BADMINTON SINGLES PLAY

The Need For Specialized In-Game Mental Skills Applied To 'Tactical Discrimination' Between Serve And Receive Rallies

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Abstract

This three-year statistical analysis of badminton singles rallies highlights a need for structured mental skills programmes in a sport where such psychological training is rarely done. The analysis was performed by Roger Mills, a former world-class player, who, by 1993 had had twenty-two years coaching experience as a full time professional.

The purpose of this study was twofold:

A general aim was to confirm and objectify the author's previously subjective opinions, which were not in accord with commonly held views on the nature of singles tactics.

A specific goal was to demonstrate the advantages of a **'tactical discrimination'** between serve and receive rallies, and to initiate interest in this concept amongst sport psychologists.

Results confirmed that all seven hypotheses were significantly true, suggesting that a review of current coaching practice is overdue. In particular, a greater coaching emphasis should be placed on the reduction of unforced errors in the first six shots, especially on the receive of what is a defensive serve.

The use of variable imagery and ritualistic behaviour in such short rally-breaks (usually well under 10 seconds) to take advantage of tactical discrimination, without affecting the 'flow state' required for peak performance, may be too difficult a mental skills task. Psychologists should investigate further the implications, as research into this concept could be highly relevant to other athletic performances, not just in racquet sports.

Keywords: mental training, badminton, rally analysis, serve, receive, errors, winners.

1. Introduction

Sports games tactics may be defined as those procedures adopted to win a match. As an aid to coaching and research, tactics can usefully be sub-divided into four distinct areas:

1 *Logics*	the laws of the game and logical ways of taking advantage of them
2 *Anatomics*	the anatomy and or/ physiology of the performers
3 *Technics*	the technical skills of the performers.
4 *Psychics*	the mental skills of the performers.

This study concerns mainly Psychics, with Logics and Technics considerations. The paper poses the question whether players should try to **'tactically discriminate'** between serve and receive rallies. By varying their mental preparation during rally-breaks players could adapt their playing style (particularly at the beginning of each rally) depending upon whether they are serving or receiving.

2. ADVANTAGES OF 'TACTICAL DISCRIMINATION'

Although scoring in badminton is only on serve, as in racquet ball, volley ball, and squash (unless 'point-per-rally' scoring is used), the player who wins the most rallies in any one game wins that game. Under *Logics*, this *'most rallies won = winner'* situation gives no statistical justification for **'tactical discrimination'** between serve and receive rallies. However, under *Psychics* (and partly *Technics*) a strong case can be made that a tactical advantage may be gained by such discrimination, (as well as concentration being enhanced), even if only at the beginning of the rally, by applying one of the theories below. These theories relate to the fact that there is a **real difference** between serve and receive rallies, not in their relative importance, but in the nature of **each player's first shot.**

2.1 THE THEORY OF MAXIMISING SERVER-TENSION

The serving laws make the serve a relatively slow defensive shot, since it must be struck in an upward direction. Serving requires accuracy and consistency, along with subtle technique variations to create some receiver-uncertainty.

Although there may be many variations of direction, height and trajectory, serves are placed in three categories for the purposes of this analysis. These are 'low', 'high' and 'flat'. The 'low' serve will skim the net, landing just beyond the front service line. The 'high' serve is hit up towards the rear-court, gaining great height and falling vertically to land close to the baseline. The 'flat' serve will also be hit up towards the rear court, but will have a much flatter trajectory than the high serve.

The receiving laws merely insist that no foot movement be made prior to the serve. Receiving allows many deceptive options, including the fastest shots - a smash in return to a high serve and a net kill in reply to a low serve - using speed and power.

The key difference is that tension created at the beginning of each rally usually **adversely** affects accuracy, consistency and subtle techniques, whereas it normally **enhances** speed and power. A *Psychics* argument would suggest that receivers should try to **maximize server-tension** by adopting a more aggressive tactical approach, which might force inaccurate serves or even serving endshot errors. (This certainly applies to doubles and has been common practice for many decades at all playing levels).

It is harder to make a case for this theory in singles, where the increased length of the service court (20%) makes it much harder to force service errors. After hitting the receive shot the singles receiver has the whole court to cover, so attacking shots receiving serve from near the front or back of the court are much less viable than in doubles, where a partner can assist by covering other areas of the court.

