THE PLAYING PATTERN OF WORLD'S TOP SINGLE BADMINTON PLAYERS

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A total of 10 matches from the 1996 Hong Kong Badminton Open Tournament were video taped and notated. The analysis profiled the percentage distribution of shots with respect to court-areas; the frequency the players used the different serves; the area the players returned the most shots to; a rank order of the different return shots; and the playing effectiveness in relation to each court-area. The study further identified the types of strokes used for killing shots and isolated the critical factors influencing winning or losing a match.

KEY WORDS: notation, badminton, playing pattern, game strategy, tactics

INTRODUCTION: Methods of notation have been widely used to analyze the playing pattern in sports (Horobin, Kitchen and Hughes, 1995; Miller and Bartlett, 1994; Hughes and Tillin, 1995; Hong, Robinson and Chan, 1998). Badminton is a fast and dynamic sport. To win a game, the proper use of tactics is of vital importance (Downey, 1982). Scientific studies on tactics, strategy, or playing patterns of international level badminton, are, however, very limited. The purpose of this study was to profile playing patterns of international male badminton players in single games and to establish a comprehensive database of badminton tactics.

METHODS: A total of ten single matches played in the 1996 Hong Kong Badminton Open were analyzed. To reduce bias, in addition to the four players competed in the semi-finals and final matches, seven other players from the quarterfinals and second round matches were also selected as subjects. All the players were right-handed. Games were recorded using a 3-CCD video camera placed at the back or at the side of the court. After the games, the videotapes were notated.
Court was divided into six areas: right forecourt, left forecourt, right mid-court, left mid-court, right rear court and left rear court. Strokes were identified according to serves and return shots. The serves were: serve low, serve high, and the return shots were: smash, clear, drop, block, lob, drive, push, net, and hit. Each of the return strokes was in turn identified as either straight or cross court shots. In order to depict the quality of strokes, each stroke was classified into one of six categories of effectiveness: effective, ineffective, unconditional winner, conditional winner, forced failure and unforced failure. Each category was defined as: effective, ineffective, unconditional winner, conditional winner, forced failure, and unforced failure shots.
The data were analysed by calculating the percentage distribution of shots in relation to the six effectiveness-categories, the 20 kinds of strokes and the six court areas. One-way analysis of variance (ANOVA) was applied for multiple comparison to identify statistically significant difference. Post hoc analysis was conducted by Scheffé Significant Difference Test to evaluate the significant mean differences. T-tests were used to evaluate the significant mean difference between two groups. The 0.05 probability level was used for all tests as the criterion value when determining the presence or absence of statistically significant results. Reliability of the method was evaluated by comparing the results of a repeated analysis of a match containing 108 rallies and 619 shots. (Hong et al., 1996).

RESULTS AND DISCUSSION: The serve. It has been pointed out in literature that the high-deep serve is used more often in single than in doubles badminton games (Poole, 1991; Bloss & Hales, 1994; Downey, 1982). The aim is to force the opponent to move to the rear court, blunting the attacking power and developing open space in the forecourt. A weak return allows the server to take the offensive. Data from this study, however, showed that the world's top single badminton players served virtually the same number of low-short serve

(512) as the high-deep serve (516). Moreover, among the eleven players involved, seven played more low-short than high-deep serves. These seven players served low, eliminating their opponent's chance of hitting the shuttle downward. With good blocking at the net, it forced the opponent to lift the shuttle upward, giving the server the opportunity to implement their offensive strategy, for example a smash or a drop.   This explanation can be substantiated as the data of this study indicated that the smash (straight and cross-court) was the second most popular shot played. Based on the analysis made, it was concluded that more players preferred to used low-shot serves to facilitate offensive strategy in the male single matches of Hong Kong Badminton Open Championships 1996.

The rally. Table 1 shows that, as would be expected for this level of competition, a much higher rate of "effective" shots was found than that of the "ineffective" shots. Among the six court areas, the left rear court contained the highest rate of "ineffective" shots, with the left forecourt receiving the highest rate of "effective" shots.

Table 1   **Percentage distribution of the six effectiveness-category shots in each of the six court-areas (%). (N=20. Values are Means±SD)**

	Effective	Ineffective	Unconditional Winner	Conditional Winner	Forced Failure	Unforced Failure	Sum
Fore Left	76.07	11.05	4.45	0.00	2.40	6.04	100
	±6.44	±4.87	±2.98	±0.00	±2.02	±3.56	
Fore Right	74.22	10.90	4.63	0.14	2.05	8.07	100
	±5.68	±5.73	±3.01	±0.46	±1.85	±3.46	
Mid Left	66.11	13.71	9.89	0.18	4.84	5.27	100
	±9.28	±6.33	±4.53	±0.58	±2.56	±4.61	
Mid ight	63.52	15.12	8.57	0.24	7.86	4.68	100
	±11.15	±6.85	±5.13	±0.75	±4.22	±4.40	
Rear eft	67.72	18.75	4.65	0.08	0.26	8.54	100
	±8.99	±6.21	±3.32	±0.34	±0.65	±4.92	
Rear Right	72.15	14.96	4.50	0.12	0.11	8.15	100
	±10.07	±9.36	±3.92	±0.43	±0.36	±5.53	

As shown in Table 2, for winning shots, the rate of "unconditional winner" was much higher than that of the "conditional winner" for the whole court, with the greatest rate of the "unconditional winner" shots being found in the mid court. The highest rate of "forced failure" shots was found on the mid-court with the greatest rate of the "unforced failure" shots found in the rear court.

