ANALYSIS OF PATTERNS OF PLAY IN ASSOCIATION FOOTBALL

Araz Hussain Ali

A Thesis Submitted for the Degree of PhD
at the
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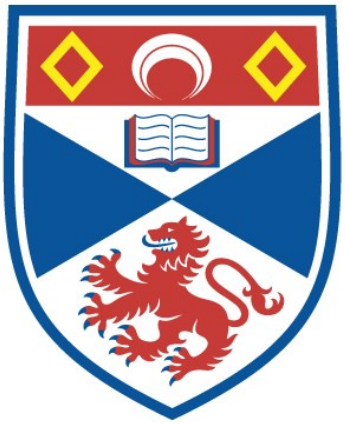

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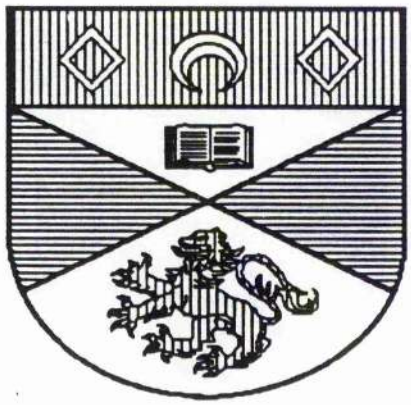

SUBMITTED IN FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN THE DEPARTMENT OF PHYSICAL EDUCATION

BY

ARAZ HUSSAIN ALI

OCTOBER 1989

ABSTRACT

The main problem in analysing soccer is the existence of a large number of interacting variables. Far fewer difficulties exist for cricket, baseball, racket ball games or even American football, where the actions may be broken down into a series of discrete events which are relatively easy to record and assess. Despite the considerable interest which soccer matches provoke, and the many varied post-game discussions on its strategy which often result, little research has actually been conducted into the strategical aspect of play. This study is an attempt to examine patterns of play at professional level and more specifically, to investigate whether successful attacking patterns can be identified which are commonly used by all teams.

The study concentrates on the analysis of patterns of play in soccer, by examining the suitability and accuracy of the two methods of obtaining objective data on patterns of play: the live match analysis technique and the video recording technique with subsequent analysis. The results show that both techniques produce the same results; however, the former is more convenient. Data for five league teams playing home and away matches and for an international team playing five home matches during the season 1987–1988 have been obtained and analysed.

Analysis of patterns of play for the five league teams shows that there were similarities and dissimilarities between the top and the poorer teams. The distinct patterns of play identified for each team in both home and away matches were few in number. Top teams had the same number of successful patterns of play in home and away matches. The poorer teams also had the same number of successful patterns in home and away matches but they were fewer in number. Top teams

applied the same strategies when they played at home or away whilst the poorer teams applied different strategies when playing at home or away.

These findings led to another investigation which compared the patterns of play of the league teams with those of an international team. The international team and the poorer league teams had the same number of successful patterns of play in home matches but they were fewer in number than those of the top league teams. Successful patterns of play appeared more often for the international and league teams in those matches they won.

The number of free attacking moves and set pieces in a match did not give any indication of success for the international and league teams. A team wins when it has a greater number of shots on target and a greater proportion of attacks producing shots regardless of whether the team is playing at league or international level.

The final part of the study examines the defensive strategies employed against the successful attacking patterns of play of the five league teams. The results indicate that both the top teams and the poorer teams had distinct successful defensive strategies which were similar in home and away matches but the defensive strategies of the poorer teams were, of course, less successful than those of the top teams.

These findings clearly indicate that there are similarities in employing defensive strategies in home and away matches for all teams, but the defensive strategies of the top and the poorer teams were markedly dissimilar. It is clear that close marking is a crucial element of the best defensive strategies (i.e. teams who marked their opponent players most frequently, succeeded in nullifying successful attacking patterns of play).

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DEDICATION

I would like to dedicate this thesis to my parents, brothers and sisters and also thank them for their unlimited support and for their devotion and compassion.

Most importantly, my praise and gratitude goes to **Allah** the most gracious, the most merciful, who gave us all the potential to be creative and the ability to perform.

DECLARATION

I, Araz Hussain Ali, hereby certify that this thesis has been written by me, that it is a record of work carried out by me and that it has not been submitted in any previous application for a higher degree.

Date 28.9.89 **Signature of candidate**.....

I was admitted as a research student under Ordinance No. 12 in January, 1986 and as a candidate for the degree of Ph.D. on the same date; the higher study for which this is a record was carried out in the University of St Andrews between 1986 and 1989.

Date 28.9.89 **Signature of candidate**.....

I hereby certify that the candidate has fulfilled the conditions of the Resolution and Regulations appropriate to the degree of Ph.D. of the University of St Andrews and that he is qualified to submit this thesis application for that degree.

Date 28th September 1989. **Signature of supervisor**.....

ACKNOWLEDGEMENTS

The extent and depth of the scholarship dedicated to the world's greatest sport has a humbling effect on any student who even presumes to attempt any analysis of association football. Faced with this endeavour, I had the good fortune to be ably guided and supervised by **Dr. Martin Farrally** who also provided invaluable advice throughout the duration of my Ph.D. course. I wish to thank him and the other members of staff in the department of Physical Education for enhancing my understanding and enjoyment of association football studies and making this a most stimulating course.

Several people have had a sustaining influence on me while I have been studying at the University of St. Andrews. Their encouragement and inspiration was of considerable assistance. In particular I would like to thank **Mr. Archie Strachan, Mr. Craig Brown, Mr. John Devereux, Mr. John Newton, Dr. Alan Gordon, Dr. Andrew Head, Dr. John Ball and Dr. Michael Lusty**. To them I owe a debt of gratitude which can not be adequately discharged here.

Finally, a particular word of thanks to the players, coaches and managers of those teams who have helped in the completion of this research. For obvious reasons they must remain anonymous.

GLOSSARY OF TERMS AND ABBREVIATIONS

±	– Plus or minus
>	– Greater than
<	– Less than
Cm.	– Centimetre
Kg.	– Kilogramme
Km.	– Kilometre
mm	– Millimetre
m.	– Metre
$\bar{X}$	– Arithmetic mean of a sample
P	– Significance level
N.S.	– Not significant
SPSS–X	– Statistical package for social scientists version 10.
NAG	– Numerical Algorithms Group
F02WCF	– Computing library routine
VDU	– Visual display unit
T4662	– Command to plot a graph
T4010	– Command to display a graph on a VDU
FORTRAN	– Computer language program
P1	– Computer program one
P2	– Computer program two
%	– Percentage

No.	**– Number**
Vol.	**– Volume**
Soccer	**– Association football**
Final action	**– End results (goal, throw-in, penalty, free-kick, corner-kick, etc.)**
Attack	**– An offensive action**
Defence	**– To attempt to prevent an opponent from scoring**
Set plays or Set pieces	**– Corner-kick, throw-in, free-kick and penalty**
Free attack	**– Attack excluding set plays**
Pattern	**– Represent a group of similar attacks**
Cluster	**– Represent a group of similar patterns**
Attacker	**– A player assigned to an offensive position**
Defender	**– A player assigned to a defensive position**
Midfielder	**– A player assigned to a midfield position**

*** Note: The terminology of modern lineup in soccer is not so settled as that of the traditional line up, but the commonest names for the positions are as shown above.**

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CHAPTER ONE

INTRODUCTION AND REVIEW OF THE LITERATURE

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1.1 INTRODUCTION :

Significance of sport in present day society is widely recognised. It is an integral part of our culture, the value of which should be studied in a wider-ranged programme of research, and should gain a greater support from different organisations to fulfil its full potential. **Pierce et al. (1982)** emphasised the importance of sport to society by stating that:

> **Sports can help understand how a society defines itself and regulates violence. Games may be an essential human-specific need which provide entertainment, retain survival skills, ameliorate existential anxiety and promote religious and/or secular socialization.**

The authors further elaborated on the willingness and the insistence of humans to deploy enormous resources of material and time to maintain competitions among themselves, as well as with other species. Soccer can perhaps be accurately described as the most popular international sport. It has been played in more countries of the world than any other game **(Di Clemente 1955)** and it has more member countries affiliated to its world governing body, 'Federation International de Football Association' **(FIFA)** than those registered with the United Nations. The game is not simply an immensely popular competitive sport, but it also constitutes a major spectator's attraction. It is estimated that 600 million to 1

billion people followed the 1970 World Cup in Mexico on television and radio. These facts are striking evidence of the tremendous popularity of the game, both as a participation sport and as entertainment. Nearly twenty billion spectators viewed the 1978 World Cup for the whole tournament **(Miller 1978)** (it should be noted that this figure includes multiple viewing by the spectators for the entire tournament), and more than 2 billion fans watched the final game (about half the population of the world sharing one event), **(Lever 1983)**. The 1982 soccer World Cup was the first to be broadcast by network television in the United States, an indication of the sport's growing popularity and participation on that continent. For the first time in the history of sport, there were over two million spectators attending one tournament at the 1986 World Cup championship in Mexico and also billions of fans following the tournament on radio and television **(Soar And Bone 1986)**.

Soccer is enjoying growing popularity both with players and spectators throughout the world. It is one of the pre–eminent sports on a world–wide basis and merits more than passing attention. It is the object of careful study and scientific research, an exciting spectacle and a commercial activity. As in most professional sports today, the political, sociological and economic aspects of the game have assumed an importance which reaches far beyond the mere practice of the sport and the performance of the players. The game

has been transformed because of the various technical and physical improvements which have been made to it and continues to be the subject of scientific research. This justifies a deep analysis of the tactical aspects of the game, to discover how important they are to the outcome of a match.

Soccer is shrouded in much myth, legend and superstition which seems to have come from its earliest beginnings and the game generally remains reluctant to accept that science can make a most valuable contribution to its improvement and progress. Seemingly, little has been done on a large scale to incorporate previous scientific findings into the training, coaching and preparation of teams.

However, there should be much attention directed towards the improvement of the most important elements in all games in general and in soccer in particular. Today's technology provides important opportunities for the teaching and analysis of the sport, and the promotion of interest in the sport. An analysis of the techniques and tactics of the world's best soccer teams may reveal successful patterns of play and players' movement, but one can not tell how much the analysis of players' performance, both positive and negative, can contribute to the advancement of certain aspects of the game. However, one strongly believes that an analysis with objective methods can make a significant contribution to the game.

Winterbottom (1959) emphasises the way soccer managers and coaches could optimise their teams' performances. He states that:

> **The manager and coach of a team must avoid these superficial observations. In any case, their task is not merely to pass judgment, but to discover ways and means of making improvement. They must analyse the team's performance carefully, retaining and developing what is good, improving what is bad.**

In the past soccer and science do not seem to have had much in common. Soccer has to do with intuition, emotion and superstition, while science is concerned with facts and verifiable observations. Because soccer is a sport with a profile of complex requirements, such as motor and mental skills, it is difficult to recognise and rank the influence of the interrelated components. In fact there are many ways science and soccer may be linked. For example, sports scientists can play an important role in the preparation of individuals and teams and in improving their performance. This can be done by analysing various aspects of the game and providing valuable feed back to the players, coaches and managers to help them to optimise team success and minimise failures. Recently it has been noticed that there is increasing awareness and confidence among football coaches and managers that information from scientific endeavours can contribute both to the understanding and

solution of problems that confront them.

1.2 REVIEW OF THE LITERATURE :

Coaches, athletes and exercise scientists each have a special interests in examining or describing those characteristics which contribute to successful performances in sport. Numerous investigators have studied athletes in a variety of sports. The effects of heredity and environment have been examined, as have individual differences in function, physique and psychological parameters.

Athletes within a sport are generally fairly similar anatomically. Their muscular-skeletal and cardiovascular respiratory system are similar. Physical differences such as size and strength which individualise the athletes, are manipulated through physical practices and by selection for the demands of a particular sport, and allowance is made for sex differences where it is an influencing factor.

In general, a great deal of research effort has been spent in describing the characteristics of competitors in various sports **(Chervenjakov 1988; Di Prampero et al. 1970; Reilly 1979; Yaffe 1973 and 1975; Yaffe et al. 1974; Lover 1978; Thomas and Reilly 1975; Veit 1973; Graf 1975; Holt 1986;**

Cattell et al. 1970; Blaser and Schilling 1975; Douglas 1973; Volkamer 1971; Essing 1970; Luschen 1969; Huska 1974; Rosen 1958; Anderson et al. 1969; Davies 1973; Ikia and Steinhaus 1961; Loy 1969; Ogilvie 1968; Cooper & Payne 1972; Saltin & Åstrand 1967; Tanner 1964; Price 1967; Caru et al. 1970; De 1979; Thomas 1970; Gettman et al. 1976; Reilly and Thomas 1977a & 1977b; Rhodes et al. 1986; Reilly 1975; Ekstrand and Gillquist 1982; Di Giovanna 1943; Franks 1983; Agnevik 1970a & 1970b; Öberg et al. 1984; White et al. 1988; Reilly and Thomas 1976a; Ramadan 1984; Lukyanova and Novocelova 1964; Seliger 1968). These investigations have tended to concentrate on elite athletes in order to identify critical requirements for success and have described such characteristics in physical, physiological, sociological and psychological terms. This task increases in complexity when team games rather than individual sports are considered. Greater variability between individuals may perhaps be observed, this particularly will apply in a field game such as soccer.

A limited amount of research has been carried out on soccer. The literature reviewed for the present study is divided into two categories:

Literature concerned with movement analysis and total distance covered in soccer :

Little research has been focused on the movement analysis of soccer players. There are several references in coaching and conditioning books relating to the distances covered by various types of locomotion in matches, but the literature contains few studies where the reliability and/or validity of the measuring instrument was established prior to data collection.

Researchers who did not disclose their methodology :

Several researchers have indicated the distance covered during a game of soccer, without giving any indication of how they obtained this data. These are reported in this section:

In **1967, Wade** reported that the distance covered by professional soccer players during each game ranged between 1,600–5,486 metres. The total distance covered by walking or jogging, and running at speed ranged between 1,372–3,657 metres and 229–1,829 metres respectively. No indication was given as to how these figures were derived. **Wade's** report, contained in coaching books, was designed to supply students of the game with

information on the running requirement of soccer.

Saltin (1973) used film analyses of Swedish professionals for 3 minutes per half to extrapolate to obtain the running requirements of a full game. He accordingly reported an average total distance of 12,000 metres per game for 5 players who had normal pre–game glycogen concentrations (96 mm) in their vastus lateralis muscles. He stated that 27% and 24% of the total distance comprised walking and moving at maximum speed, respectively. Saltin's data dramatically highlighted the influence of the pregame glycogen concentrations. Players with low pregame glycogen concentrations (45 mm) in their vastus lateralis muscles not only covered a smaller total distance (9,700 metres), but ran only 15% of this distance at maximal speed. Furthermore, they covered 1,500 metres less in the second half compared with 200 metres less for the normal group.

Whitehead et al. (1968) completed an analysis of two full–backs and two midfield players, from the English First and Second Divisions. He used pencil and paper in making his analysis of performance for 10 minutes per half. **Whitehead et al.** did not give details of the methods used, but from the results he extrapolated the running requirements of the entire game. The overall average distance covered per game was 11,692 metres. **Whitehead's** finding is almost identical to the 11,752 metres per game reported by **Withers et al. (1982)** but is much greater than the figure of 8,680

metres reported by **Reilly and Thomas (1976b)** for a similar competitive level in the same country. However, the limitations of extrapolating data from 20 minutes and then applying them to the entire game must be noted.

Agnevik (1970a) carried out a study on the average distance covered by the players of the Swedish first division teams. The author indicated that the average distance for the team was 12 kilometres. He also reported that recreational players covered an average of 4 kilometres per 40 minutes, which is about the same distance per unit of time covered by the national league players. However, there was no indication of how these figures were derived.

Vinnai (1973) cited Russian reports of football players covering up to 17 kilometres during a match, though no reference was made to the methodology he used to determine this. Since no details are available and **Vinnai's** figure is considerably greater than that quoted by others, it is not considered to be very reliable.

Zelenka et al. (1967) referred to **Seliger's** observations that a centre–forward covers 11.5 kilometres during a match. In their review of other studies in training and in matches in Czechoslovakia they concluded that football players run more than 6 kilometres in a match. It was not disclosed as to how this distance was estimated.