2.2 THE THEORY OF MINIMIZING RECEIVER-ERROR (& MAXIMISING SERVER-ADVANTAGE)

The serve is a relatively 'closed' skill, delivered from a fully 'ready' position, in the server's chosen base. As in tennis, the serve is the one shot over which a player has complete control (Burke and Rotella, 1984). Unlike tennis, where the serve is the most complex technique to execute properly (Gallwey, 1974) and probably the most important shot (Groppel 1980), **badminton** serves involve a fairly simple technique to hit the shuttle into a large service court with a controlled underarm stroke. This is easy, compared to the technical demands of **receiving** the serve, since the receiver is moving and having to make decisions based on a number of factors.

The receiver has a wide choice of strokes to return the serve - the range of options increasing for players with better technique. Whilst the server can be **'pro-active',** deciding in advance what to do, the receiver has to be **'reactive'**, responding to a set of circumstances largely dictated by the type of serve (low, high or flat), the quality and direction of the serve, and the server's position and movement (if any) after the serve. Other factors, such as the score, the receiver's level of confidence, perhaps even the outcome of previous attempts at various replies to the serve, may also be considered. The number of factors involved can easily lead to indecision. The receiver has a limited amount of time to make a decision whilst moving to return the serve, though, paradoxically, the extra time and even greater range of options allowed by a **very** high serve can lead to **greater** indecision from the receiver, who will be executing a complex overhead forehand technique. It is the author's contention that **minimising receiver-error**, (with its emphasis on a more cautious tactical approach to the receive) and maximizing server advantage, (wherein servers will plan, during their first shot, to be more adventurous on **their** second shot) would seem to be **far more applicable to singles than maximising server-tension**.

Whilst Logics dictate that the serve is not an attacking shot, it should nonetheless be accompanied by an 'adventurous' mood' and followed up by an aggressive tactical approach to the third, and perhaps the fifth, shot of the rally. By contrast, in order to avoid giving the server easy points from unforced errors (particularly on the receive shot itself) the receiver should adopt a more cautious **'safety-play'** mood certainly on the second and probably on the fourth shot of the rally. Receivers will always have lost the preceding rally, which can cause a distracting sense of failure, making it more difficult for them than for servers to re-focus concentration during rallybreaks.

3. Study Rationales

1. To confirm the author's subjective observations of singles during the 1980's, which led to the formation of the hypotheses shown at section 4 below.

2. To demonstrate that these observations have not been made by other badminton coaches, as current coaching practice does not appear to have taken them into account. Badminton coaches are notoriously subjective in match-analysis, possibly due to a lack of motivation caused partly by doubts as to the specific relevance of quantitative study, and partly by the unrealistic complexity of currently

recommended notation systems. The value of such objective observation (with user-friendly notation systems) will be emphasized by the publishing of statistics on those key performance factors which appear to contribute significantly to match results. Coaches will be able to compare their pupils with the published data, using this knowledge to enhance their pupil's motivation by providing clear objectives.

3. There is little published badminton rally research, other than episodic studies of world ranked players, examining the physiological demands of the game. A database of detailed rally analysis will allow for future reviews of coaching and training methods, using comparative studies.

4. Purposes

(a) Carry out a statistical analysis to help gauge the possible benefits of coaching either, or both, the theories (2.1 & 2.2 above).

(b) Initiate interest and discussion amongst sport psychologists on the development of specialized mental skills training to facilitate the practical application of those theories.

(c) Confirm the following hypotheses:

1. More rallies end on errors than on winners.
2. A high percentage of rallies end on the serve or receive.
3. A higher percentage of end-shot errors occur on the receive than on the serve.
4. A higher percentage of rallies end within six shots.
5. A higher percentage of end-shot errors occur by the sixth shot
6. A high percentage of serves are high, only a small percentage are flat.
7. All the hypotheses will have greater significance for female players.

5. Methods, Procedures & Definitions

Evenly matched male and female games were analysed at county, national and international events from age 11 to senior. Analysis forms were manually

completed over a four-year period, almost solely by the author, and occasionally by other coaches being trained with the author in attendance.

Each rally end-shot was notated 'E' for error or 'W' for winner. An error was a shot that it was judged a player of that level could reasonably have been expected to return. A winner was a shot which the opponent could not reasonably be expected to return, even if they reached it. 6. Summary of Results

All the hypotheses were fully supported, as shown in the following tables:

1) More rallies end on errors than on winners.

	% Errors	%Winners	E:W Ratio
Male	64	36	1.78 **:** 1
Female	64	36	1.78 **:** 1
All	64	36	1.78 **:** 1

(2) A high percentage of rallies end on the serve or receive.