The one-way ANOVA test indicated a significant difference ($p < 0.05$) in the percentage distribution of shots among fore, mid and rear court areas using. While the Post Hoc tests showed to be between the fore and mid-court and between the fore and rear court. No significant difference was found between mid- and rear court. These findings indicated that players preferred to return shots to the opponent's forecourt as placement there is considered to be safe and offensive. By playing a shot close to the net eliminates the opponent's chance to hit the shuttle downward; and when a good net shot is followed by blocking, it forces the opponent to lift the shuttle up, offering the chance to attack.

Table 2   Percentage distribution of the six effectiveness-categories shots in the fore, mid, rear and whole court (%). (N=20. Values are Means±SD)

	Effective	Ineffective	Unconditional Winner	Conditional Winner	Forced Failure	Unforced Failure	Sum
Fore-Court	74.99 ±5.18	10.95 ±4.81	4.51 ±2.08	0.07 ±0.24	2.29 ±1.30	7.18 ±3.01	100
Mid-Court	64.73 ±8.19	14.62 ±6.04	9.02 ±2.77	0.24 ±0.52	6.41 ±2.23	4.98 ±3.48	100
Rear-Court	69.80 ±7.80	16.94 ±6.75	4.63 ±2.92	0.10 ±0.38	0.19 ±0.36	8.33 ±3.99	100
Whole Court	70.34 ±4.82	14.02 ±4.69	5.76 ±1.91	0.13 ±0.20	2.82 ±0.76	6.92 ±2.75	100

The backhand rear court is considered by many as the players' weakest area (Breen & Paup, 1991; Bloss & Hales, 1994; Poole, 1991). When playing a backhand stroke, the body has to twist and the grip changed from the forehand to the backhand position. As a result, time is needed to attain the standby position. Also the backhand is usually less powerful than the forehand stroke and often offer the opponent an offensive opportunity. This study shows that of all returns, 51.94% were played from backhand side, revealing that offensive players preferred to return more shots to the opponent's backhand side (left forecourt, left mid and left rear court for the right-handed players), thus putting pressure on the opponent's backhand. The study further revealed that amongst the six court-areas, returns from the left rear court had the highest "ineffective" rate (Table 1), showing that even in high level competition, the backhand rear court tends to be the weakest one.

Table 3 demonstrated that the number of "effective" shots was much higher than that of "ineffective" shots. Among all the shots, the highest "effective" rate was with the net, block and drop shots.

Table 3   Comparative relationship of effective and ineffective rate with the 9 main shots. (N=20. Value = Means±SD)

	Effective	Ineffective
Smash	77.87±17.99	22.13±17.99
Clear	74.57±28.21	25.43±28.21
Drop	91.12±12.95	8.88±12.95
Block	92.20±8.01	7.80±8.01
Lob	69.18±23.19	30.82±23.19
Drive	82.90±28.55	17.10±28.55
Push	78.83±33.99	21.17±33.99
Net	95.79±24.88	4.21±24.88
Hit	59.26±46.17	40.74±46.17

The net shot was found to have the highest "effective" rate. It has been shown that a good net return can be very useful as it can finish a rally and win a point, in fact it has been found that the net shot was the second ranking killing shot (Table 4). With net blocking, the opponent is forced to lift the shuttle, thus providing opportunity of a smash which was found the top ranking killing shot (Table 4). If, however, a player plays an "ineffective" net return, the opponent will have a chance to hit the shuttle down at the forecourt.

The block shot or underhand drop was ranked second in its "effective" rate (Table 3). This shot is usually used to return a smash from the opponent, which is usually executed from the opponent's rear court or mid-court. Using the block shot to make a net return, the opponent is forced to move a long distance to play which places the opponent in an off balance

position and causes them to expend considerable energy.

The drop shot was the third ranking shot in the "effective" category (Table 3). It is usually played from the rear or mid court, with the aim of hitting the shuttle downward softly to the opponent's forecourt. Returning a good drop usually requires the use of deception to create situations to the player's advantage. For example, when the shuttle is high in the rear or mid court, faking a smash, can cause the opponent to adopt a defensive stance, which makes him more difficult to move quickly to the rear or forecourt. The offensive player then has the option of playing an attacking clear or attacking drop to force a weak return (Downey, 1982). Meanwhile it would be too energy consuming if the smash was used all the time.