Nettleton and Briggs (1980) studied the frequency and distance of sprints in an analysis of the 1973 European Cup Final between Ajax and Juventus, and found that the players ran a total of 530 metres in full sprints of 10 to 25 metres. They did not disclose how they obtained such data.

It should be noted that **Whitehead et al. and Saltin** have stated that the total distance covered per match was obtained by extrapolating from a range of 2–10 minutes for each half of a game. Although some of those researchers mentioned the total distance covered by walking or jogging, and running at speed for each player, they did not refer to the different players in specific positions on the field. It is therefore impossible to make precise statements about the movement characteristics and the fundamental differences between the different positions of the soccer players. **Table 1.1** summarises this section.

Researchers who disclosed their methodology :

The researchers discussed below have given more detailed reports of their work and have explained the methods used to obtain data.

Winterbottom (1959) was one of first managers to collect information for match analysis. In 1959 he published data obtained

Table 1.1

Summary of the mean total distance covered per game of soccer as recorded by a number of researchers where data collection procedures were not given.

Researchers	Mean total distance covered per game
Wade (1967)	$\bar{X}$ = 1,600 - 5,486 metres
Saltin (1973)	$\bar{X}$ = 12,000 metres
Whitehead et al. (1968)	$\bar{X}$ = 11,692 metres
Agnevik (1970a)	$\bar{X}$ = 12,000 metres
Vinnai (1973)	$\bar{X}$ = 17,000 metres
Zelenka et al. (1967)	$\bar{X}$ = 11,500 metres

by tracking professional soccer players for an entire game on a scaled plan of the pitch, to assess the distance covered by the team. The overall average distance covered by each outfield player in the team was 3,361 metres, which consisted of 2,347 metres of walking and jogging and 1,014 metres of running at speed.

Doubt must be raised over **Winterbottom's** methods, since there were obvious weak points. Firstly, it can be seen that some of the maps were so covered with lines that it was almost impossible to interpret them. Secondly, it was difficult for the recorder to quickly determine the type of movement being made, subjectively estimate the distance covered and transfer this information on to the scaled plan of the pitch. For these reasons, such an analysis is considered to be inaccurate. It can also be seen that the values given by **Winterbottom** (**Table 1.2**) were considerably smaller than those obtained by later researchers.

Reilly and Thomas (1976b) analysed the study of the work rate for the different positions in an English League First Division team. The authors devised and validated a motion analysis method of quantifying work rate during soccer competitions. The technique required monitoring the extent and intensity of the discrete movements of individual players. A coded commentary on the behaviour of one player per game was performed on fifty one occasions using a tape recorder and stopwatch. Movement was

Table 1.2

Distance covered in various positional roles. According to types of activities and types of game per match. (Winterbottom 1959)

Players Positions	Walking and jogging (Yards)	Running at speed (Yards)	Total (Yards)
The centre half	2,600	520	3,120
A wing half	2,500	1,480	3,980
Inside forward A	4,000	2,060	6,060
Inside forward B	1,680	1,070	2,750
Wing man A	3,780	1,420	5,200
Wing man B	1,440	270	1,170
Centre forward A	2,050	760	2,810
Centre forward B	2,480	1,300	3,780

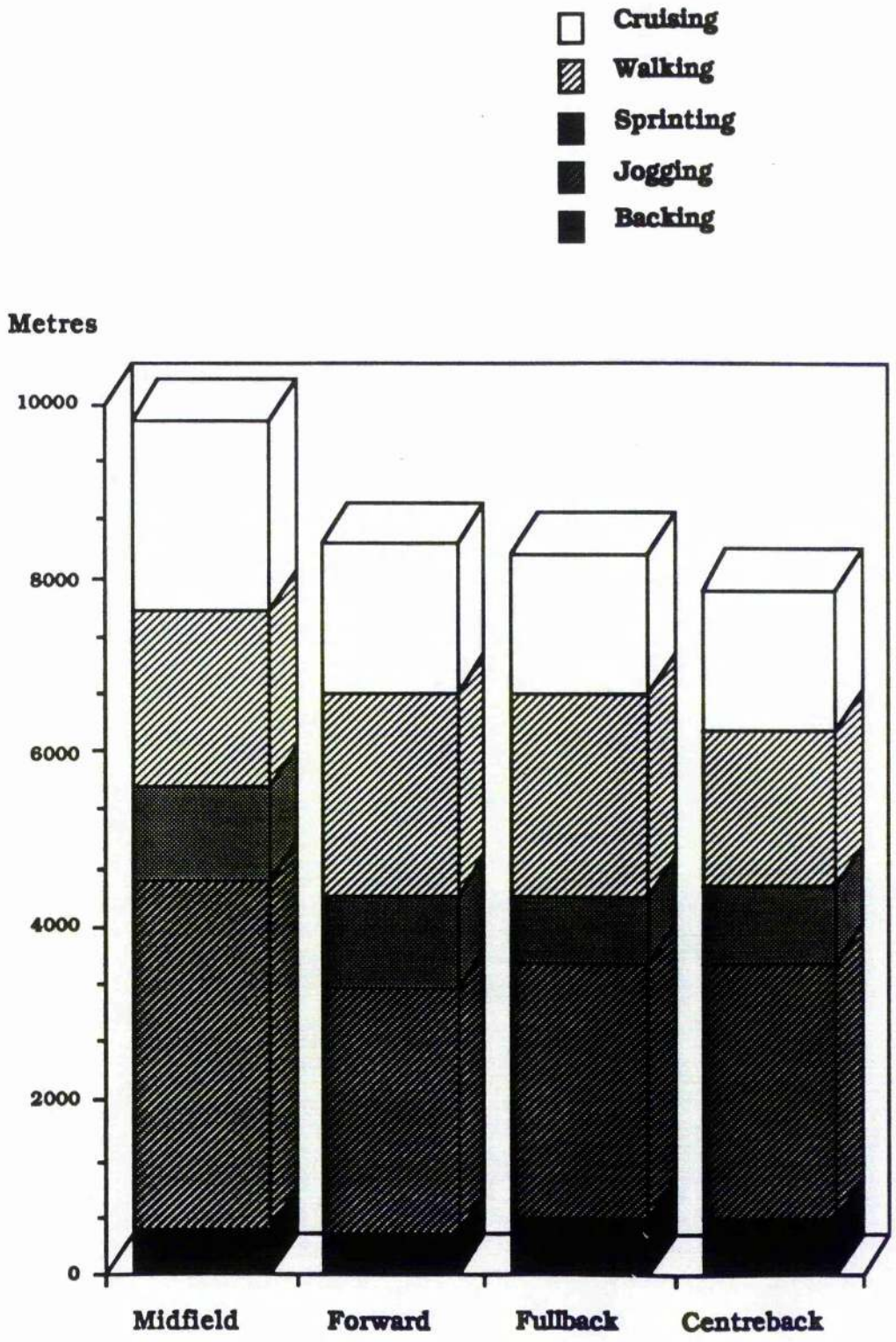
divided into walking, backing and running. Running was subdivided into three intensity levels of jogging, cruising, and sprinting. The distance of each discrete movement was estimated in one metre units from an elevated position in the stand, directly over the halfway line, using a number of cues on the playing pitch, and along its boundaries. The incidents of jumping, tackling and kicking, the duration of stationary rest pauses and the distances covered with possession of the ball were also recorded. The method was validated by simultaneously filming one subject, and obtaining distance measurements from a film record of one complete game. The team studied employed a 4–3–3 formation with positions classified as goalkeeper, full–back, centre-back, midfield player, and striker.

The overall distance covered per game was 7,759 metres for centre-backs, 8,245 metres for full-backs, 9,805 metres for midfield players and 8,397 metres for strikers (see **Figure 1.1**). The goalkeeper covered 3,972 metres per game. They found that centre-backs covered proportionally more distance moving backwards than the other outfield players. The frequency of jumping in centre–backs and in strikers was significantly greater than in midfield players or full-backs. The authors reported that the overall distance covered by outfield players during competition ranged from 7,069 to 10,921 metres. Of this, 36.8% was covered by jogging, 24.8% by walking, 20.5% by cruising, 11.2% by sprinting, and 6.9% by

Figure 1.1

Analysis of total distance covered in different positional roles of English professional soccer players.

(Reilly & Thomas 1976b)



backing. The proportion of the overall distance covered in possession of the ball ranged from 0.26% to 4% among outfield players.

The behaviour profile included more than nine hundred discrete activities per player per game. An average game involved forty-three pauses and the accumulative time spent standing still was one hundred and forty-three seconds per player per game. The results indicated the frequent alteration in movement intensities, and the infrequency of rest pauses in top class play. The mean distance per discrete activity changed on average every five seconds, and a stationary rest pause of 3.8 seconds took place every two minutes. They also found that the work rate was significantly higher in the first than in the second half. This decrement may represent a fatigue effect. It is possible that the usual reduction in the uncertainty of the result, as the match progressed, effected a change in work rate.

Finally they recommended that the midfield players, because they acted as linkmen between defenders and attackers and contributed to both of these functions, would need a higher work rate since they covered the greatest distance.

Withers et al. (1982) studied Australian professional football players in order to determine the movement patterns of the outfield positions by analysing videotapes of five full-backs, five central-defenders, five midfield players and five forwards. They believed that such an analysis has implications for the specificity

of fitness training in soccer. The researchers obtained their data by videotaping one of the players during a game and then examining the tape to determine the number of paces in walking, jogging, sprinting, and moving backwards and sideways. Pace length was then calculated from a videotape recording of each of the preceding types of locomotion, when the players covered a given distance such as the diameter of the centre circle. This enabled the number of paces to be converted into a specific distance. The authors indicated that there were no statistically significant differences between the four positions as far as distances travelled were concerned. The average distance for each player was (11,527±1,796 metres), which constituted: walking (3,027±533 metres), jogging (5,140±1,440 metres), striding (1,506±584 metres), striding and sprinting (2,172±798 metres), walking backwards (590±271 metres), jogging backwards (285+239 metres), moving sideways (316±135 metres), and travelling with the ball (218±101 metres). They also indicated that there were no statistically significant differences between the four positions overall for : tackles, headers, ball contacts with the foot, turns and jumps.

They showed that most of the distance was covered by the low intensity activities of walking (31.4%) and jogging (47.1%), whilst the high intensity work (striding and sprinting) accounted for only 18.8% of the total distance.

For the determination of distance covered, ground marking and cues **(Reilly and Thomas 1976b)**, or the stride length and frequency **(Wither et al. 1982)**, have been measured. Possible errors involved in the former approach include the difficulty in quantifying diagonal movement relative to the ground markings, the distance of the recorder from the game and the parallax error. In the latter study, possible errors may occur from changes in gait characteristics during the game. A high reliability **(Reilly and Thomas 1976b)** and objectivity **(Reilly and Thomas 1976b; Wither et al. 1982)** have been reported for these methods.

Withers (1979) did a further analysis and reported the total distance covered as 2,869, 4,671, 1,901, 1,128 and 625 metres, for walking, jogging, sprinting, moving backwards and moving sideways respectively. The overall average distance covered by each player was 11,195 metres. He recommended that forward players required approximately 2000 metres of quality work which should comprise mainly short, fast interval training and some sprints training. Midfield players, who jog for longer distances, need to be aerobically fit. Withers noted that most sprints ranged from 5 to 30 metres. However, players may be required to sprint longer distances during a match. Withers also reported that in England, the higher the level of soccer played, the greater the distance covered, either walking, jogging, striding or sprinting. Also, the higher the level of

soccer played, the greater the total distance covered by striding or sprinting – particularly sprinting.

Brooke and Knowles (1974) obtained data during the 1970–1971 season on over forty different players in four matches involving Manchester City Football Club. They used trained observers to record sprinting, jogging and walking distance in units of 4.6 metres (5 yards). The players covered approximately 5,290 yards in a game (range 4,000 yards to 8,360 yards) with an average of 52 sprints. The average distance sprinted was 11.4 yards, but ranged from 5 yards to 65 yards. The proportions of sprinting: jogging: walking were approximately 1: 5: 3. The authors explained that by manipulating the range and frequency of sprinting and jogging, fundamental changes to tactical play could be possible.

Several weak points can be pinpointed in the methods used by **Brooke and Knowles**. Despite the fact that shorthand notational symbols were used, it was extremely difficult to be accurate. The technique required the recorder to momentarily look away from the player in order to take note of his movements. Another problem arose because observers were required to subjectively estimate distances. Because the movements of the players in certain situations are so rapid and varied, there was little time available to estimate the distance each player had travelled. At least a few seconds was required to assess and record the events. Perhaps the

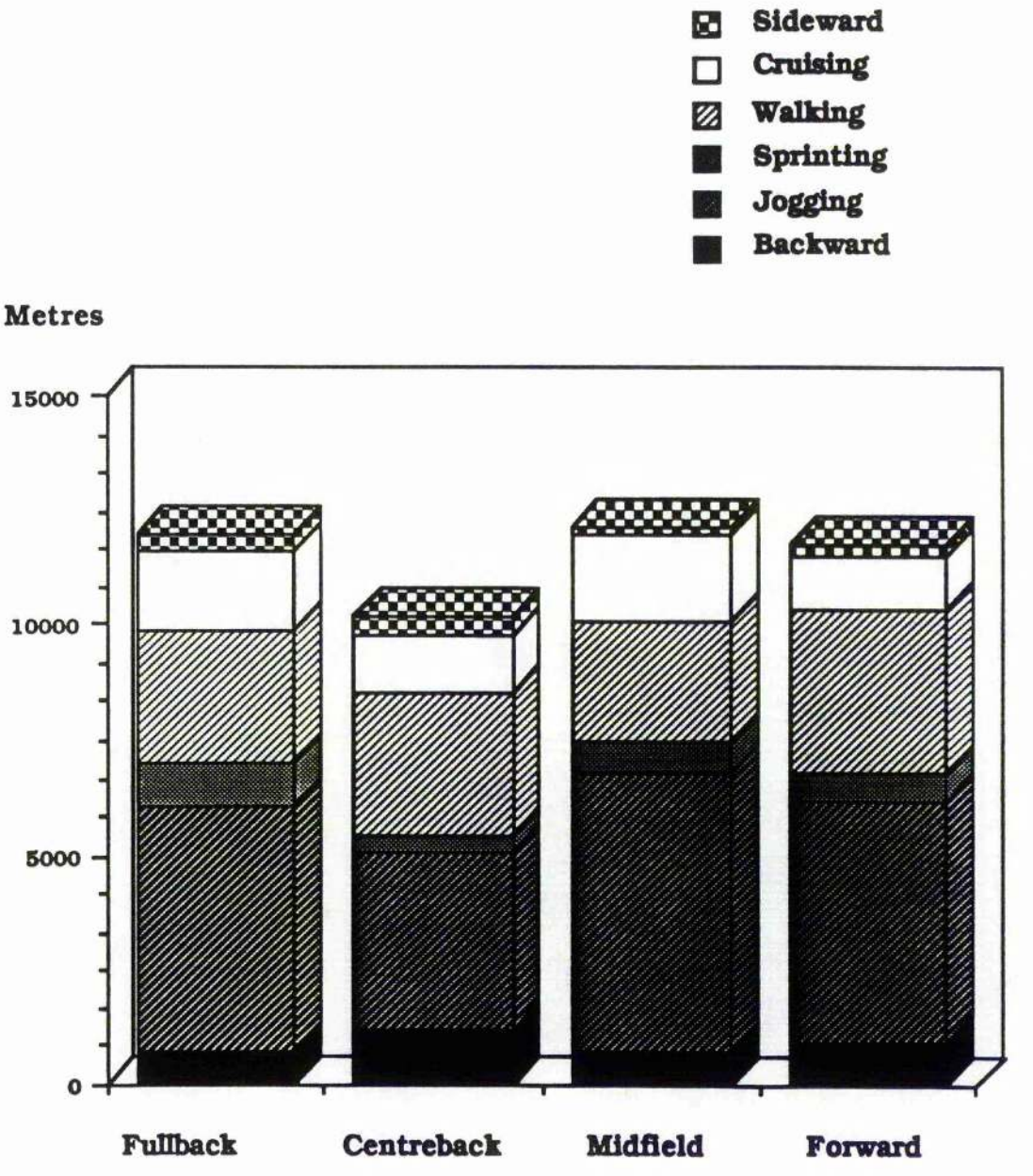
biggest problem experienced was that this method gave no account of those movements which did not approach five metres.