	1E	2E+2W	Serve/Receive End-shot total
Male			19.6
Female			22.6
All			21.1

(3) A higher percentage of end-shot errors occur on the receive than on the serve.

	%Receive errors	%Serve errors	Total%	*Receive**:**Serve error ratio
Male	10.1	3.9	14	2.58 **:** 1
Female	11.4	4.5	**15.9**	**2.53 : 1**
All	10.7	4.3	15	2.49 **:** 1

(4) A higher percentage of rallies end within six shots.

Male	Female	All
69.3	**70.7%**	69.8%

(5) A higher percentage of end-shot errors occur by the sixth shot

Male	52.2%
Female	**64.5%**
All	58.4%

(6) A high percentage of serves are high, only a small percentage are flat.

	%High	%Low	%Flat
Male	65.3	30.8	3.9
Female	**84.3**	13.8	1.9
All	74.6	22.7	2.7

(7) All hypotheses will have greater significance for female players.

With the exception of (1), data was 20% to 50% greater for female players, in confirming each hypothesis.

7 Discussion

These results pinpoint the need for a greater coaching significance to be placed on the reduction of end-shot errors during the first six shots of a singles rally, particularly on the receive of what is a defensive serve. Subjectively, the author postulates the cause of such errors to be a combination of the following: (a) difficulty of re-focusing tactically appropriate concentration during such short rally-breaks, in games involving constant serve/receive changes and short rallies; (b) ignorance of the potential advantage of using **'tactical discrimination'** between serve and receive rallies, especially at the beginning of the rally; (c) lack of sport psychological information about how coaching interventions and mental skills training can be used to improve (a) and (b) above.

Feedback from pupils has convinced the author he has substantially increased awareness of (1) the rationale for 'tactical discrimination' between serve and receive rallies and (2) the need for re-focusing of concentration in rally-breaks by the use of ritualistic behaviour. When his attempts to train pupils by combining (1) and (2) failed, he consulted several sport psychologists on an ad hoc basis. Their suggestions were tried but this experimentation was necessarily short term and fragmented, with inconclusive results and only subjective views. Pupils seem to resist experimenting with different types of imagery, possibly because (a) badminton has traditionally placed insufficient emphasis on regular, progressive mental skills training, or (b) coaches are unaware of its value, and they lack knowledge of its teaching. A longer-term programme by sport psychologists is required.

Despite the advent of relevant N.C.F. courses, the use of imagery in badminton is still in its infancy; in order to progress, coaches will need more **practical** help with its application.

8 Conclusion

The use of imagery and ritualistic behaviour during rally breaks in badminton singles, in order to take advantage of **'tactical discrimination'** between serve and receive rallies, might be a mental skills task too complex for the human mind to tackle without adversely affecting the 'flow state' required for peak performance*. Even more interesting would be the implications of trying to apply the principle in level and mixed doubles tactics. Research into this concept could be highly relevant to other athletic performance, not just in racquet sports. A joint project between the author and interested sports psychologists is recommended, in order to investigate further the implications.

**Very recently, the author has discovered empirical evidence to refute this. Having trained a sixteen year old female elite player in the specific goal-oriented mental skills required to use this concept, she has found it easy to achieve the mindset required for tactical discrimination, both in practice and in competition. Crucially, there has been a valuable spin-off in terms of a more focussed concentration. The player has given positive feedback regarding both the use of tactical discrimination and the subsequent enhanced concentration.*

9Review of relevant literature

Studies since the late 1960s have shown that various types of imagery enhance motor skills, but more recent studies point to the value of sport-specific measures of concentration and forms of psychological training. Van Schoyk and Groscha (1981) developed a T-TAIS for tennis, based on its parent instrument, the TAIS (Nideffer, 1976). Silva (1984) found that coaches ranked concentration as one of their highest concerns; Nideffer (1986) predicted that operationally defining concentration would be a vital service to coaches. Hill (1991) advises on simple self-designed cueing scripts for the 'controlled attention required to help create order in consciousness and reduce mental dissonance.' Kenitzer & Briddell (1991) remind us that 'imagery skills must be regularly maintained.'

Horsley (1989) recommends the 'controlling the controllables' approach and refers to Rotter's (1954) 'locus of control', which proposed that 'successful people are highly internally controlled' and that 'perceived personal control is a amenable to change.' Rotter's 'locus of control' refers to what people believe controls the factors in their lives.