Comparing the straight and cross court shot, it was found that 66.81% of returns were straight shots and 33.19% were cross court shots. Breen and Paup (1983) stated that the ability to change the direction of shuttle flight is one of the crucial aspects in the strategies of single badminton. For example, if the opponent plays a straight shot the best return is cross court shot. Changing directions makes the opponent run farther but the cross court shot is more difficult and dangerous to return. If the cross court clear is not played high and deep, the opponent may have an easy smash. The straight return of the shuttle is generally the simplest error-free shot to play and it can also give a better positioning for subsequent shots. This study indicated that 84.16±10.33 % of the straight court shots were "effective" and 81.19±12.02 % of the cross court shots were "effective", which showed that the high level single badminton players studied preferred to play the more safe and conservative straight shots rather than the high risk crosscourt shots.

The kill shots. In order to profile the commonly used playing strategy that leads to winning, the last five shots played in the "unconditional winner" and "forced failure" rallies were analysed. Table 4 shows that the smash was the most frequently used kill shot with net the second and hit the third. This highlights the fact that the smash is a very important shot in badminton game. Although the smash is frequently used to win a rally, it is impossible to smash all the time, as the opponent may not provide such an opportunity. Knowing, therefore, how to "set up" the opponent for a smash is essential.

Table 4   Percentage distribution of killing shot and the preceding returns (%)

Killing shot			Preceding shots (including serves)							
			1		2		3		4	
1	Smash	53.9	Net	21.89	Lob	21.87	Lob	24.35	Lob	24.04
2	Net	14.56	Lob	19.93	Smash	15.46	Net	16.85	Net	21.32
3	Hit	11.27	Smash	18.93	Clear	14.40	Clear	14.61	Smash	15.85
4	Push	5.03	Drop	8.68	Net	13.06	Smash	13.86	Block	10.38
5	Lob	4.16	Clear	8.48	Block	9.87	Drop	8.61	Clear	8.74
6	Clear	3.47	Block	7.89	Drop	7.20	Block	6.37	SH	6.56
7	Drop	2.95	SL	4.93	SH	5.87	SH	6.37	SL	6.01
8	Drive	2.42	Push	3.75	SL	5.33	SL	5.23	Drop	5.46
9	Block	2.24	SH	2.76	Drive	3.47	Push	2.25	Drive	1.09
10			Drive	1.38	Push	3.47	Drive	1.50	Push	0.55
11			Hit	1.38						
	N=577		N=507		N=375		N=267		N=183	

There are different playing styles, for example the strong player, the touch player, or the fast player. To smash, one must have an overhead return from the opponent. To force the opponent to make an overhead return, a good net shot is the best choice. Findings of this study support this statement as all the shots used in the second last return, the net shot ranked the first, the lob the second, and smash the third. Although the lob is a defensive shot, it can make use of the deep part of badminton court and force the opponent to run a long way to get the shuttle, resulting in a high energy consumption of the opponent. The smash, which ranked third in the second last returns, is usually employed by using power. A strong smash followed by a good net or hit shot is commonly used by the "strong players"

(Downey, 1982).

The first three ranking shots used for the third last return were lob, smash, and clear. The net shot was ranked closely at the forth. If the first ranking shots in the last three returns are linked, a commonly used pattern can be found. First, the player plays a lob, forcing the opponent to the rear court; the player plays a good net shot, making the opponent run to the forecourt. If the good net shot is followed by net blocking, the opponent must lift the shuttle up. And if the return is not long enough, the player has the opportunity for a smash.

The winning strategy. The mean and standard deviation of shots returned by match winners and losers with different effectiveness categories in an average match were computed (Table 5). Among all the effectiveness category shots returned, only the "unconditional winner" showed a significant difference ($p < 0.01$) between the winner and loser, reflecting the fact that the pressure and attack game was the most important strategy for the top level international players. Players who play with good skill, patience, stamina and a variety of different tactics set up the rally for a kill - an "unconditional winner" shot. The more effective the player, the less error appears.

Table 5 **Comparison of different number of shots played by winner and loser in each category of an average game. (N = 10. Values are Means±SD. T is between the Winner and Loser. T critical value for p< 0.05 is 1.96 and p< 0.01 is 2.576)**

	Winner	Loser	Difference	t
Effective	247.40±87.27	243.50±92.39	3.90	0.13
Ineffective	45.50±24.90	53.70±25.28	-8.20	0.90
Unconditional Winner	22.70±7.75	16.20±6.05	6.50	3.29_c
Conditional Winner	0.50±0.85	0.50±0.71	0	0.00
Forced Failure	9.30±3.59	9.60±2.80	-0.30	0.21
Unforced Failure	21.20±10.27	25.30±8.23	-4.10	0.97

CONCLUSION: More male badminton single players studied preferred to serve low-short shots to facilitate an offensive strategy. The players returned a higher percentage of shots to the forecourt than the mid- and rear court in order to play an offensive game. The lob was the most preferable return played by the players, followed by the smash, net and clear. Among all the effectiveness categories, the "effective" shots took the predominant place. More "effective" shots were returned from the forecourt, while more "ineffective" shots were returned from the rear court with the left rear court containing the highest "ineffective" index. The smash was the most frequently used shot to kill and win a rally, net the second, hit the third. Among all the effectiveness categories of shots returned, only the "unconditional winner" showed a significant difference between the winner and loser, reflecting the fact that the pressure and attack game was the most important strategy for top level international players in producing a winning performance.

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