It was felt that the technique used by **Withers et al. and Reilly and Thomas** was the most sensitive to the measurement of distance because it allowed the calculations to be made after the event (see **Figure 1.2**). This is a very important point since many situations arise during a competitive game of soccer where there is little time for subjective estimations. This technique therefore enabled the observers to concentrate on identifying the many movement types, something which posed a problem in the other methods. From the figures revealed by **Withers et al. and Reilly and Thomas** it is possible to make realistic statements about the movement characteristics and the fundamental differences in the positions of soccer players.

Thapar and Sharma (1982) conducted a study on 32 half-back soccer players in three tournaments; a regional tournament at Nabha (Punjab; Durand Cup at Delhi and the National Championship at Cuttack, Orissa, in December 1980 and January 1981). Their aims were to develop a proper training programme for half-backs. To this end they determined the physical load on the players in a competition. In order to record the physical load, they observed the frequency of and the distance covered while sprinting, cruising, jogging and dribbling the ball.

Figure 1.2

Analysis of total distance covered in different positional roles of Australian professional soccer players. (Withers et al. 1982)



The total distance covered in each type of running during the match was calculated from the stride frequency and stride length. The players were asked to sprint, cruise, jog and dribble the ball various distances of 5 metres, 20 metres and 30 metres. The total distance covered in each type of activity was measured and then divided by the number of strides which were taken to cover the distance. This gave the average stride length of each player in each type of activity. This estimated average stride length was then used for calculating the distances covered by half-backs in each type of activity in these tournaments. The average stride length was found to be 1.5 metres in sprinting, cruising and dribbling the ball. The average stride length during jogging was 1 metre. The results indicated that an average Indian half-back covered about 2.5 kilometres in a match. The authors also reported that a good half-back covered more distance in all types of activity and his total frequency of various type of running was about 200 as compared to the 141.1 of a weaker half back. The physical load of an Indian half-back was significantly less than that of an European half-back. The reasons for this may be a low fitness level and a lack of tactical understanding about the interchange of positions and the tempo of the match.

Ohashi (1979) attempted to develop a method whereby the movement patterns of athletes within a team game could be measured. A form of sighting device was used to map the coordinates of a soccer player during a game. A positional fix was taken from two potentiometers whose output was monitored continuously. This gave a continuous positional record of one player throughout the game. Despite its ingenious conception, this method has obvious drawbacks. In order to record two players, four sighting devices would be required and for three players six devices and so on. This means forty-four sighting devices positioned around the field would be required to gain match play data on all of the players. Besides, there is a problem when the sighted player is masked by groups of other players. This has the effect of placing the observed player in a no-movement category when in fact his movement may be of crucial importance to the overall team performance. **Ohashi** reported that the average total distance covered by Japanese national players was 10,824 metres.

The most recent study on total distance covered in soccer was conducted by **Van Gool et al. (1988)**. This aimed at determining the physiological load imposed on players during a real match played by a university team, by measuring the distance covered with a video analyser system, the heart rate using the telemetry system and lactic acid levels. The results showed that the mean total distance

covered by each player was 9,769 metres. For 3,827 metres of the total distance the players were walking, 5,205 metres jogging, 672 metres cruising and only 65 metres sprinting. The mean heart rate was 167 beats per minute. Lactic acid accumulation below the anaerobic threshold of 4 millimole per litre, was observed after each period of 45 minutes. From these findings, it is clear that the physiological load imposed on soccer players when playing a real match seems to be very high. Therefore soccer players should combine technical and tactical skills with maximal aerobic power. **Table 1.3** summarises this section.

It should be noted that most of those who have been involved in the research mentioned above, have done analyses of distance (**Figure 1.3**). However, a few of them have used an objective analysis technique, which could give accurate information.

Literature concerned with match analysis in soccer :

In the past decade, there has been a significant growth of interest from the public in coaching and managing of soccer, and a noticeable increase in the presentation of factual reports of matches in the media, ranging from basic tables of soccer goalscorers in the newspapers to complex sports analyses on television. This kind of information has many uses, from historical

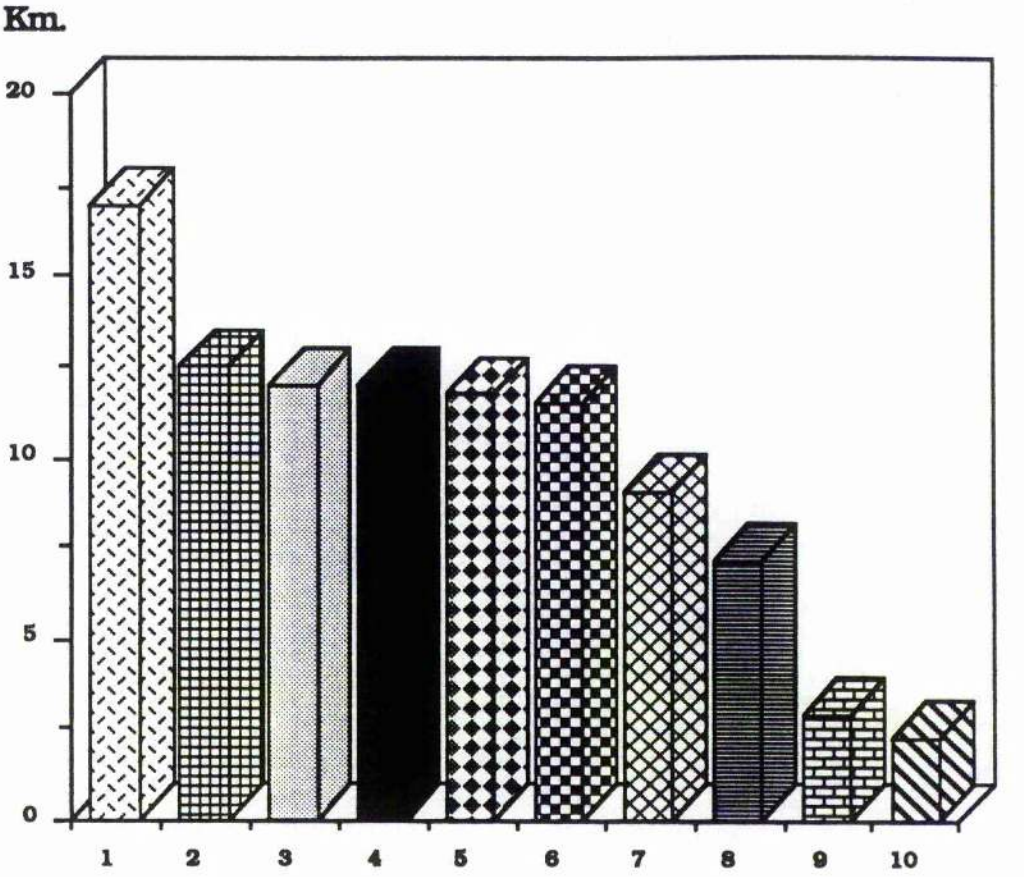
Table 1.3

Summary of the mean total distance covered per game of soccer as recorded by a number of researchers where data collection procedures were given.

Researchers	Mean total distance covered per game
Reilly and Thomas (1976b)	$\bar{X}$ = 7,069-10,921 metres
Winterbottom (1959)	$\bar{X}$ = 2,347 metres
Withers et al. (1982)	$\bar{X}$ = 11,527±1,796 metres
Withers (1979)	$\bar{X}$ = 11,195 metres
Brooke and Knowles (1974)	$\bar{X}$ = 4,000-8,360 yards
Thapar and Sharma (1982)	$\bar{X}$ = 2,500 metres
Ohashi (1979)	$\bar{X}$ = 10,824 metres
Van Gool et al. (1988)	$\bar{X}$ = 9,769 metres

Figure 1.3

Summary of the mean total distance covered per game of soccer as recorded by several researchers.



1) Vinnai 1973

2) Withers et al. 1982

3) Agnevik 1970a

4) Saltin 1973

5) Whitehead et al. 1968

6) Zelenka et al. 1967

7) Reilly & Thomas 1976b

8) Wade 1967

9) Brooke & Knowels 1974

10) Winterbottom 1959

record keeping to sports coaching.

Statistical analysis could be useful to coaches and managers (**Ali 1985**). It is important to give them some idea of how to use existing match analysis systems and, more importantly, how to adapt systems to serve the particular needs of their own club requirements. Coaching is a deliberate act of intervention in sport, with the intention of improving performance. The purpose of match analysis is to evaluate performance in order to improve the coaching process. This process involves a cycle of logical steps, each of which is designed to cut down the uncertainty a performer will meet in competition. For example, fitness schedules should meet the precise demands of the sporting contest. Technique and tactic practices should equip performers with an appropriate repertoire for the tasks they face, and so on.

One of the most important aspects of the coaching process is the analysis of individual and team performance. Since the coach's aim is to improve on existing performance, he must first watch the match in order to collect relevant information. This information is then analysed to produce a plan which could be implemented in practice sessions. Limitations of eyes, ears, attention span, concentration and memory make it difficult for the coach to observe a match and recall it accurately at some later stage. Without some access to backup storage, most of the events noticed by the brain

are either perceived partially, forgotten or become distorted over a period of time. Some preliminary studies done by **Hughes (1984)**, have indicated that coaches are only 12% correct in their post-game assessments of what had occurred during a soccer game.

Even experienced coaches may overlook key details of performance from time to time. For example, research on memory capacity among trained sport teachers and top coaches indicates that a specialist is only marginally better able to recall match information than a casual observer **(Franks and Goodman 1985)**. These findings support other studies, such as those on accident witnesses, which show that people miss a great deal of potentially important information when trying to watch relatively complex behaviour **(Franks and Miller 1986)**. It can thus be seen that coaching will profit from the use of systems of recording match information that are more effective than simply watching and then remembering highlights. The quality of both watching and analysing is crucial to the success of the coaching process. Not only must match information be comprehensively stored, but it should also be as objectively compiled as possible. For a host of reasons, it is very easy for unintended bias to creep into a coach's appraisal of a performance. In addition, competitors themselves invariably respond best to match records which have been objectively compiled and analysed.

Anyone can record observations of sport events, but accurate records can only be collected by trained observers using systems which have been carefully designed and refined in the match setting. Like any sporting skill, match recording and analysis needs to be practised. Coaches need not necessarily be involved in the actual job of recording, but they should be able to understand the system, and even advise on how it should be set up and introduced, and they should certainly be able to interpret the results.

All sports have both technical and tactical dimensions, giving rise to different kinds of coaching knowledge and questions. For example, the tactical and technical complexities of some games are far greater than those of others. Different sports make different demands on performers in respect of techniques and tactics. In the past, the emphasis of coaching in different sports has been mainly on technique. Even in games which are essentially territorial contests, where strategic possibilities are boundless, surprisingly little has been written on strategy compared with the volumes published on how to perform the various techniques. A good match analysis system will help to devise and exploit new strategic aspects of the sport.

While the recording of technical events is relatively easy, since techniques can be observed, the tactics of performance must be inferred because they exist only as plans in the performer's head.

Match analysis is a particularly useful aid for this tactical part of the coach's work. Particular difficulties arise when trying to analyse interactive games. Up to twenty-two players may be moving at once, and the off-ball play may be just as vital as play on the ball, if not more so. This problem can be partly overcome by assigning one observer to each player and, although this has been attempted by some coaches, results are very difficult to collate and interpret. For now, the most practical and informative match analysis methods are those which focus on the pathway of the ball.

Cook (1982) analysed different levels of soccer players, considering schoolboy and league club players, and the performance of teams and players over the years. His analysis was based upon three general areas:

(i) Individual performance: by charting the individual's skill in technical, psychological or tactical performances and his success or failure at passing, shooting, covering in defence and goalkeeping.

(ii) Team or group performance: by charting the technical play and the system of play, restarts and goals scored or lost by both the opposition and his own team.

(iii) Fitness performance: by charting players physical output to determine how hard they were working and what changes needed to be made to the training programme in terms of distance covered, number of sprints and jumps.

Cook did not disclose how he obtained this information and what method was used. He analysed many matches when he was a coach at Bradford City A. F. C., examining both his own and opposing teams. He believed that player and team performance analysis was a valuable tool for the coach if used properly. It could help to identify what was going wrong with his players and team, and motivate them to improve their effectiveness. It also helped his team to win matches, by locating strengths and weaknesses in the opposing side which required special attention.

An analysis of goal scoring in soccer has been done by **Hughes (1984)**. He focussed on the number of passes in possessions, and in particular the location and number of passes preceding attempts at goal. He implied that top level coaches had "got it all wrong", tactically, for the last 25 years. He suggested that the general approach of possession football actually militates against the scoring of goals. In brief, his position is simple. A very high proportion of goals result from possessions of less than five passes, the majority of which start in the attacking third of the field. **Hughes'** evidence comes from an accumulation of detailed match records, many analysed by his own staff, in all, over 2000 games. From the result of this research, he has developed a "model" for the game of soccer, which he calls the "domino effect".

(i) Get the ball in the attacking third of the field more often than the opposition.

(ii) Have forwards do something positive with the ball in the attacking third of the field more often than the opposition.

(iii) Get a higher repossession rate and set play rate in the attacking third of the field than the opposition.

(iv) Attack the goal earlier in the possession than the opposition.

(v) Get a higher percentage of shots on target than the opposition.

(vi) Get a higher success rate of shots than the opposition.

Franks et al. (1983a) configured a computer keyboard to resemble the layout of a soccer field and designed a programme which indicated the frequency of various features of play. A video was timelocked to the system so that the relevant sections of the match could be replayed visually alongside the computer analysis. This method of analysis allows for immediate access to all specified events and provides a means whereby the coach can formulate his own ideas on how to improve the performance of the team at group and individual level.

Franks et al. concluded initially that the above technique in match analysis will be an additional aid to supplement the coach's intuitive decision about the sport, and eventually could become a regular part of the coach's armoury.

Essing (1970) studied teams in the German Federal League and found that only a constant team line–up is conducive to the development of mutual knowledge and thus tactical improvement. In fact, he found a positive correlation between measures of team success and the degree to which a team line-up remained constant. He also showed that successful teams played their old-established players more than the unsuccessful ones did. The successful teams were less likely to put new players in their line-ups.

The importance of team work for success can not be overestimated. Researchers are in agreement that the success of a team is dependent on the cooperation of everyone in the team **(Csandi 1978; Eastham 1966; Kawacs 1975; Di Clemente 1955; Prachuab 1974). Weiss (1969)** stated that:

> **Alone, a man usually makes his activities turn in a circle about himself. When he plays in a team he carries out a role in relation to the roles others assume. As a consequence, he functions on behalf of all members of his team. Not until he actually plays with others as part of a team, however, does he face up to what they can do, what they are doing and what they will do.**

Soccer is a game which is structured in such a way that the careful acquisition and evaluation of the observable details associated with each movement of play may lead to a meaningful

trend analysis. In fact, most coaches and managers at international and professional levels of the game compile statistics which convey information on their opponents as well as on their own teams.

The application of data processing to soccer is developing quite rapidly. Computer technology provides an opportunity to render practical and valuable assistance to the coaching and managing system in the area of strategy preparation. While it is standard operating procedure to review films of previous games and to chart tendencies in a variety of situations, data processing methods could disclose further essential information to assist coaches and managers in organising their training programmes and playing tactics.

The computer is a means of meeting the information needs of soccer coaches and managers, to help them process and evaluate soccer data. Soccer possesses a large number of factors with easily identifiable characteristics. These include, shot on target, shot off target, shot blocked, long passes, short passes, dribbling sections, set plays, relative score, and defensive and offensive formations. These factors can be evaluated relative to one another in order to obtain essential information about the game. The basis of soccer analysis is the study of live matches and game films in which each movement of play is recorded either by computer in situ or on paper, the data subsequently being fed into computer.

Figures 1.4, 1.5 and **1.6** illustrate examples of different types of analyses that can be undertaken. **Figure 1.4** shows a framework of shooting analysis, and identifying the factors in rank by order of importance. **Figure 1.5** shows a framework of goal scoring analysis, illustrating which circumstances produce the best chance of scoring. **Figure 1.6** shows a framework of movement analysis, clarifying those elements which affect on the results of the game.