Albrecht and Feltz (1987) showed from cricket examples that sport-specific measures of concentration characteristics were found to be more precise. Burke (1990) recommended tennis-specific mantras, and other meditational techniques. Palmer (1992) proved from ice-skating that there was a need to distinguish between various mental practices and to identify those elements that prove to be most beneficial within specific sports performances. Moritz (1996) describes the need for specificity in the use of imagery, referring to both Paivio's (1985) and Murphy's (1990, 1994) viewpoints that different types of imagery maybe associated with different outcomes.

Other recent research focuses on peak performance. Orlich (1990) calls it 'minimum conscious effort and attention'. Csikszentmihalyi (1990) defines '**FLOW**' as 'a state characterized by a feeling of total involvement, directed psychic energy and harmony,' and also as 'a state of concentration so focussed that it amounts to absolute absorption in an activity.' Moore & Stevenson (1991) speak of 'freeing athletes from fear of mistakes or outcome.' Reardon & Gordin (1992) state that 'athlete TRUST (to let go of conscious controlling tendencies)' is related to peak performance. They also write that 'the athlete is so immersed in the process of the moment (the 'now') that the feelings of control and certainty overshadow any concerns about, or attention to, outcome. Ironically, this freedom from worry about outcome optimises the likelihood of a favourable result.' Roberts and Jackson (1991) maintain that '**FLOW**' 'appears to be more frequently associated with a task-mastery orientation **during** the actual event.'

In the past two decades, the amount of applied research has increased considerably and the investigation of factors influencing sports skills has been of particular significance. The following examples show that sports psychology practitioners have discussed and developed practical applications:

Bandler and Grinder (1981) – 'unforced errors are not entirely within your control, but your feelings about them are.' Loehr (1982) 'concentration is about not trying hard. You cannot force it, rather you should encourage it and let it happen.' Connolly & Syer (1984) 'when performers get distracted they should maintain a passive attitude, note the distraction and then **gently** bring their attention back to the task.' Hill (1991) a performer's attentional system must be taught to discriminate between stimuli which enhance performance and those which are irrelevant. Lee (1991) 'concentrate, immediately before and during the match, on the things you can do and over which you have control' Wrisberg & Pein (1992) 'one reason athletes develop pre-performance routines (*for use in the match*) is to help them sustain control during competitive moments when there is a high level of situational stress'[1].

It is reasonable to suppose that such rituals might assist badminton players in sustaining control at key points in the game, when used in rally-breaks before serving or receiving. Wrisberg & Pein (1992) write that 'rhythmicity and timing are important to the performance of skilled activity.' There is evidence to suggest that rituals can enhance rhythmicity in static situations, such as basketball free throws, and this should apply equally to **serving** in badminton. Southard & Miracle (1993) say 'performers should maintain consistent rhythm; this appears to be easier to achieve if ritual behaviours include at least one, or a combination of, pre-performance rituals.' They also state 'maintaining a consistent rhythm appears to be more important than any one type of ritualistic behaviour.'

Terry (1993) 'the key phase in psychological skills training involves teaching **how to effectively implement psychological techniques during practice and match game-situations.**' Moran (1996) 'the planning and use of rituals, especially after mistakes, so as to help players interpret and react to what happens on court, is the ultimate key to their performance consistency.' Weinberg (1988) recommends the use of positive self-talk to initiate action, sustain effort and improve concentration. Railo (1986) – 'during the match, as during the battle, only the present matters.' Galway (1974) 'staying in the present is perhaps the most difficult but most important concentration skill to learn.'

Adler (1981) describes psychological momentum as 'the results of purposeful striving for accomplishment,' but that it was 'fragile and could be diffused by interruptions.' Perreault & Vallerand (1999) state that experiencing PM can facilitate performance of a task that requires a great deal of effort, whilst the loss of PM, for a short duration can also influence performance through negative facilitation. Miller and Weinberg (1991) say psychological momentum is an 'elusive concept, but there is a perception that it does exist following

results from a volleyball study,' (where, as in badminton, points are only scored on serve). If rituals, imagery and other concentration-enhancing techniques can facilitate the use of the psychological technique of **tactical discrimination** between serving and receiving rallies, it may well be that that technique could help the performer achieve the psychological momentum.

[1] Wrisberg & Pein refer to routines or 'rituals', as I have called them, developed in training, but used immediately before the player performs (hence 'pre-performance') a task,, perhaps at an critical moment in a match. For example, most tennis players bounce the ball before serving. Similarly, a player receiving might have a ritual (string straightening, perhaps) whilst preparing to receive. Tennis is an excellent source of information on such rituals, since the nature of the game means there are many key points (egs, game points, break points, set points).

