second stroke's aim will be finalizing the point as already proved in the analysis. Besides, the chop strokes from the players in the defensive situations are mostly slow which gives the offender the chance to place highest amount of rotation to make it difficult for the opponent to return. Also it gives the offender the chance to return the ball outside the boarders of his half which gives him the chance to place the highest amount of spin in the ball. (9) (13).

Concerning the offensive smash strokes, table 3 shows that the first smash stroke had the highest degree of efficiency when compared to the second or the third stroke. This can be referred to the surprise element in the first stroke is higher than smash strokes in other order as it can be easily anticipated if it was the second or the third in order, but the first one is performed in the highest speed and strength more than any other offensive stroke. (3) (10). This high speed and strength applies more surprise on the first stroke which is enough to confuse the opponent which in turn increases the efficiency degree on the first smash stroke in order.

As for the forehand counter, we figured out that the third one in order has the highest efficiency degree as the change in direction is mostly applied on the third stroke as if the first and second strokes were directed to the right side of the defender, the third will be directed towards his left side and vice-versa, which confuse the defender and comes the third ball in order to finalize the point.

From table 4, it is clear that the offensive backhand spin strokes had a greater degree of efficiency than the offensive forehand spin strokes, this can be referred to the position of the hand wrist joint when performing the backhand strokes is more flexible and agile to offer the highest amount of spin to the ball as the anatomical body position allows offering either highest right or left side spin in addition to the basic top spin. But in case of using the forehand offensive spin stroke, the only available side spin will be to the left side only as the anatomical body position does not allow applying the right side spin. So it is much more difficult for the defender to deal with a ball with 2 types of side spin in addition to the basic top spin than dealing with one side spin in addition to the basic top spin. (9)

Concerning offensive smash strokes, we can figure out from the analysis that the forehand smash is more efficient than the backhand smash and this can be referred to the increase in the arm swing distance in the forehand smash – as it is performed latelary - than the swing in the backhand smash – as it is performed in front of the player's body – which decreases the amount of strength and speed in the backhand smash than the forehand smash. (13) (2).

Also it is clear from the same table that the efficiency degree of the counter offensive backhand strokes is higher than the degree of efficiency of the counter offensive forehand strokes as the backhand stroke is performed in front of the player's body and the player's position is directly behind the ball which is suitable and comfortable for performing the stroke. But the forehand is performed beside the player's body which decreases the amount of control on the ball and the player might not be able to place his feet or entire body to place the highest efficiency in his counter forehand stroke

Form table 5 we can conclude the increase of efficiency for spin and smash to the highest degrees during the second game in the match and this can be referred to the increase in the players' fitness and skill level after finishing the first game that can be used only for exploring the opponent's technique in different playing situations other than enhancing the efficiency of the performance itself. But when the second game begins, the players are well introduced to each other and both are well prepared physically and motivationally so comes the chance for the strokes efficiency to be obvious due to concentration in performing smash and spin strokes.

But for counter strokes, the highest efficient degree was obvious in the third game as it needs studying the footwork of the opponent and this might take a longer time than other techniques.

Conclusions:

1- The highest degrees for efficiency for the offensive strokes were for the smash, spin then the counter stroke respectively.
2- The most efficient smash strokes were the ones directed into areas 4, 5, 6.
3- The most efficient spin strokes were the ones directed into areas 7, 8, 9.
4- The second spin stroke was the most efficient in regard to its order inside the same point.
5- The first smash stroke was the most efficient in regard to its order inside the same point.
6- The third counter stroke was the most efficient in regard to its order inside the same point.

7- The backhand spin was more efficient than the forehand spin.
8- The forehand smash was more efficient than the backhand smash.
9- The smash and spin stokes were highly efficient during the second game.
10- The counter stroke was highly efficient during the third game.

Recommendations:

1- Coaches should plan to train their players to drop smash strokes into areas 4, 5, 6 to increase the strokes efficiency.
2- Coaches should plan to train their players to drop spin strokes into areas 7, 8, 9 to increase the strokes efficiency.
3- Driving the players' attention towards training on backhand spin strokes more than forehand spin strokes as backhand spin strokes are more efficient.
4- Driving the player's attention to the importance of the offensive smash, spin and counter strokes.
5- Using questionnaires to analyze table tennis matches.
6- Applying more researches to design programs that aim for developing the efficiency of performing offensive strokes for table tennis juniors.

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