It should be noted that the spying mission in soccer is often performed during live matches. Usually coaches or managers are involved in scouting a game which involves a future opponent. While this lacks much of the precision found in extracting data from films, it frequently provides an important supplement to the analysis of the game films. It should also be noted that in a live match scouting depends on the experience of the scout and the accuracy of the techniques used for collecting data. For many years this was the only system teams had for scouting an opponent.

The overall purpose of scouting is, of course, to obtain as much information as possible concerning the specific strengths and weaknesses of an opponent team. While each match in a soccer season is an event that will never specifically recur, the strengths and weaknesses of a team are recurrent in well defined statistical patterns. These patterns are particularly suited to trend analysis. Most soccer teams normally follow similar patterns of play

Figure 1.4

Shot on or off target analysis.

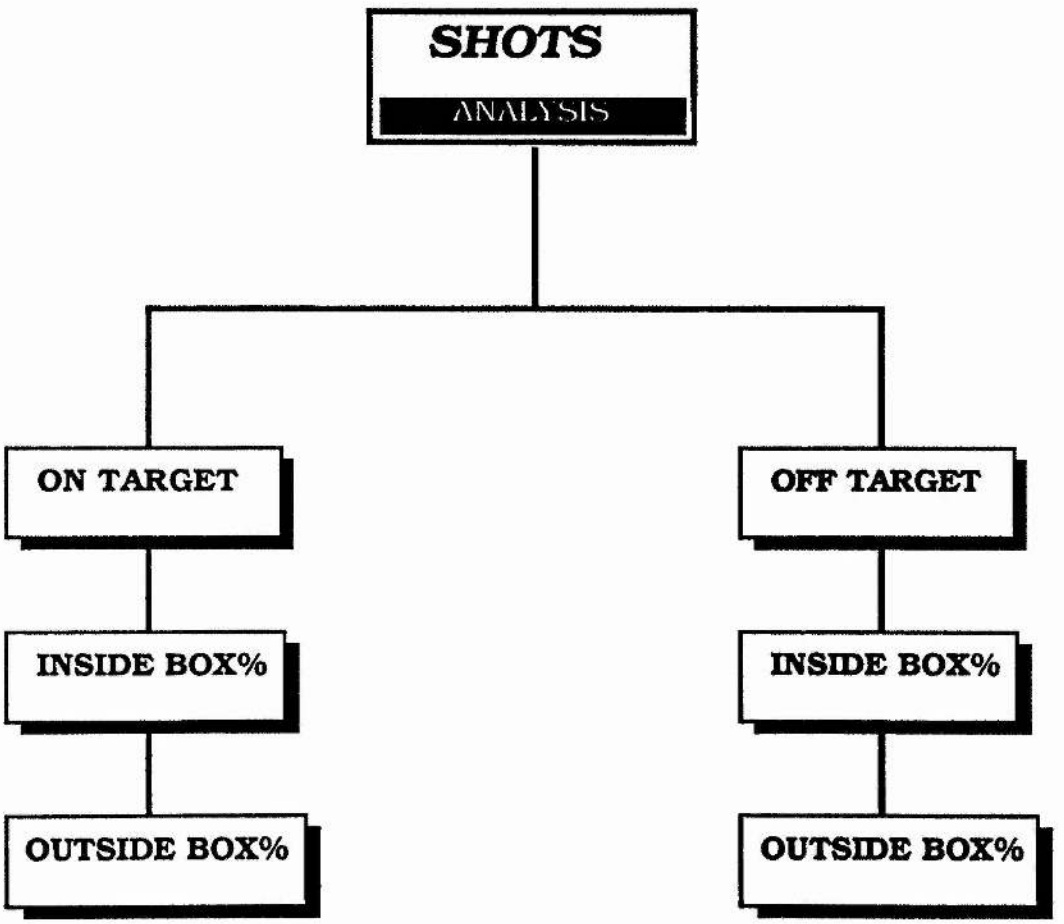


Figure 1.5

Goal scoring analysis of free attacking and set plays.

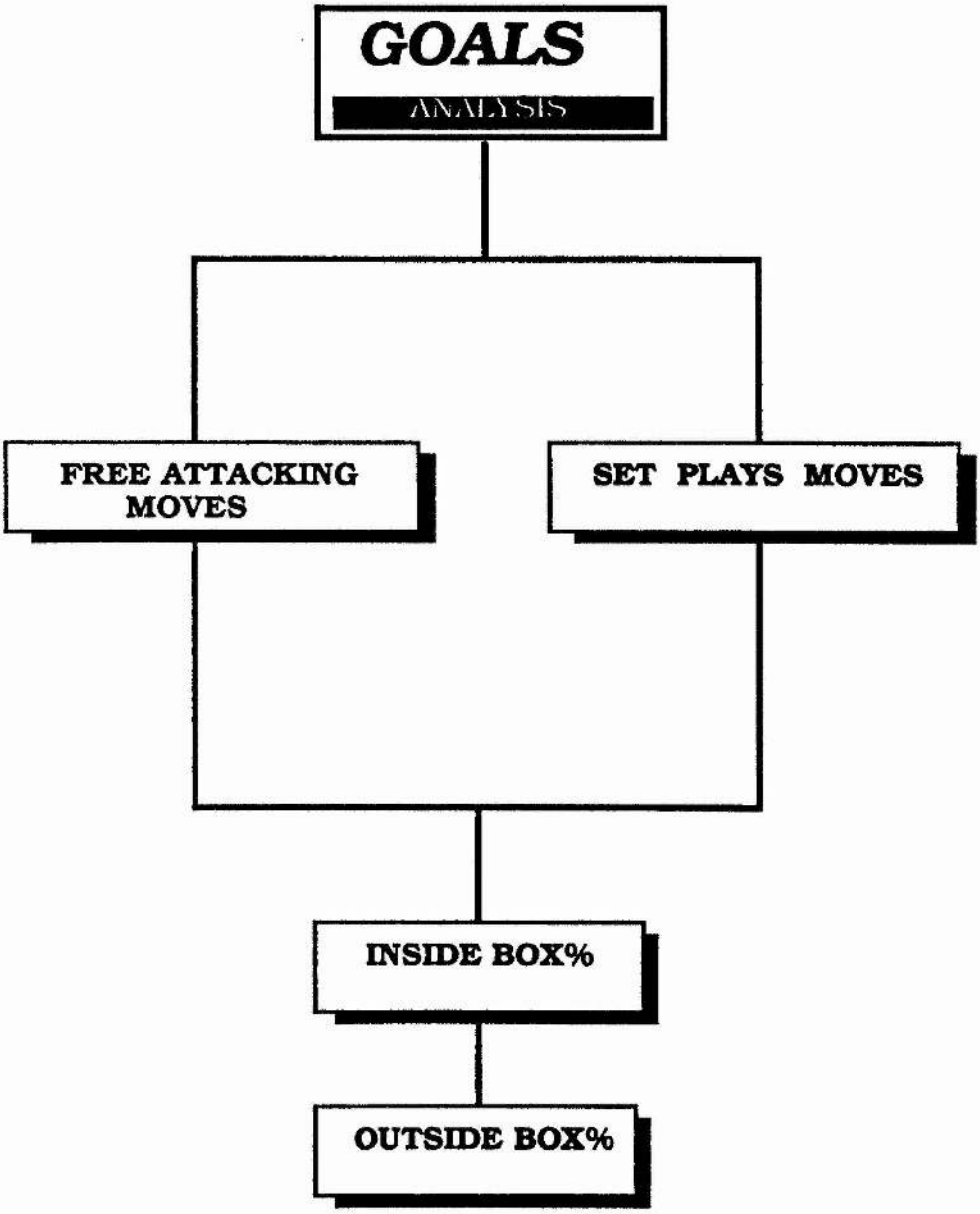
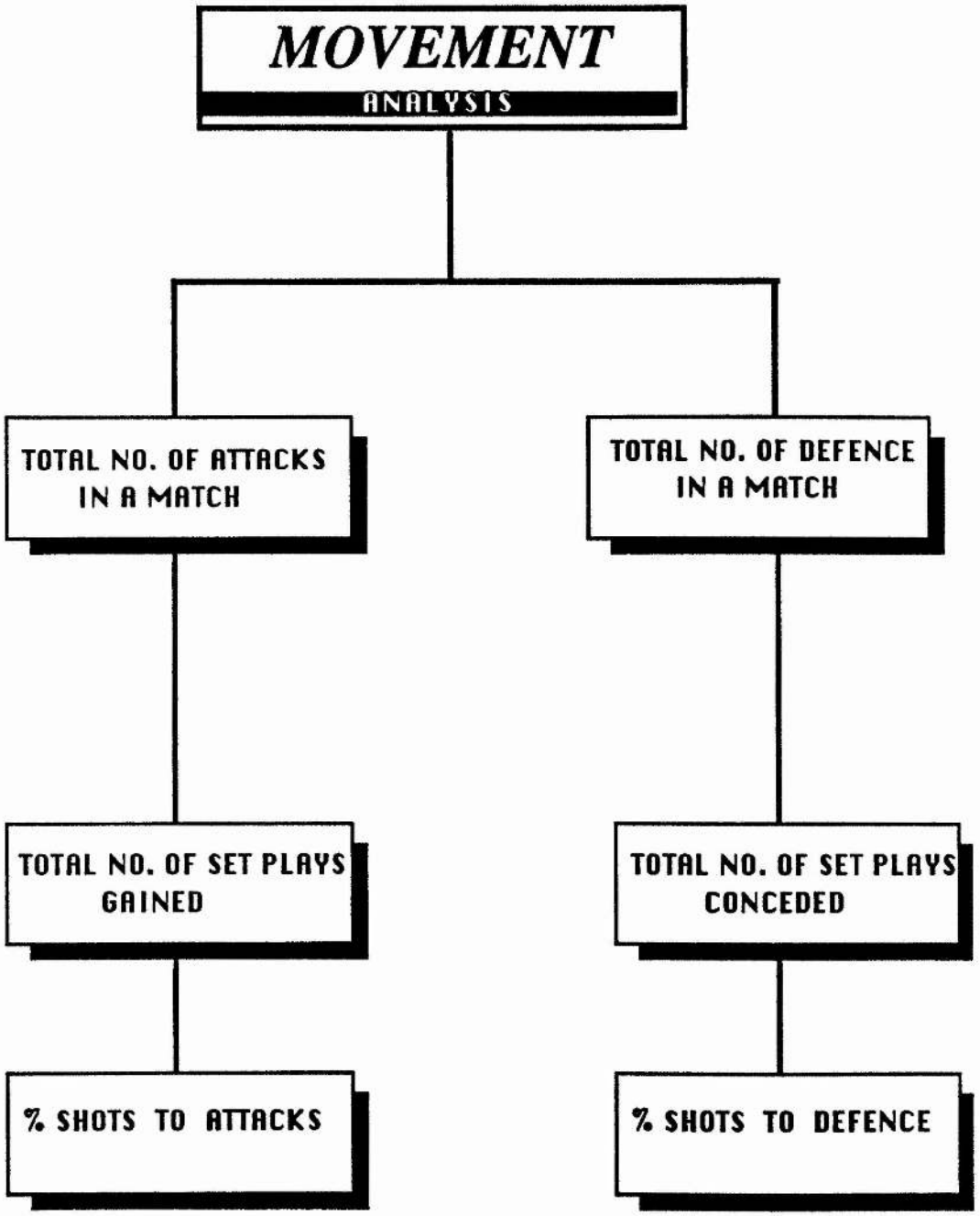


Figure 1.6

Offensive and defensive movement analysis.



"modified by predetermined strategies" when confronted by similar situations. Thus, for planning purposes in soccer it is important that detailed information concerning both the opponent and one's own team is known to managers and coaches.

The analysis technique developed must have the flexibility to allow the report to provide answers to the soccer analysis questions with minimal effort. It should also be flexible enough to allow for immediate retrieval of the information as it is required. For example, the report of analysis should fit the needs of the user. There is need for a detailed analytical report which shows for each game the overall tendencies, including for example the most successful attacking patterns of play, the most successful attacking set plays and the most effective defensive formations. This type of analysis depends on the reliability of the technique by which the data is collected and should be sophisticated enough to provide a profile of a team's tactical decisions and tendencies. As an example of the type of information collected and studied, the analysis of several soccer matches of one team might reveal that whenever it initiated an attack which moved along the right or left wing towards the corresponding corner flag and then was terminated by a cross from this position to the penalty area for shooting, there were good scoring opportunities. If this information was available to an opponent, the coaches and managers could plan and organise their

defenders to cope with this situation and, ideally, nullify this pattern of play.

An ideal match analysis system would be one which includes all aspects of the game, both offensive and defensive, using appropriate and objective techniques to provide comprehensive information. Comprehensive analysis is necessary because it reveals the weaknesses and strengths of each team; for example, a team may appear to have a precise long forward pass during an attack when playing another team which has a weak defence in such a situation. Another team may appear to be very successful in attacking set play situations only because its opponent is particularly vulnerable in set plays.

Any soccer analysis system should have the ability to permit the retrieval of the tendencies of a team in a particular situation and to calculate the probability of success or failure based upon previous attempts in the same or similar situations. External factors such as weather, injuries, and conditions of the ground of the game should also be considered. This type of information requires the continuous analysis of games in order to maintain up-to-date information.

Technique analysis :

Skill is a capability or faculty of the nervous system, by which a subject may master new movements quickly and easily, be conscious of his movements, orientate himself in difficult and unexpected situations, and choose the method which will be most effective in meeting each situation. Speed, strength, endurance, and even elasticity can be gauged with an absolute unit of measurement, but the establishment of the degree of skill is rather subjective.

Skill can generally be termed as embracing the methods in the execution of all the movements in the sport concerned. Each sport has its own special skill. Special skill implies not only the specific movements necessary for the sport concerned, but all the related general and complementary movements, such as running and jumping. From this principle, soccer skill covers all the methods of executing the movements that can occur when playing soccer.

Skill in soccer is of fundamental importance. In particular it is indispensable to be familiar with all the movements carried out when in possession of the ball. It is possible for a player to continue playing reasonably well while not in absolutely top physical condition. To emphasise the fundamental importance of skill, however, it is necessary to examine the relationships of all elements and to determine the sequence of importance **(Tyler and**

Cordwell 1982; Batty 1981; Wilkinson and Thomas 1978; Adams 1974; Cohen and Dearnaley 1962).

The basic requirement for ball skill is an exceptional control of the body or "body technique". Being able to control the ball and a good feeling for the ball is, however, certainly not all there is to soccer **(Reilly and Bowen 1984; Jones 1984; Herbin and Rethacker 1978; Tyler 1976; Jago 1974; Hughes 1981; Pawson 1973; Batty 1980a)**. Statistical observations have shown that even world class professional players do not have possession of the ball for more than 3 minutes during a game. During the remaining 87 minutes they have to move without the ball, trying to position themselves to receive the ball from their colleague, or trying to get it away from their opponents **(Bauer 1978)**.

Reilly and Holmes (1983) have analysed selected soccer skills to find out how these were related to outfield positional roles. They discovered that, overall, defence players were more successful than their midfield and attacking counterparts in terms of their passing, controlling, dribbling, tackling and heading. **Reilly and Holmes** suggested that this was probably due to the fact that forwards had less space in which to execute their skills, they were under greater pressure and therefore paid more attention to their opponents. Since the quick execution of skills is of paramount importance under these conditions, the researchers concluded that attackers should be

subject to "pressure training" drills to prepare them for the stress of competition.

The acquisition of complex motor skills is best achieved under conditions where fatigue is absent. Once these skills have been entrained, their employment in competition could be enhanced by training under stressful conditions. Execution of game skills in emergency could be practised by some form of pressure training. A player may be subjected to a concentrated service of the ball and required to repeatedly produce certain skill patterns with a decreasing time for rest or recovery. The intended outcome is that the skill can be automatically and accurately produced when appropriate in match play.