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Appendix I, Full Statistical Results

TABLE I - ANALYSIS FORMAT

	Number of Matches Analysed			Number of Rallies Analysed		
Age Range	**Male**	**Female**	**All**	**Male**	**Female**	**All**
Senior	34	22	56	3,239	1,666	4,905
U-18	17	35	52	1,728	2,285	4,013
U-16	58	68	126	5,180	4,678	9,858
U-14	26	46	72	2,109	3,396	5,505
U-12	23	17	40	1,949	1,366	3,315
Grand Totals	158	188	346	14,205	13,391	27,596

TABLE II AND IIA - ENDSHOT ERROR:WINNER PERCENTAGES AND BREAKDOWN OF RALLIES ENDING BY SECOND SHOT

Male Age Range	**E**	**W**	**1E**	**2E**	**2W**	**Total within 2 shots**
Senior	63	37	3.2	7.9	3.6	14.7
U-18	64	36	4.2	10.4	6.4	21.0
U-16	65	35	3.1	9.7	5.4	18.2
U-14	62	38	4.0	11.0	6.2	21.2
U-12	64	36	5.1	11.5	6.1	22.7
All	63.6	36.4	3.32	10.1	5.54	19.56
Female Age Range	**E**	**W**	**1E**	**2E**	**2W**	**Total in 2**
Senior	65	35	3.2	10.1	4.7	18.0
U-18	64	36	4.2	10.9	7.1	22.2
U-16	65	35	4.7	12.6	7.0	24.3
U-14	65	35	5.6	13.1	7.5	26.2
U-12	63	37	4.8	10.5	6.9	22.2
All	64.4	35.6	4.5	11.44	6.64	22.58
Male and Female Age Range	**E**	**W**	**1E**	**2E**	**2W**	**Total in 2**
Senior	64	36	3.2	9.0	4.2	16.4
U-18	64	36	4.2	10.7	6.8	21.6
U-16	65	35	3.9	11.2	6.2	21.3
U-14	64	37	4.8	12.1	6.9	23.7
U-12	64	37	5.0	11.0	6.5	22.5
All	64.2	36.2	4.22	10.8	6.12	21.1

TABLE III - PERCENTAGE OF RALLIES BY SERVE TYPES

	Male Percentages			Female Percentages			All Percentages		
Age Range	High	Low	Flat	High	Low	Flat	High	Low	Flat
Senior	38.5	57.5	4.0	72.0	26.0	2.0	50.0	47.0	3.0
U-18	54.0	38.5	7.5	83.0	14.0	3.0	71.0	24.5	4.5
U-16	69.5	27.0	3.5	83.0	14.0	3.0	76.0	21.0	3.0
U-14	73.5	23.5	3.0	91.5	7.0	1.5	84.5	13.5	2.0
U-12	91.0	7.5	1.5	92.0	7.9	0.1	91.5	7.5	1.0
All	63.3	30.8	3.4	84.3	13.8	1.9	74.6	22.7	2.7

TABLE IV PERCENTAGE OF RALLIES ENDING WITHIN SIX SHOTS

Age Range	Male Percentages	Female Percentages	All Percentages
Senior	55.00	65.50	60.25
U-18	66.50	67.50	67.00
U-16	79.00	76.00	77.50
U-14	71.00	73.00	72.00
U-12	75.00	72.50	73.75
All	69.3	70.7	69.8

TABLE V PERCENTAGE OF RALLIES ENDING WITH AN ERROR BY THE SIXTH SHOT

Age Range	Male Percentages	Female Percentages	All Percentages
Senior	32.25	40.50	36.38
U-18	36.25	41.50	38.88
U-16	38.50	43.75	41.13
U-14	40.75	44.25	42.50
U-12	44.50	41.50	43.00
All	38.45	42.03	40.24

What is this ?

		1E			2E			2W	
Age Range	High	Low	Flat	High	Low	Flat	High	Low	Flat
Senior	38.5%	57.5%	4.0%	38.5%	57.5%	4.0%	38.5%	57.5%	4.0%
	62	34	4	44	48	8	46	41	13
U-18	54.0%	38.5%	7.5%	54.0%	38.5%	7.5%	54.0%	38.5%	7.5%
	71	19	10	62	27	11	75	15	10
U-16	69.5%	27.0%	3.5%	69.5%	27.0%	3.5%	69.5%	27.0%	3.5%
	76	22	2	67	27	6	78	15	7
U-14	73.5%	23.5%	3.0%	73.5%	23.5%	3.0%	73.5%	23.5%	3.0%
	71	27	2	74	23	3	89	10	1
U-12	91.0%	7.5%	1.5%	91.0%	7.5%	1.5%	91.0%	7.5%	1.5%
	89	11	0	91	7	2	90	5	5

Age Range	High	Low	Flat	High	Low	Flat	High	Low	Flat
Senior	72.0%	26.0%	2.0%	72.0%	26.0%	2.0%	72.0%	26.0%	2.0%
	72	23	5	78	18	4	78	14	8
U-18	83.0%	14.0%	3.0%	83.0%	14.0%	3.0%	83.0%	14.0%	3.0%
	78	17	5	86	11	3	90	6	4
U-16	83.0%	14.0%	3.0%	83.0%	14.0%	3.0%	83.0%	14.0%	3.0%
	85	10	5	84	14	2	90	8	2
U-14	91.5%	7.0%	1.5%	91.5%	7.0%	1.5%	91.5%	7.0%	1.5%
	87	9	4	91	6	3	89	8	3
U-12	92.0%	7.9%	0.1%	92.0%	7.9%	0.1%	92.0%	7.9%	0.1%
	90	7	3	89	10	1	94	6	0

Age Range	High	Low	Flat	High	Low	Flat	High	Low	Flat
Senior	50.0%	47.0%	3.0%	50.0%	47.0%	3.0%	50.0%	47.0%	3.0%
	65	31	4	58	36	6	59	30	11
U-18	71.0%	24.5%	4.5%	71.0%	24.5%	4.5%	71.0%	24.5%	4.5%
	75	18	7	76	18	6	84	10	6
U-16	76.0%	21.0%	3.0%	76.0%	21.0%	3.0%	76.0%	21.0%	3.0%
	90	8	2	81	15	4	76	20	4
U-14	84.5%	13.5%	2.0%	84.5%	13.5%	2.0%	84.5%	13.5%	2.0%
	82	14	4	85	12	3	89	9	2
U-12	91.5%	7.5%	1.0%	91.5%	7.5%	1.0%	91.5%	7.5%	1.0%
	89	10	1	90	8	2	91	6	3

Appendix II,

Introductory Paper (for coaches)

BRIEF BACKGROUND AND EXPLANATION TO THE SINGLES STUDY PAPER

A review of the English Coaches' Bulletin Nos. 49, 51 and 52 (1985/86) will reveal a debate between myself and the BA of E Director of Coaching concerning the nature of singles play. My contention was that singles should be taught to young players on the basis of an 'error reduction' concept. I had based this contention on considerable (subjective) observation of junior events over seven or eight years since becoming a freelance coach of mainly junior players. As there were no comprehensive statistics available on singles rallies, I decided to start objectively recording how rallies began and ended. Although I had a good idea of what to expect, I was nevertheless shocked by the high **end-shot error** rate of junior players, particularly U-14 and U-16 girls, during the first few shots, and by the high percentage of rallies **ending within only two shots** including the serve.

In 1990 I devised a 'user-friendly' two stage (simple and complex) notation system and during the next four years I used my complex stage, along with a few colleagues using the simple stage, to analyze nearly 27,600 rallies from 346 evenly matched singles at county, national and international level from age eleven to senior. Separately attached are tables of the relevant results comparing at least some of the figures in all these age ranges - they are very enlightening - but to start with I wanted to show perhaps the most interesting age range, i.e., the U-16s. I will be giving more details and discussing implications in later papers, but meanwhile I hope that sufficient interest, comment and evaluation will be stimulated by this introduction and the Singles Study Paper itself (attached). Although written with coaches in mind, this paper was essentially for sports scientists and therefore constructed in an academic style and constrained by the Conference Paper layout requirements. I am therefore giving below additional explanation of **three** of the subject matters covered in the paper delivered at the first World Congress on Science and Racquet Sports in July, 1993.

1 FOUR CATEGORIES OF TACTICS, USING SPECIFIC DEFINITIONS

As there did not appear to be such categories in any relevant literature, it seemed appropriate to re-define and re-name them. These sub-divisions may be more clearly understood by the following explanations/examples:

1. **Logics** are tactics which are based on the Laws of the game and are linked with fundamentally logical ways of using the Laws to advantage:

e.g., hitting 'Away from opponent' to use the relatively large court dimensions; using 'Depth rather than width' because of the shape of the singles court area; taking risks during serving rallies to 'Gamble on own serve' when opponent cannot score (Mills, 1985).