Match analyses have to some extent clarified the emphasis to be placed on such fundamental game skills as shooting, dribbling, heading, tackling, throw-in and goalkeeping **(Winterbottom 1953; Kuhn 1988a; Glanville 1977; Wade 1967; Bone et al. 1986; Widdows 1982; Heath and Rodgers 1933; Cook 1982)**. About half of the skills used in games involve kicking, and a third involve keeping possession. The proportion increases for both kicking and keeping possession the greater the skill level of the team **(Morris 1980; Hughes et al. 1988)**, suggesting a positive relationship between possession and match result. Outfield players as a whole cover about 3,200 metres dribbling the ball, much of it at high speed

(Reilly 1977). Clear shots at goal occur at a frequency of about once every 5 minutes **(Thomas and Reilly 1976)**.

The number of skills leading to a shot at goal is usually low, though the efficiency of shooting increases when there is a greater succession of skills **(Bate 1988; Tsuruoka et al. 1970; Reep and Benjamin 1968)**. Since games are decided on the basis of goals scored, and shooting opportunities are moderately rare, the implication for training is that shooting skills are important for effective preparation for competition, particularly in strikers to whom most scoring opportunities fall. This will involve practice of heading as well as kicking skills.

Adams (1974), reporting on the final of the 1974 World Cup Championship in Munich, analysed the final match from the television coverage. From observing several Dutch and German players, he found examples which helped him to identify some aspects of both individual and team play for both teams taking part. Some of these examples for the German team were:

(i) in passing, the overall level of success was high, although there was less success in the second half. This could have been due to the score in the first half, pressure on the winners, or mental and physical fatigue.

(ii) in shooting, from six shots at the target, two produced goals.

(iii) in set plays, from six corner-kicks, there were strikes at goal from five of them. Free-kicks and goal-kicks were also analysed.

It is apparent that the speed with which the ball is accurately moved is important in shooting and in passing, though in certain conditions some speed may be traded for accuracy. The speed of ball movement has received some research attention, particularly with reference to the action of the kicking leg **(Luhtanen 1988; Roberts and Metcalfe 1968; Kermond and Konz 1978; Bloomfield et al. 1979)**. It seems that ball speed in kicking increases with experience in the game. **Asami and Togari (1968)** reported a positive relationship between knee extension power and ball speed from instep kicking, both increasing with experience in the game. These findings support continued practice of various kicking forms in training.

A close examination of the games during the World Cup in Mexico in 1986 showed that the number of throw-ins near the opponent's goal was similar to the number of free-kicks in this area **(Laux 1986)**. Therefore it would seem important to have specialists in a team not only for penalties, corners and free-kicks but also for long throw-ins.

Throw-ins seem to require a degree of specific skill as well as being dependent on fitness factors. The throw-in distance of soccer players has been found to be related to pull-over strength and trunk

flexion strength **(Togari and Asami 1972)**. Training methods using a medicine ball were shown to increase physical fitness factors without a corresponding increase in throwing distance. These results suggest that individual players should be preselected to take tactical long throws.

A review of the English and German soccer literature reveals some tactical advice on taking penalty kicks. For example, **Cramer (1952)** and **Schmid et al. (1968)** have identified two basic styles of executing penalty kicks, one emphasising power, the other accuracy. The kick for accuracy is usually initiated with a fake. **Cramer** recommended the power kick as it can hardly ever be stopped, even if lacking precision.

Goalkeepers are directly involved in play more frequently than any individual outfield player. The main goalkeeping skills include diving, catching and punching the ball, as well as correct positioning to save shots from opponents or receiving back passes from colleagues. Additionally, kicking and throwing the ball accurately over long distance is important since the goalkeeper distributes the ball approximately 70 times per match **(Thomas and Reilly 1976)**. Since he may have little time in emergency situations for decision making, he should be subjected to pressure training involving repetitive shooting from various angles and ranges **(Kuhn 1988b)**. Continued practice will enable him to anticipate ball flight

earlier. This prediction will enable skilled goalkeepers to fix their eyes on the opposing player, while eye-fixation of unskilled players in this position tends to be on the ball **(Kanamoto et al. 1977)**. Instructions to keep the eyes on the ball seem to be ill-advised, because it could lead to bad positioning by the goalkeeper.

A lot more advice is given in the literature to goalkeepers. **Maier and Pfaff (1984)** concluded that for the goalkeeper to be successful it was necessary to wrest the advantage from the shooter by clever positioning which could dictate the direction of the ensuing shot. A second strategy of advantage, outlined by coaches is careful analysis of pre-contact cues (e.g. angle of approach run and body orientation in addressing the ball) which could again provide valuable anticipatory signals on intended direction of ball flight. Other favourite strategies include the use of faked upper body movements and the use of detailed notes on favoured strategies, gained from detailed observation of selected penalty takers.

Clearly what is necessary in this aspect is a detailed observational analysis of penalties, which could aid in identifying successful strategies for both shooters and goalkeepers. In this way more meaning would be attached to the subjective opinions of coaches and expert goalkeepers in the coaching literature on this important aspect of play.

The question arises as to the extent to which soccer skills are amenable to test and measurement procedures. **Heath and Rodgers (1933)** constructed a soccer test for fifth and sixth year boys with reported reliability coefficients of between 0.71 and 0.74. The individual test elements consisted of a dribble, a throw-in, a place kick for goal, and kicking a rolling ball. Another test of general soccer ability consisted of kicking a ball against a backboard as many times as possible in 30 seconds. The correlation coefficient between performance on this test and the subjects ability as rated by their coaches was 0.85 **(Clark 1967)**. The reported reliability and validity coefficients for a wall-volley test at a target for a similar period was 0.92 and 0.83 respectively **(Clark 1967)**. These results suggested that soccer skill tests may be of use, particularly in the screening of junior players.

There is general agreement among investigators that kicking, passing, dribbling, throwing and heading constitute important soccer skills **(Csandi 1978; Brown 1980; Roxburgh 1985; Eastham 1966; Spurdens 1984; Hughes 1980; Worthington 1980; Adams 1975; Beim 1977; Docherty 1978; Zelenka et al.1967; Batty 1980b; Winterbottom 1959; Whiting 1969; Wade 1981)**. In addition to these skills, **Ozores (1955a)** stated that anticipation is essential for all soccer players especially for defensive players. He also suggested that successful players need to

be fast and make accurate decisions. In another related study on how to play high balls by heading, **Ozores (1955b)** investigated the importance of physique and general qualities of good soccer players. He listed the basic fundamentals for training as courage, peripheral vision, good athletic condition, proper timing and equilibrium. **Winterbottom (1953)** has also suggested that because of the changing situations in a game of soccer, it is essential for players to have intelligence.

Goal scoring analysis :

Since games are decided on the basis of goals scored, this aspect of play has inevitably generated much descriptive data. Most goals are scored from within the penalty area and most of the moves consist of less than 4 touches **(Olsen 1988; Bate 1988; Reep and Benjamin 1968)**. This conclusion supports the finding of **Jerome (1971)** and **Ali and Farrally (1989)** that the proportion of successful attempts to score goals was much greater from inside the penalty area than outside, in the world cup games in 1966 and 1986, the 1956 cup final, and the 1960 and 1988 European cup finals. The number of goals scored both inside and outside the penalty area together with the number of touches which led to the goalscoring in the 1986 World Cup in Mexico and the 1988 European

Cup in West Germany are shown in **Tables 1.4** and **1.5**.

Jerome concluded that in each group of matches, the difference between winners and losers was not related so much to what they do outside, as to what they do inside the penalty area. In every one of the 1966 world cup groups, the winning team made far more attempts than the losing team to score from inside the penalty area. While this was not the case for attempts from outside the penalty area **(Kane 1971; Olsen 1988; Bate 1988; Reep and Benjamin 1968)**.

The average number of goals scored in the European Cup in West Germany in 1988 was 2.3 per match. This was similar to the previous World Cup championship held two years earlier in Mexico. It should be noted that the average number of goals scored in these two championships was less than the previous world cup championship held in Spain in 1982 **(Soar & Bone 1986)**. The reason for this is that most of the teams in the European championship and the 1986 world cup employed defending formations, for example 4–4–2; 4–5–1; 3–5–2. In simple terms more players were being employed in back positions and fewer in forward positions. This may place an emphasis too on deploying midfield players with more thought on their attacking ability. It was not uncommon to see eight or even nine players deployed in permanent defensive positions. One needs, of course, very little imagination or tactical skill to deploy nine

Table 1.4

No. of goals scored inside and outside penalty area.

(Ali and Farrally 1989).

	Inside Box	Outside Box	Total
No. of goals scored in the World Cup in 1986.	122	10	132
No. of goals scored in the European Cup in 1988.	33	1	34

Table 1.5

No. of goals scored with 4 or less than 4 touches.

(Ali and Farrally 1989).

	Less than 4 touches	More than 4 touches	Total
No. of goals scored in the World Cup in 1986.	109	23	132
No. of goals scored in the European Cup in 1988.	32	2	34

players in defence.

Typically, successes come from less complicated moves **(Wilkinson 1978; Ali 1988)**. An investigation of the determinants of goal scoring indicated that the feature most common in goals was first time shots close to goal, followed in importance by headers **(Wilkinson 1978)**.

Pollard et al. (1977) suggested that a long sequence of passes was not necessarily the best tactic. If the pitch was seen as divided into four transverse quarters, 50% of goals came from passing moves originating in the quarter nearest the goal. Of these, 50% came from regaining possession from the defence in that area **(Reep and Benjamin 1968)**. Consequently, exploiting defensive errors seems to be a prolific source of goals, as is the astute use of set-pieces near goal which results in low pass-moves. Results support a direct method of attack to quickly reach the opponent's goal area. A long high kick into the opponent's penalty area presents a situation of high unpredictability for the defence and so weighs its value as a gamble in favour of the attack.

Russell (1988) studied passing movements in relation to strikes at goal by analysing ten video recordings of live televised international football matches. He recorded the number of passes for each team when in possession of the ball by using a notation system and computer program technique. The results showed that 80% of

goals and strikes at goal originated from passing moves of four or less. Results concerned with the scoring of goals and styles of play, showed that 22% of goals were scored from set pieces, and that the successful teams made similar passing moves to unsuccessful teams. The successful teams also made similar numbers of strikes, but scored more goals. Unsuccessful teams had significantly more set pieces. The author suggested that the most successful style of play in international competition was to concentrate on defence, using the occasional attacking break to create effective strikes at goal. Well practised set plays were also recommended.

The task of goal scoring falls heavily on strikers, although midfielders are often used to assume positions from which goal attempts might be made. Centre backs are frequently employed in set–piece plays in attack with the expressed purpose of heading goals. An analysis of goals scored from different team positions in 3,192 English League matches played over a decade indicated that the centre forward accounted for 32%, the inside forward for a further 40%, and the two wingers for 23% of the total number of goals scored **(Cohen and Dearnaley 1962)**. The outfield formation common in this period was two full-backs, three half-backs, two wingers, two inside forwards and the centre forward. The least productive position was fullback while the left-wingers scored significantly more goals than the right-wingers. Whether this

indicated the assymetry in offensive moves was not clear from the results. Further analyses may indicate optimal employment of striker characteristics in current team configurations.

It should be noted that goal scoring analysis will provide few data points for the entire game. It could be more fruitful to study broader aspects of success within the game. In this respect success can be viewed as producing attacking patterns that culminate in a shot at goal. It may also include negating the opposition's attacks or denying the opponents space to set up scoring opportunities.

Factors influencing game strategies :

Tactics could be defined as the art of planned and rational play, adjusted to meet actual conditions in the manner best suited to achieve optimum results. They could be developed to a considerable degree by suitable activities such as coaching and practising. The immense importance of experience is shown by the way in which senior players can employ tactical ability to compensate for lack of or inferior technique in some departments of the game.

Tactical experience is relative. Players may be almost perfectly trained technically and physically and yet be incapable of making the maximum use of their knowledge in the interests of their team. Other players with less developed technique and insufficient

physical condition can contribute more into a game because they have the ability to exploit these more limited capacities rapidly, on a wider scale, and in a manner adapted to meet the needs of a given situation.

Obviously soccer is a team game and it follows that the efforts of the team must be concentrated on a single common purpose. To achieve maximum results the team is required to play according to a plan or a conception of play agreed on beforehand. The main problem with analysing soccer is the existence of large numbers of potentially interacting variables. However, there are several complex and multi-factor problems which the analyst will face when trying to analyse the game and in particular the effectiveness of a team's performance. Some of these factors (i.e. player transfers, the size and the quality of the pitch, a change of a team manager, the form and current league position of a team, etc.) are quite difficult to control because they are unpredictable; these factors will be discussed in detail below.

Players transfers will be more of a problem for the poorer clubs than the bigger, more financially sound clubs. The bigger clubs will be able to sign star players whenever they need them, often from one of the poorer clubs.

At certain stages of a game, success may depend on the actions of a single player. It is important for the goalkeeper to be able to anticipate a shot correctly or for a defender to be able to make a successful tackle on a forward when he is the last obstacle before a goal. It is of equal importance that a forward should be a good dribbler, capable of creating scoring opportunities, and converting such opportunities into goals.

The venue, the size and the quality of its pitch, is another problem. This applies to other sports too, but it is doubtful whether it varies to such an extent as in association football. One of the external factors exercising an influence on tactics is the size of the field of play. Most of the professional teams have their own field. They not only train there, but at least half of their games are played at the home ground. The players are accustomed to the dimensions, the surface and the feel of their own ground, and home game tactics are shaped accordingly. That is one aspect of what could be called the advantage of the home ground. In away games, the tactics which were so successful at home may fail under unusual circumstances. The measurements of the field of play and other conditions are all factors to be reckoned with when giving tactical instructions to the players before the game.

Tactics should be adjusted to the dimensions of the field of play. A good sized field is particularly suitable for the building up of fast attacks with long passes. It also favours a team in good condition. On a large field the attackers are in a much more favourable position than the defenders. Tactical experience, however, plays a vital role on a small sized field. Passes have to be taken in a relatively confined space, with opponents much closer and ready to challenge for the ball; and because there is so little room in which to work, passes must be especially accurate. Dribbling, feinting and shooting at goal are all made more difficult when there is less space to work in, and long passes from behind are seldom successful – short and accurate passes should be used. The defence line can only be broken if the forwards are constantly on the move and switching position frequently. Normally, a field of small dimensions puts the defenders in a favourable position, while the forwards are greatly handicapped. Generally even the most experienced forwards are reluctant to play on the small sized fields in the provinces.

The quality of the ground is another factor exerting an influence on tactics. For example, most of the grounds are soft and grassy which has unpredictable effects on the ball. Therefore, the players keep the ball in the air as much as possible.

The venue of the game, that is, whether the match is to be played at home or away, also determines the tactical approach. The size and the quality of the home field which the players are familiar with, the spectators and the home environment, can be of great psychological assistance to the players, giving them added confidence. Under such circumstances, the team can usually adopt much bolder tactics.

The form of a team, that is, whether the team has all its players in good shape physically, whether the team is performing well in current matches, the team's position in the league and whether there is a chance of promotion or of qualifying for a place in a European competition or whether there is a danger of relegation, should also effect tactics. For instance, if a team is not in with a chance of promotion or of qualifying for a place in a European competition and also in no danger of relegation, a manager will often try to introduce as many new players as possible to give them a chance to experience first team conditions. At such times, the manager will be more concerned about the future of the team than the actual result.

Finally, a change of manager can greatly affect a team, as each manager has his own ideas on and attitudes to organising a team. These days, it is common for managers whose teams lose in a number of consecutive matches to be replaced.

It should be noted that some of the factors that have been mentioned and discussed above are extremely difficult to control when an analyst attempts to analyse the tactical performance of a team in the game such as soccer. This, however, should not deter researchers from carrying out such analyses, but these factors should be duly noted.

It is often stated that soccer is "a game of opinions" and no doubt many coaches and managers have based, and will continue to base, strategy and tactics on their own opinions. Whilst opinions may be both respected and valid, much more than opinion is necessary in mapping out a strategy for success.

A widely held opinion is that possession soccer (the retention of the ball, often accompanied by many consecutive passes) is the key to winning soccer matches, especially in many European and South American countries. Whilst keeping possession of the ball may be skillful and artistic, it is not necessarily effective in producing scoring chances and goals **(Reep and Benjamin 1968; Hughes 1984; Bate 1988)**.

Some attempts have been made to apply conceptual models in the study of field invasive games **(Wilberg 1975; Wilkinson 1978)**. These have included individual decision theory and game theory. Two major factors are considered in individual decision theory: 1) whether there is enough information to warrant deciding on a

particular move and 2) whether the performer is sure of the priorities or the possible alternatives available. These factors can be presented in a two-sided pay-off matrix. The presence or absence of one or both (decisions with incomplete knowledge and decisions with unsure preferences) determine the amount of risk involved in finally opting for a particular course of action. In play, no one player can predict with certainly the outcome of a given kick or shot. Experienced players can, however, be expected to predict within reason the approximate consequences of their actions, while novice players are less able to decrease the apparent randomness in the outcome of a given action. Experimental results indicate that amateur and professional soccer players do not differ significantly in their self-assessment of shooting skills, although significant mean errors occur in overestimation of their skills by schoolboy players **(Cohen and Dearnaley 1962)**. All players tend to overestimate their skill when the task seems hard and to underestimate it when it seems easy. The agreement between what players actually achieved in shooting and what they thought they could was found to be more pronounced in Manchester and West Bromwich Albion professionals than in university or schoolboy players **(Cohen and Dearnaley 1962)**. This indicates that the margin of hazard more closely resembles the margin of safety in the experienced Soccer players.

Church and Hughes (1988) developed a computer system for analysing the game of soccer to provide useful information to the coach who can formulate strategies and tactics accurately. A BBC microcomputer was used in conjunction with membrane technology in the form of a concept keyboard to overcome the problems posed by the storage capacity of the micro. A sample of six matches of an English first division league team was analysed from video tape recordings of their games. It was concluded that their system could provide the coaches with immediate feedback, tactical evaluation and technical evaluation.

The game system is defined as the general form in which players' attacking and defensive actions are organised, by establishing a precise arrangement of certain tasks (positions and field coverage) and certain principles of co-operation between them. The game system is the basic structure of collective team tactics. In soccer these arrangements refer most often to a formal distribution of positions and field coverage among various players, as expressed in team structure. These are described in systems such as WM, 4–2–4; 3–5–2; 4–3–3; 4–4–2 and 5–3–2 **(Ali 1987; Sledziewski and Kisonda 1983; Lodziak 1966; Frantz 1975; Rippon 1983; Rissing 1984; Winkler 1988; Morris 1980; Talaga 1977)**, which illustrate with more or less precision the strategy the manager has chosen.

The German analyst, **Winkler (1984)** tried to discover if he could find out which playing system a future opponent would use. He used video tape recordings of two successful teams, deliberately choosing those with an acknowledged high level of play : Brazil, selected by the experts as having the best playing system at the 1982 World Cup Tournament, and Hamburg SV, from the 1984–1985 season. **Winkler** found that it was not possible to assign wing defenders and midfield players to positional groups because of the similarities in their tasks. For example, a 4–4–2 system during the match could convert to 2–6–2 or 2–3–3–2. Citing a new definition of the playing system, he suggested that the playing system should be the objective and should decide the precise distribution of the individual playing area of each player on the pitch. By relying on this definition, it is possible to give ones own team a fairly exact description of the behaviour of a future opponent, and, by using a video recorder, it is also possible to show players their own team's errors.

In decision theory, incomplete knowledge and unsure preferences interact to present two guises, depending on the decision being made. The first is based on an attacking strategy referred to as "maxi-min." Here the player attempts to obtain maximum gain with minimum opportunity of failure. This may mean that the gains decided on are conservative and have a low risk or a high likelihood

attached to them. "Mini–max" is the second type of decision often apparent in defensive strategies. A minimum amount of damage is accepted while the widest possible defensive cover is provided as, for example, in a typical pass back to the goalkeeper. Soccer players and teams should be able to operate both strategies simultaneously or switch to either rapidly. There is, however, little empirical data on their applications in match play.

Pollard et al. (1988) compared the playing styles of all 22 teams in the English first division league during 1984–1985. They recorded the performance of soccer matches in detail by using a notation system technique **(Reep and Benjamin 1968)**. Computer analysis produced a correlation matrix giving a measure of the similarity of style between each pair of teams playing each other. Classification analysis was used to group the teams according to similarity of playing style. The results indicated considerable variation between the playing style of the teams. For example, frequency of the long forward pass was high in certain teams (Sheffield Wednesday, Watford and Ipswich) and low in others (West Ham and Norwich). The pairs of teams with the highest similarity measures, and hence most similarities in style, were Watford and Sheffield Wednesday; Leicester and West Ham; Coventry and Norwich. The two teams whose styles differed to the greatest extent were Watford and West Bromwich.

Harris and Reilly (1988) investigated the contributions of variables associated with space on the pitch and teamwork to attacking success. Altogether 180 attacks divided equally into three hierarchical success categories were monitored. All of the games involved top European club teams or national teams. Data was collected from video-tape recordings of the game. The variables associated with space were measured both in relation to the player in possession and the attack as a whole, whereas the teamwork variables were calculated from the relative change in numbers of the attacking to defending players. The data were collected at specified intervals during an attack and were then summarised to present average values for the final data points and the attack content. The results showed that both space and teamwork discriminated between the three levels of attacking success. Data suggested firstly, that teams try to create space when attacking, and deny it when defending; secondly, that they support each other in attack, and in defence attempt to dispossess the opponents when they are unprepared; thirdly, attacking players try to pass the ball through or behind the defence to a team-mate; and finally, forwards are willing to try and pass their marker if need be in space.

Summarising these findings mentioned above it is clear that most of the soccer coaches' and managers' opinions on strategies of the game are doubtful. At present in many fields including business and

the military, a factual appraisal of the situation is a necessity before any policy is embarked upon. Why is this not the case in the game of soccer which has grown into a multi-million pound part of the entertainment industry? One believes that team strategies and consequent results of the game should be based on valid and objective methods to provide comprehensive information.

Summary :

It is clear from the available literature discussed above, that a great deal of study has been conducted on individual physical characteristics, aerobic fitness and movement analysis. Due to the various methodologies utilised, some studies are more objective and relevant than others (e.g. **Reilly and Thomas; Withers et al.** as opposed to the earlier studies of **Vinnai** and **Winterbottom**).

Other studies have tended to concentrate on individual techniques and goal scoring statistics. However, soccer is a team game. Little research has been carried out into the interaction of the team as a unit, and the various patterns of play adopted by players as a team, in both attacking and defending situations.

Analysis of such patterns could be utilised to identify successful strategies, the adoption of which could eliminate weaknesses in a team. Managers and coaches should base their team plans on such analyses, enabling their teams to counter the game plans of the opposition; creating many goal scoring chances and providing the team with opportunities to optimise its attributes.

1.3 STATEMENT OF THE PROBLEM :

The main purpose of this study is to investigate attacking and defending patterns in free movement and set plays, in relation to success and failure in soccer. This study was divided into two stages:

Stage one: To identify patterns of play; to find out whether there are any similarities or dissimilarities among successful and unsuccessful teams.

Stage two: To analyse the teams in home and away situations and compare their patterns of play.

This study was limited to five Scottish premier soccer league teams and an international team during the 1987–1988 season.

1.4 HYPOTHESES OF THE STUDY :

The hypothesis of the research in this study is that patterns of play are related to success and failure in soccer at professional level. More specifically, this study attempts to test the following hypotheses:

(i) Successful attacking patterns are common to all teams.

It is expected that all the teams will have the same successful patterns of play. However, it is possible that each team has a range of patterns of play some of which are unique to that team but it may be that the successful patterns of play are the same for all the teams. Possible reasons amongst others for all the teams having the same successful patterns of play are that all the coaches are from the same coaching school and the style of the game may be known because the league in which the teams play comprises only ten teams.

(ii) All the teams have similar defensive strategies.

For reasons similar to those given above for attacking patterns, it is expected that all the teams will have the same defensive strategies. Differences between the better and poorer teams may be associated with the ability to be able to adopt defensive strategies successfully.

(iii) Teams employ the same attacking and defending patterns when they are playing at home and away.

It is commonly believed that teams play differently in home and away matches. However, it is hypothesised that teams are playing to the same patterns but the emphasis between attacking and defending changes in home and away.

CHAPTER TWO

MATERIAL ANALYSIS TECHNIQUES AND METHODOLOGIES

2.1 REVIEW OF MATERIAL ANALYSIS TECHNIQUES :

Notation system analysis :
Paper and pencil recording system :
Computerised system :

Visual analysis :
Video analysis :
Film analysis :

Summary :

2.2 METHOD OF THE STUDY :

Data collections and recording :
Notation symbols :
Paper and pencil technique :

Data conversion :
Grid :
Procedure of data conversion :

Data storage :

Data analysis :
Computer programs :
Specification of the two computer programs :
Graphs :

Final actions symbol :

2.1 REVIEW OF MATERIAL ANALYSIS TECHNIQUES :

The major problem with attempting to analyse team games is the existence of large numbers of potentially interacting variables in any one game. This illustrates one of the problems encountered by the analyst when he/she analyses the game. Only after a critical event does a previous event become retrospectively important. Events unfold in time; thus the sequential nature of information that is available from the sports activity places undue stress upon the memory system of the analyst. Due to the enormity of this information processing problem, few sports science researchers have attempted to develop a team game method in a conceptual manner, with the intention of using that method to guide subsequent analyses.

Franks and Goodman (1984) attempted to help different sports establish their own system of analysis. Several tasks that could be used as a guide for the coach in developing a sport-specific system were outlined. The first were tasks related to the evaluation and establishment of priorities among the key factors of performance. They illustrated how these tasks could be carried out in a team sport such as field hockey, by examining team possession of the ball (i.e. how or where the possession was gained or lost).

The liaison between the technical experts in specific sports and the sports scientist is a crucial feature at this stage of process. This ensures that the information that is collected during the competition is relevant, not only for the statistical purposes but also for the coaches continuous monitoring and modification of performance. **Gould and Greenawalt (1981)** emphasised such interactions but for different reasons:

There are many examples in the history of science where the methodological perspectives of one field have helped to enlarge and inform the content of another.....Clearly, our own particular perspective bears upon the analysis of team games, but each of us acknowledges and learns from the other....We believe that team games are phenomena that a number of scientific perspectives can illuminate, and we would argue, out of our own direct experience, that cross disciplinary approaches be explored much further.

Sports can be developed, that is, more logical, rational and efficient forms are still sought. It is the role of the trainer to help this evolution. For that reason he/she needs observation techniques, so that progress can be accelerated. Other reasons include pin pointing strengths and weaknesses of their own teams and their opponents as well. For individual and team sports feedback could provide coaches with enough information to build up team strategies and a training scheme.

Match analysis methods range from the very simple to the highly complex. The analyst must first decide what he/she wants to know and then determine the type of system which should be used. The use of technology does not necessarily make the analysis more or less difficult or sophisticated, it may indeed tell us less than we can see for ourselves. But technology can often improve the efficiency, depth or speed of analysis and therefore should at least be considered.

In the following sections, various types of method will be defined and described in detail and examples for both individual and team sports will be discussed, considering in particular their relevance to the analysis of soccer. Although not a great deal of literature related to the tactical aspects of soccer is available, it will be useful to survey studies which have been conducted in related areas.

Notational system analysis :

Notational analysis is the recording of certain events within a game by tallying them on paper or putting them into a computer and then producing figures to describe the aspects of performance associated with the events recorded. This system can use either a paper and pencil or a computer-based technique.

Paper and pencil recording system :

Paper and pencil records have been used by generations of researchers, and by managers, coaches, bench players and keen spectators, usually to produce player statistics. Paper and pencil methods are quick and cheap and they can be used effectively by a well trained observer involved in obtaining information – a well-trained observer's errors are negligible. Inexperienced observers however, often miss essential events.

The production of a permanent paper record of match events requires the use of a system of notation. Such systems can be simple, or may be elaborated for recording very complex movements of some events. Notation is useful for providing quickly stored and easily translated records: it comprises symbols recorded in various formats, often using vertical or horizontal linear layout in grids or charts. Several hours of practice are needed for the observer to become reasonably competent at using a basic notation system. Various methods have been developed for different reasons in many sports, some of these are described as follows.

A simple method of charting information about the start and finish of rallies was devised for the game of tennis **(Doherty 1981)**. This kind of system allows statistics of success to be calculated quite easily, and

also allows an objective assessment of which shots were winning rallies outright and which shots were executed as unforced error.

In earlier studies on tennis, **Downey (1970)** devised a tennis notation system which has since been adapted for badminton and used as a basis for coaching. **Sanderson (1983)** used a squash notation based on stroke symbols charted into multiple diagrams of a squash court: a streamlined squash notation was subsequently devised by **Mackinnon (1983)** and used for post match analysis.

Those researchers mentioned above have studied racket ball games. Their aim was to lend some objectivity to the coach's words, irrespective of his personal authority, so that the player would find it more difficult to dispute or ignore the evidence. To this end, the idea of a comprehensive stroke notation system was explored. To be useful, this would have to allow skilled observers to record strokes, rallies and games in written form by means of a specially developed shorthand. It was envisaged that the recorded information would allow systematic analysis of a player's performance in terms of, for example, the length of rallies, the kinds of strokes played and relative efficiency of the strokes. It was expected that summarised feedback information, useful to the players, could be generated immediately after the match (see **Table 2.1**).

Notational and charting systems have also been developed in selected sports **(Hall 1981; Sanderson and Way 1977; Downey 1973; Hughes 1988; Reilly and Thomas 1976b; Hughes 1985a; Sanderson 1983; Mackinnon 1985; Taylor and Hughes 1987; Thornton 1971; Hutchinson 1970)** which no doubt owe something to the original ideas of **Laban and Lawrence (1947)**, in effort analysis.

A notation system can be used to ask general questions about the

Table 2.1

Example of feedback information provided to the player (PH) within a short time of the completion of his match. From (Sanderson 1983)

Game	Strokes	Rallies	Strokes/rally	Scores
1	217	20	10.9	4–9
2	149	16	9.3	3–9
3	159	23	6.9	6–9

	PH		VS. DC	
Game	Errors	Winners	Errors	Winners
1	5	2	6	8
2	5	3	2	5
3	4	6	2	8
Total	14	11	10	21
W/E Ratio	0.8		2.1	

Coding

W – Winners

E – Errors

PH – Player

DC – Player

VS. – Versus

nature of performance in a given sport. In a study of karate **(Genery and Alderson 1985)** all the moves used by the fighters in an international competition were noted using paper and pencil techniques. Symbols were invented to denote the twelve single or combination techniques in this form of karate.

When all technical moves were recorded, they found that two of the techniques taught by coaches were not used at all in the competition, a third technique was used only once, a fourth only twice. In the latter two cases the techniques did not score. An astute coach might ask why these techniques survive in the training repertoire and might make adjustments to future coaching sessions on the basis of such results.

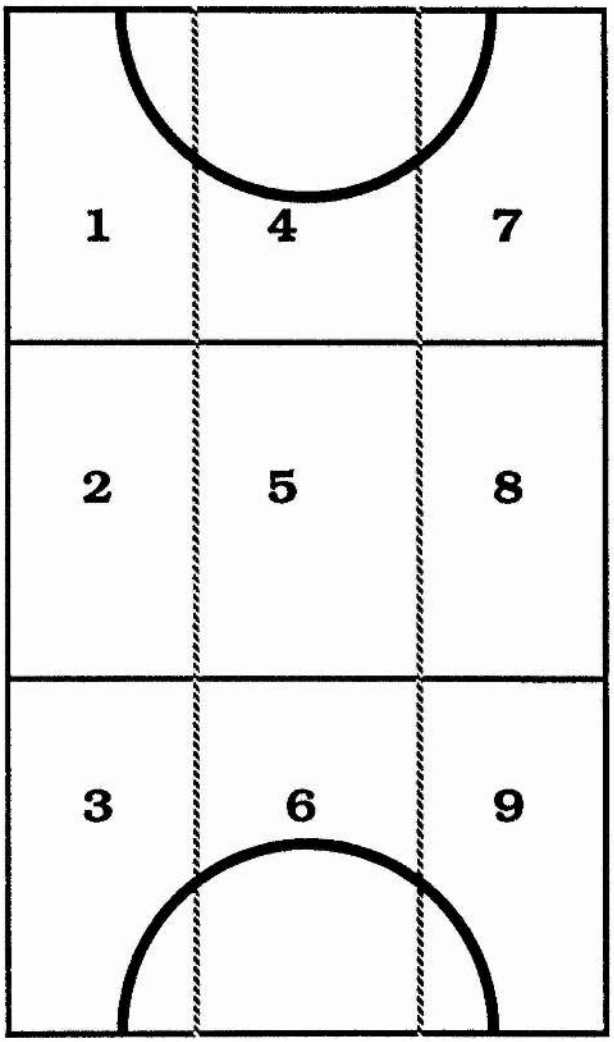
A netball coach **(Potter 1985)** was interested in comparing the pathway of the ball after the centre pass in schoolgirl games with the pathway advocated in the coaching books. Having numbered each player and divided the court into nine areas, she was able to chart the centre pass possession by player and area. It was reported from the coaching manual that scoring opportunities should result from direct attacks down the centre of the court using possessions of only three or four passes, including the centre pass. **Potter** reported that, the squad showed a tendency to veer to the right side of the court, despite having been coached to use the centre route. This analysis raises the question of whether the team should in fact be coached to attack down the centre, since this was not its most successful route.