2. **Anatomics** are tactics which are based on the anatomy or physiology of the player: e.g., a larger, slower opponent will be made to twist and turn quickly, whereas a smaller, nimbler one will be made to reach up and out wide; an aerobically fitter player will wish to prolong rallies whereas an alactic-anaerobically fitter opponent would want to increase the pace of the game.

3. **Technics** are tactics which are based on individual aspects of technique: e.g., serving low to protect a defence weakness or stop opponent using a favoured heavy smash; concentrating play on opponent's deep backhand corner because of predictable backhand replies or a faulty round-the-head hitting recovery footwork.

4. **Psychics** are tactics which are based on the psychological skills: e.g., trying to demoralise an opponent by playing to that opponent's strength so as to 'blunt' or counter-attack it; using pre-trained mental skills to refocus attention quickly following breaks in play, especially during normal rally-breaks.

2 USE OF VARIABLE IMAGERY AND RITUALISTIC BEHAVIOUR FOR 'TACTICAL DISCRIMINATION'

It is my contention that singles players should be aware of the benefits of 'tactically discriminating' between serve and receive rallies, especially at the very beginning of each rally. To recap, since points can only be gained on serve, then generally, a more adventurous tactical approach is appropriate when in a serving rally, whilst a more cautious tactical approach is appropriate when in a receiving rally. Both apply especially at the beginning of the rally. During the brief rally breaks 'rituals' (i.e., practised mental procedures) before serving or receiving will help considerably with this tactical discrimination.

Mental imagery (visualisation) can be used during the brief rally-breaks to gain emotional control and refocus concentration. Various types of ritualistic behaviour can 'trigger off' the required 'mental set' (e.g., looking at the racquet strings or the shuttle, touching one's shorts, pulling up one's socks, etc.) My suggestion is that players should use **variable** rituals and imagery, depending upon whether they are serving or receiving. Not only will this create a 'tactically-appropriate' mood before the beginning of the rally, but it will help to avoid loss of concentration, especially from the internal distractions which may occur, particularly after a lost rally which has been caused by a player's own unforced mistake. (External distractions are those

not caused by internal emotional reactions to a situation, e.g., crowd noise, delays due to shuttle changes, disagreements about line calls or the score, etc.)

I intend to relate all my efforts to coach this combination of improved concentration and tactical discrimination so that coaches can avoid all the pitfalls I encountered. Meanwhile I am delighted to report that my most recent psychological skills training advice from Peter Terry, Psychological Adviser to the LTA, has spurred me to yet another re-think. I now feel that I have finally found a system, using task-oriented imagery (just before the end of the rally-break) as part of the rally break ritual, that is likely to be successful with **all** players - but this must necessarily be the subject of a separate paper.

3 ERROR:WINNER RATIOS AND DEFINITIONS

My analysis of errors and winners was of **end-shots** only. An error (E) was judged when a player **of that level** should have been able to return the shuttle back into play. A winner (W) was judged for the opposite to this, that is, a shot that was impossible to reach or return back into play. Such judgements are necessarily subjective, but I felt justified, being a very competent judge and having studied the game for over 40 years. As I did almost all the analysis myself, and the rest was done by trainees in my presence, I believe such judgements were both fair and standardised.

The percentage ratio of end-shot error:winners (E:W) was 64:36 (1.78**:**1) and, as will be seen from Appendix I, this ratio applied across the board whatever the age range.

This implies - astoundingly, in my opinion - that there appears to be a consistent mathematical '*shape*' to badminton singles statistics regarding end-shot errors and winners.

It is debatable as to how this ratio would alter if it had been judged as to how many opportunities for winners resulted from opponents' poor shots (call them 'mistakes') and that such mistakes were added to the number of **end-shot errors** to make a grand total of all 'mistakes+errors'. I have recently started analysing that specific ratio. A further and more detailed analysis during 1995/96 showed the 'mistakes + errors'**:**winners ratio was roughly 4.5**:**1.)

CONCLUSION

I have a very large database containing much more information about these singles rallies which is as yet unanalysed. Nevertheless, the results so far obtained manually have proved to be even more important than expected,

with far-ranging coaching implications, which have already caused changes in my approach to the tactical and mental skills coaching of singles.

SUMMARY

My four year study (now extended to six) highlights the need for coaches to consider ways of **reducing end-shot errors** in their singles players **as a priority**, especially during the first six shots, but most particularly during the first two shots, and especially **on the receive of serve**. I will document successful techniques after a more in-depth practical experimentation period of my mental skills training methods.