A number of examples on notation methods are shown in **Figure 2.1** and **Tables 2.2.** and **2.3** Perhaps the most astounding collection of match data is that on soccer, compiled from over 2,000 games, over a 30 year period **(Hughes 1984)**. The analysis focused on the number of passes in possessions, and in particular on the location and number of

Figure 2.1

Notational analysis of the pathway of the ball in netball.

From (Potter 1985)



Key to netball notation

7	**GS**	**Goal Shooter**
6	**GA**	**Goal Attack**
5	**WA**	**Wing Attack**
4	**C**	**Centre**
3	**WD**	**Wing Defence**
2	**GD**	**Goal Defence**
1	**GK**	**Goal Keeper**

Route	**Left**	**Centre**	**Right**	**Total**
Positive	14	35	52	101
Negative	15	43	23	81
Total	**29**	**78**	**75**	**182**

Table 2.2

Example of notation system (soccer work analysis).

From (Brooke and Knowles 1974)

Subject :

Date :

Location :

SYMBOLS KEY

5 YARD SPRINT	/
5 YARD JOG	_
5 YARD WALK	.
STANDING	O
5 YARD DRIBBLING	8

Minute	Activity	Sp	Jog	Walk
0 - 1	. . _ . . . . . _ _ _ // . . .	10	20	50
1 - 2	_ _ . . . . 8 8 _ . _ _ OO . . .			
2 - 3	_ . . . . 88 _ . //_ _ O . . .			
3 - 4	_ _ . . . . O _ . _ 8_ OO . . /			
4 - 5	. . _ . . . . . O _ _ _ // . . .			
5 - 6	8. . . / _ . _ OO_ . . _ _			
6 - 7	00. . . / _ . _ 8_ ...O . .			
7 - 8	_. . . . . ///_ . _ 8_ O . . 8			
8 - 9	_ _ . . . . 8 _ . _ 8_ O . . /			
9 - 10	_ _ . . . . O _ . _ 8_ OO . . /			
11 -12	_ . . . . 88 _ . //_ _ O . . .			

Table 2.3

Example of notation symbols (for squash).

From (Sanderson 1983)

		**Backhand and fronthand drive parallel..**
		**Backhand and fronthand cross-court...**
		**Backhand and fronthand drop-shot.**
C	ɔ	**Backhand and fronthand boasts.....**
		**Backhand and fronthand Lobs.**
		**Strokes can have a volley.....**
		**The backhand and drop-boast.....**
		**Forehand and backhand.....**

passes preceding attempts at goal. However, he did not give any indication of how he had obtained the data. **Winterbottom (1959)** used substitute players to analyse his squad. The method he adopted was that each substitute player followed one player and marked down on a card the number of correct and incorrect passes and goals he scored. Further similar studies concerning soccer have been reported by a number of researchers **(Brather 1984; Russel 1988; Jerome 1971; Chervenjakov 1988; Hughes et al. 1988; Volkamer 1971; Hughes and Lewis 1987; Yaffe et al. 1974)**. However, numerous methods have been employed to assess the game demands on players in different codes of soccer. Whilst giving valuable information, the accuracy of these methods is limited by the speed and experience of the analyst in obtaining the data.

The collection of individual skill data on soccer players has been performed for many years. However, the collection of this data has a number of drawbacks. One of these is that generally a large number of observers are required if each player in a match is to be analysed. Also the quality of the activity is not indicated, in terms of the interaction of the ball possessor with other players on the field.

Numerous researchers have analysed and recorded the activity in different codes of soccer for only certain periods of the game (approximately 30 minutes) **(Jaques and Pavia 1974; Saltin 1973; Whitehead et al. 1968)**. It should be noted that subsequent, extrapolation of these results to present full game analysis may introduce a substantial error, since the time period measured may not be representative of the entire match.

Little research has been devoted to improving the methods of match analysis in the sporting literature. The majority have been

concerned with the motion analysis of athletes with the aim of quantifying their work rate **(Winterbottom 1959; Brooke and Knowles 1974; Withers 1979; Thapar and Sharma 1982). Reilly and Thomas (1976b)** serves as an example. They reported comprehensive analysis of the movements of professional soccer players. With the assistance of a stop watch and an elaborately mapped playing surface they recorded such activities as walking, jumping, running and sprinting. Their tabulated results illustrated such features as the frequency of occurrence and the overall distance covered in each activities for each player.

It should also be noted that several researchers have analysed the percentage time spent in a variety of activity for different team sports, namely soccer **(Withers et al. 1982; Mayhew and Wenger 1985)**, rugby **(Treadwell 1988)** and Australian football **(Pyke and Smith 1975; Jaques and Pavia 1974).** Few researchers have reported the mean duration spent in each activity type and the work to rest ratios during the game **(Withers et al. 1982; Yamanaka et al. 1988; McKenna et al. 1988; Mayhew and Wenger 1985)**.

A problem with many previous methodologies is the excessive time required for detailed, objective analysis **(Withers et al. 1982)**. Consequently, the recording of activity patterns and data reduction using a computer is a considerable advantage **(Ali and Farrally 1988; Mayhew and Wenger 1985; McKenna et al. 1988)**. Therefore, assessment of a player's activity patterns during a game should involve video recording of the player's entire game, with a subsequent computerised analysis of the time spent in different types of activity.

Computerised system :

Several match analysts have developed methods which utilise an on-line computer facility. This requires a mains electricity supply plus protection from the elements, but has the great advantage of providing almost instant feedback to the coach and players. Honeywell have recently supplied minicomputer facilities to the BBC for test match coverage of cricket **(Large 1985)**, but the traditional cricket statisticians are only just beginning to experiment with computers. The analysis of team performance in soccer has long been hindered by the continuous and fast movement nature of the game. No such difficulties exist for sports such as cricket, tennis, base ball and American football, where the action is broken down into a series of discrete events, relatively easy to record, and from which performance can be assessed and strategies and tactics developed.

However, the portable microcomputer can provide information and does so virtually immediately. There are two quite distinct aspects: (a) Time saving (b) Immediate feedback. Although some coaches and managers might find computers and electronic devices threatening or confusing, it should always be remembered that they are merely an additional aid to supplement or reinforce their decisions. They will become a regular part of the manager's and coach's armoury.

It is likely that the managers and coaches of the future will select from a range of match analysis methods and may combine two or three to secure the best possible information for their particular sports. Paper and pencil methods remain the most widely used recording system because they are cheap, convenient and flexible. However, the enterprising sport scientists will explore other systems.

Various match analysts have developed systems which utilise an on

line computer facility in order to examine frequency tallies of various features of play in different sports. Mostly for individual sports; squash **(Mackinnon 1985; Hughes 1985b and 1985c)**; badminton **(Downey 1973; Sharp 1986)**; table tennis **(Sharp 1987)**; tennis **(Arbor 1979; Amdur 1979)**; wrestling **(Gardiner 1985; Ichiguchi 1981)**; gymnastics **(Igloi and Odor 1988)**. For example, **Sharp (1987)** attempted to find out whether the BBC microcomputer can be used for a player analysis for individual sports. For example, in table tennis, he wanted to assess the strategic ability of the players and provide them with useful feedback between sets. Specifically, he wanted to know, for example, how many points were won or lost from positive or negative services and how many points were won or lost when the player made the first attacking shot. **Sharp** designed several sequences of computer programs aimed at getting answers to these questions. The system of hardware used was a BBC micro coupled to a concept keyboard which could be programmed for specific data input. The software was written in BBC BASIC, was fully structured and error-taped, and provided disc storage and file-merging facilities as well as screen display and hard copy output. He concluded that this system had been piloted and shown to be very successful for such analysis.

The systems are designed as an aid to the coach's knowledge and decision making skill for the racket games. However, the system has a number of drawbacks, the first of these is that generally a long time is spent in learning to operate the systems, and secondly that there is a limitation on data input speed.

It should also be noted that this kind of system may be used to a certain extent for team game sports (for example, in a game of soccer by assigning one player in a match and analysing his skill or motion).

A computer system has also been used in team sports. However, it should be mentioned that these results were based on observations of only one player during the same game: basketball **(Kemp 1985; Hughes and Feery 1987; Brackenridge and Alderson 1983)**; lacrosse **(Brackenridge and Alderson 1983)**; volley ball **(Ariel et al. 1983; Linda 1980; Vojik 1980)**; hockey **(Morris and Bell 1987; Franks and Goodman 1986; Franks and Nagelkere 1988; Hughes and Cunliffe 1987 and 1986; Hughes and Billingham 1986; Franks et al. 1987; Franks 1988; Brackenridge and Alderson 1983)**; soccer **(Franks et al. 1983a; Hughes 1984; Brackenridge and Alderson 1983; Miller et al. 1978)**; American football **(Hughes and Charlish 1988; Bedingfield et al. 1982)**; Australian rules football **(McKenna et al. 1988; Patrick and McKenna 1988; Patrick 1985; Patrick and McKenna 1986)**; rugby union **(Hughes and Williams 1988; Treadwell 1988)**. All the techniques employed by the researchers mentioned above were following one player at a time or the path of the ball and recording the behaviour of the player in sequential order for the entire game.

Typing match details into a conventional computer keyboard is only one way of inputting data. It can be laborious and, since mistakes are inevitable, programs must include error trapping routines. Other input devices are available which will cut out certain stages in the procedure and might also prove faster and more accurate.

One such device is the concept keyboard, a smooth-surfaced, touch-sensitive pad on which any grid or diagram of the match area can be superimposed. The keyboard is connected to the computer so that merely touching its surface triggers an input. The potential of such a device for analysing individual players is exciting, but as yet only a few sport researchers have begun to explore its possibilities.

However, the most common data entry device of computers is the **QWERTY** keyboard that is seen on most typewriters, although other devices exist. For example, **Rochester et al. (1978)** designed a "chord" keyboard that could be operated by one hand at very high speed. Also, various positioning devices, such as the "mouse" **(Newman and Sproull 1973)**, light pen and touch pad, may be preferable data entry systems for applications such as mapping out the path of a ball or the movement of players during match play. In addition an increasingly sophisticated class of devices presently being developed is known as "voice input". This has some problems, because of its speed of recognition and limited vocabulary. However, many of these problems are being overcome and in the near future voice recognition systems may be specifically tailored to collect event-related data in various sports. It should also be noted that all of the devices discussed above are specifically useful for the analysis of individual athletes in individual sports or of one member of a team in team sports, for example, by observing one player at a time and collecting data from him in terms of his skill or work rate.

There are several advantages and disadvantages of using micro computers in comparing film or video analysis methods for analysing sports. These advantages and disadvantages are listed below:

(i) A micro computer is cheaper and easier to obtain than the film and video methods.

(ii) A micro computer is portable and can be more easily transported to the game than the on-line system.

(iii) More appropriate equipment for analysing racket ball games and skill in interactive games.

Disadvantages

(i) This method has a limited data storage capacity as far as its memory is concerned, particularly when it is used for obtaining the data for team sports such as soccer which consists of a large number of players and numerous features to be observed.

(ii) Micro computers present difficulties which do not accompany film or video methods. The recorder will be required to observe and collect the data simultaneously for the duration of the live game. Using the film or video methods the researcher has time to analyse the data more objectively once the initial filming has been done and to review the game retrospectively.

(iii) Limited for studying the strategies of games in general and soccer in particular.

Visual analysis :

The quality of both observing and analysing is crucial to the success of the interpretation. To be effective the observing and analysing must be accurate and objective. Because of the limitations of human eyes, ears, attention span, concentration and memory, it is difficult for a match analyst to observe a match accurately and objectively. **Franks et al. (1983b)** states:

> **During a game many occurrences stand out as distinctive features of action (highlights). These range from controversial decisions given by officials to exceptional individual technical achievements displayed by players. Whilst these types of occurrences are easily remembered, they tend to distort the coach's assessment of the game in total.**

Franks et al. further suggested that most of the events which are remembered after a game are those associated with highlights, these would be subjective and misrepresent the facts **(Hughes 1984)**. These findings support those in other fields that the human, as a species, misses a lot of potentially important information when trying to watch relatively complex events. However, it can be argued that coaching should profit from the use of systems of recording a match which are more effective than simply watching and remembering highlights.

The visual analysis was divided into the following:

Video analysis :

An attractive alternative to paper and pencil recording is to make a visual record of the match in order to allow it to be viewed more than once, and if necessary, in slow motion. With the advent of relatively cheap and portable video tape hardware, video has become widely adopted for match analysis and has largely superseded the use of film. Video enables a complete record of the event to be made and analysed conveniently at leisure.

However, some problems could still arise; for example, video equipment is expensive to run; identification of individual players is sometimes difficult and the field of vision of the camera may cause some features of play to be missed. A reliable power supply is needed and a stable platform must be found. Sliding tracks or tripods can be used, although these may restrict the camera angle to a certain extent.

Analysis of the tape itself is a time consuming business, since the feature of interest to the coach must be distilled and the player being observed is just as susceptible to highlighting as when live matches are watched. Despite these difficulties, almost all top-level coaches now

use video recordings of matches at some point in their match analysis. The psychological value of video and the reality of its image make it a powerful means of motivating players when compared with tables or charts generated from notation.

There are several advantages and disadvantages of using video analysis in comparing micro computers or film analysis methods for analysing sports. These advantages and disadvantages are listed below:

Advantages

(i) Although the video analyser is an expensive piece of equipment video tape is much less expensive than cine film.

(ii) The film for a video camera is cheaper and easier to obtain than the cine film.

(iii) It takes less time for data to be reviewed than if the cine film were used.

Disadvantages

(i) Researchers may have problems gaining permission to take the equipment into the soccer grounds to film the match.

(ii) Since a video recording involves a number of stages. Initially, one player or path of the ball is followed throughout a match using the zoom facilities of the camera and recording is subsequently carried out. This task will therefore require extra people for filming.

Film analysis :

Sport scientists working in kinesiology have perfected techniques to dissect individual skill executions into minute parts, and to describe the motion in each of those parts through the determination of angular displacements, velocities and forces responsible for the

motion. We know that long jumpers spend 0.11 to 0.14 seconds on the take off board **(Bedi and Cooper 1977; Grieve et al. 1975)**, that a placekicker is in contact with the ball for approximately 0.015 seconds **(Roberts and Metcalfe 1968; Barton et al. 1988)** and that an athlete released the discus at an angle of 35 degrees and a velocity of 80 feet per second in a 200.5 foot throw **(Terauds 1975)**. These and similar findings have enabled biomechanic researchers to seek minute changes in movement patterns which have large effects on success or failure **(Ross et al. 1985; Schmidt 1988; Gentile 1972)**. Such information can then be interpreted by coaches in more practical terms **(Rothstein and Arnold 1976; Bilodeau 1966)**.