Appendix III, Analysis Notation Codes

KEY TO STAGE ONE (SIMPLE) NOTATION:

Examples of Stage One (Simple)

Columns	1	2	3	4	(5)	(6)
Example 1	A	F	8	W		
Example 2	B	H	13	E	R	X

Description of Example 1 above

Player A served a flick serve. The rally lasted 8 strokes including serve and end-stroke. The rally ended with a winner by receiver. (We know this because the winner was on the eighth stroke – all even number strokes are the receiver's).

Description of Example 2 above

Player B served high. The rally lasted 13 strokes including serve and end-stroke. The rally ended with a forced error played crosscourt by server.

The examples above have been split into columns to show what each separate item is for. The actual analysis sheet does not have these columns, and, indeed, analysis can be recorded on a blank sheet of paper. In which case example 1 would look like this: *AF8W*

COLUMN	**DESCRIPTION**	**CONTENT**
Column 1	Player Serving	A or B
Column 2	Type of Serve	**H** = High **L** = Low **F** = Flick or flat trajectory
Column 3	Number of strokes	

	(including serve and endshot)	
Column 4	How rally ended	W = winner or 'impossible to return' E = any other error, including line judgement or lack of effort
Column 5	**F**orced endshot errors	F = error 'forced' trying to return opponent's 'good shot'. Otherwise leave blank.
Column 6	Direction of end-shot (Even if shuttle does not travel far, or at all)	Leave blank unless the shot is played (or attempted to be played) crosscourt, in which case **X**

KEY TO STAGE TWO (COMPLEX) NOTATION:

TYPE OF WINNER ENDSHOT

Enter one of the following:

C	overhead clear
S	smash/drive/fast drop
D	overhead slow drop
B	blocked reply to smash/drive/fast drop
N	net-flick/lob
ND	net-drop
NK	net-kill
U	underarm defensive flick/lift/drive (other than from the net area)
O	other (e.g., mis-hit)
Add NC	for a net-cord whenever it applies

TYPE OF ERROR ENDSHOT

Enter one of the following:

CS	overhead clear out the side
CB	overhead clear out the back
SS	smash/drive/fast drop out the side
SB	smash/drive/fast drop out the back
SN	smash/drive/fast drop into the net
DS	overhead slow drop out the side
DN	overhead slow drop into the net
BS	blocked reply out the side
BN	blocked reply into the net
NS	net-flick/lob out the side
NB	net-flick/lob out the back
NN	net-flick/lob into the net
NDS	net-drop out the side
NDN	net-drop into the net
NKS	net-kill out the side
NKB	net-kill out the back
NKN	net-kill into the net
JS	line judgement at the side
JB	line judgement at the back
US	underarm defensive flick/drive out the side (other than from net area)
UB	underarm defensive flick/drive out the back (other than from net area)
UN	underarm defensive flick/drive into the net (other than from net area)
O	other (e.g., mis-hit or complete air shot, too tired/lazy attempting to reply, injury)

Add one of the following if error endshot was serving or receiving:

N	into the net
M	out the middle
F	short at the front

JF	Line judgement at front (service line)
JM	Line judgement middle
L	laws fault *

LAWS FAULTS

Laws faults apply in situations where a fault is called and the rally ends only **because of the call**, for example, 'fault receiver'. Technically, it is a 'fault' if the server hits the serve out or in the net, but this would **not be recorded as 'L'**. For example, a high serve where '**fault'** is called would be AL1E**L**. Similarly, a fault receiver when A served low would be AH2EL, also an error.

EXAMPLES OF STAGE TWO (COMPLEX) (added to stage 1)

Example	Notation	Description
Example	WXSNC	Winner crosscourt smash, net-cord
Example	EFNDN	Error, 'forced' net-drop into net

Optional Notation

It is useful to record when serves or endshots are backhand or round the head. If an analyst uses this optional notation, it may be assumed that anything unmarked is a straights shot. A line above indicates backhand, a line below, round the head.

A backhand low serve would be marked thus: $\overline{\text{L}}$

A backhand cross-court drop in the net (for example) would be $\overline{\text{xdn}}$

A round the head smash in the net would be <u>xsn</u>

The notation is concerned where the shot was played **from**, so any overhead hit by a right hander from the left court counts as round the head.

Tip for notation: Some games, especially junior matches, have very short rally breaks. After completing one rally notation, place a vertical bar | in the next space. This can be quickly made into H L or F, without taking your pen off the paper, allowing you to start counting!