The analysis of individual athletes, whether they are competing in individual events or as members of a team, encompasses many diverse areas. The athlete exhibits many overt responses during competition. These range from technical events such as skill to the physiological response of a heart beat. As the interaction of all responses is integral to the completion of any one goal-oriented act, it is necessary to take many simultaneous measures of performance during the event itself in order to reflect the totality of human endeavour. This same point was made by **Smith and Smith (1969)** when discussing research on feedback mechanisms of athletic skill:

> **I would go even further to encompass the hopes and expectations of people in science for the past 100 years who tried to follow the Helmholtz tradition of dissecting out particular mechanism of the body so that they can be observed more or less in isolation. The tendency of psychologists to try to follow this tradition of simplification is not yet dead although the ideas are inadequate for the goals that were initially set–namely, that through such dissected research one never really arrives at principles that will tell you how different parts of one system are tied together and what the principles of organization are.**

Figure 2.2 shows an illustration of individual analysis in assessment of the potential areas of research.

The quest to provide coaches with information which is useful in improving skills has led to the accumulation of large amounts of complex and expensive research equipment in several laboratories. High speed 16 mm cameras, electronic digitising systems, computers and their accompanying printers and plotters make precise descriptions of performance available hours after the event.

There are several advantages and disadvantages in using the film analysis method in comparing micro computers or video analysis methods for analysing sports. These advantages and disadvantages are listed below:

Advantages

(i) This method is as good as the video analyser method.

(ii) With the help of a digitiser there is less chance of error occurring during the accumulation of data.

Disadvantages

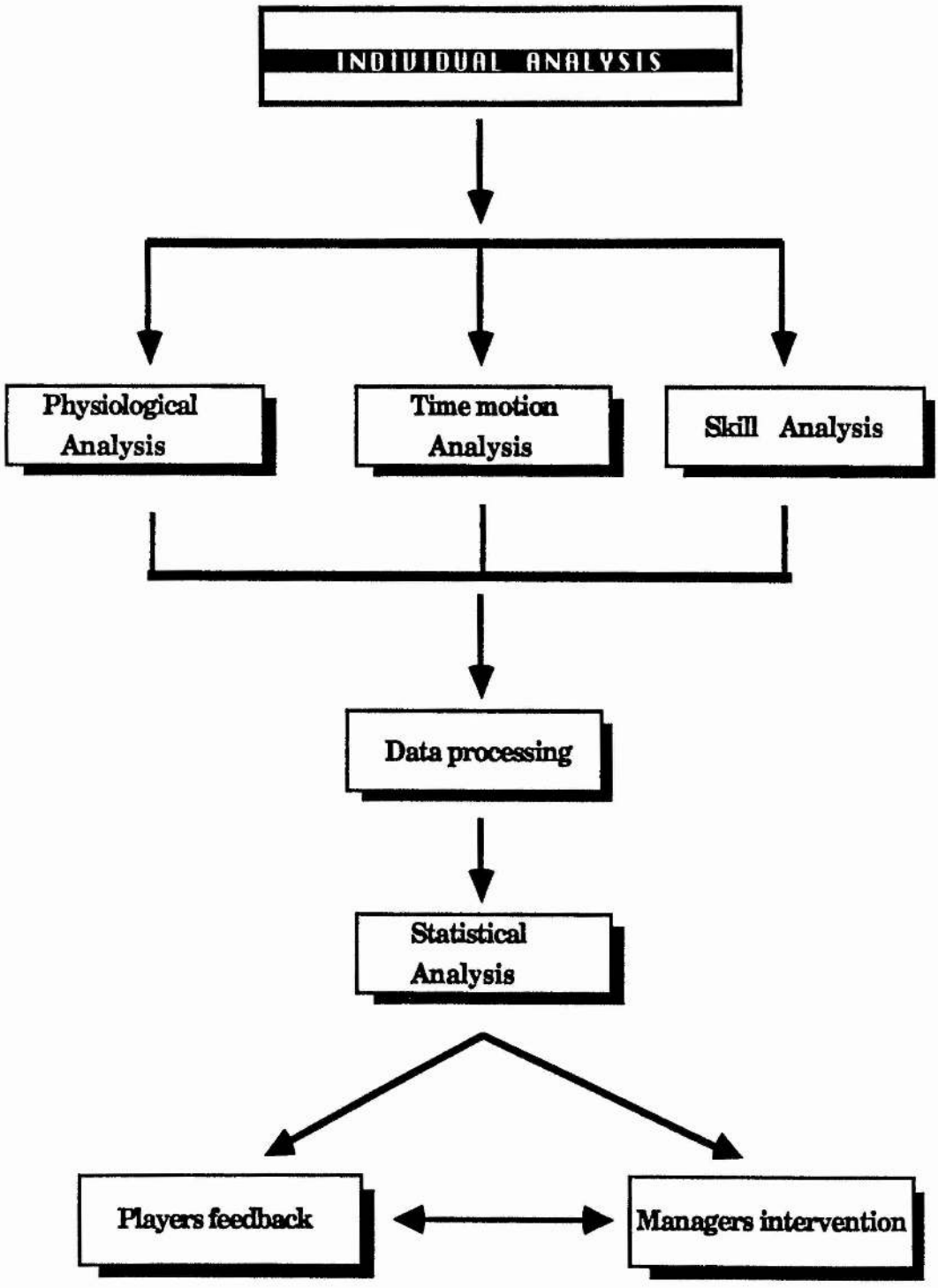
(i) Equipment is usually very expensive.

(ii) Researchers may have difficulty taking the equipment into soccer grounds. Some clubs are reluctant to give permission to have their matches filmed.

(iii) Filming analysis involves a number of stages. Initially, one player or path of the ball is followed throughout a match using the zoom facilities of the camera and recording is subsequently carried out. This task will therefore require extra people for filming.

Figure 2.2

Diagram describing the components of individual analysis.



Summary :

Comparatively little research has been devoted to improving the methods of match analysis on soccer in the sporting literature. The majority of researchers have been involved in developing methods for analysing individual sports and racket ball games. It should be noted that those researchers who have been involved in analysing soccer, have subjected one player at a time for analysis during the game with the aim of examining and evaluating his skill in performance or the proportion of his time spent running, jogging, walking and his work rate.

However, since the present study is aimed at examining the strategy of an invasive game such as soccer, there is little advantage to be gained by studying one player in isolation if an assessment of tactical parameters is required.

2.2 METHOD OF THE STUDY :

Particular difficulties arise when trying to analyse interactive games such as soccer. Up to twenty-two players may be moving at once, and a player who does not have possession of the ball may be just as vital as a player who has possession of the ball. This problem can be overcome by assigning one observer to each player but although this has been attempted by some coaches, results are very difficult to collate **(Winterbottom 1959)**. Another approach to the problem is to devise match analysis methods which focus on the pathway of the ball.

The paper and pencil system is one of the simplest methods of recording information about team and individual sports analysis. These methods are quick and cheap, and can be used effectively for analysis, especially when the observer has mastered the technique. Also, very little practice is needed to become reasonably competent at using the

system. This kind of system allows statistics of success and failure to be calculated quite easily; it also allows an objective assessment of which features of the game lead to winning outright and which of the other features are executed as unforced error to be made. One of the other advantages of this method is that it is useful for providing quickly stored and easily translated records.

Since the present study is attempting to examine the patterns of play for attacking and defending for different teams and the method of the paper and pencil which is known to be one of the most suitable, practical and efficient for such analyses, the following method was selected.

The notational method for this study is based on a technique which was devised and used by **Ali (1985)**. This technique was further developed and some modifications were made. The detailed explanation of the method and the field work of the study is divided into the following sections:

Data collections and recording :

The data collection and recording technique was as follows:

Notation symbols :

For analytical purposes, a standard pitch size of one hundred and four metres long by sixty-four metres wide for all pitches in this study was assumed, as shown on the diagram sheet **Figure 2.3**. Seventeen game features were identified and each was assigned a shorthand symbol, as shown in **Table 2.4**. These notation symbols allowed specific information to be noted down sufficiently quickly to ensure that all movements in the game were recorded.

Paper and pencil technique :

For live matches the researcher was in a stand reasonably high above

Figure 2.3

Scale of the soccer pitch.

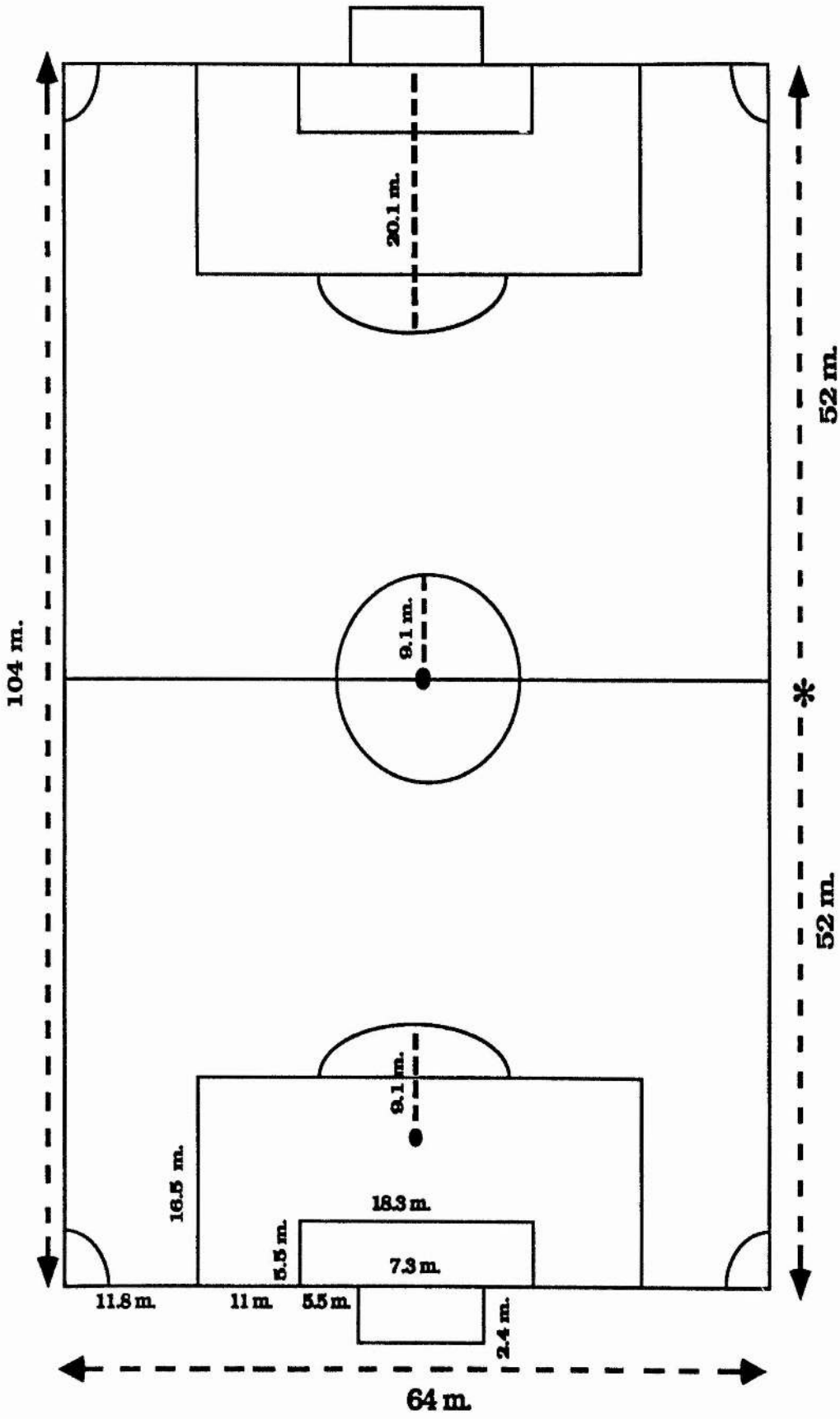
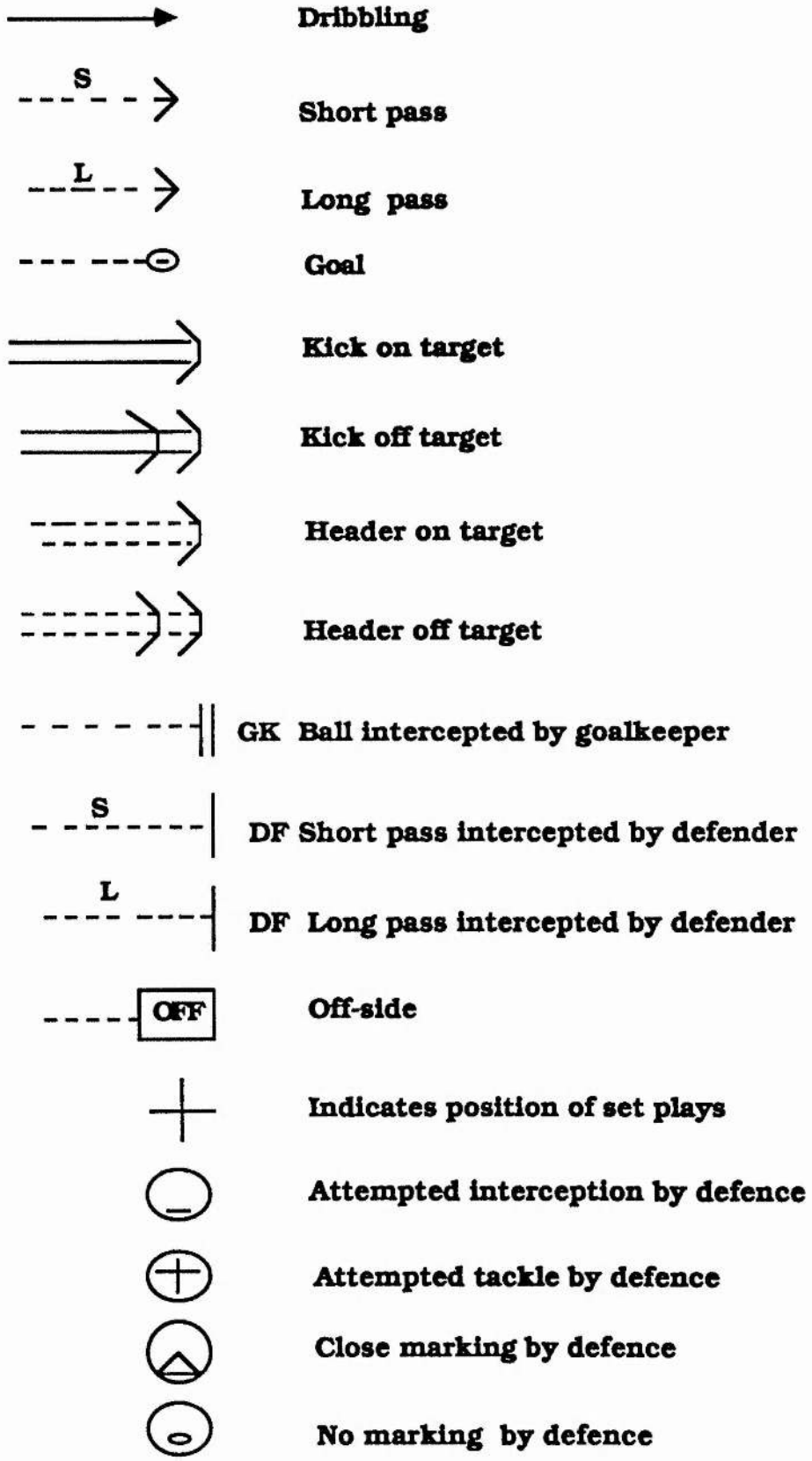


Table 2.4

Shorthand symbols.



the pitch and close to the centre line. He had an extra seat which gave him more space for free movement and for storing papers. The clear view afforded by the position facilitated marking the precise movement of the ball on the diagram sheets (see **Figure 2.4**).

The observer had two stacks of diagram sheets for each match, one stack for each team. As soon as the match started, the observer began to note on diagram sheets the movements of the ball for both teams while attacking and defending using the notation system. It should be noted that each attacking move with defending response was drawn on the same diagram sheet, then later the diagram was treated as two separate moves, one for attacking and the other for defending. Each movement was noted down, and drawn on a separate diagram sheet by using the notation technique. The symbolic notation, allowing specific information to be marked down as quickly as possible, is shown in **Figures 2.5** and **2.6.** All the movements during each match were drawn and sequentially numbered on these sheets. It should be noted that an attack was defined to begin when a team gained possession (for example: goal kick, throw-in or free-kick) and continued until either the other team gained possession or the ball went out of play (corner-kick, throw-in or free-kick). Consequently, there may be a number of attacks from the same team which follow on consecutively. It was not possible to link consecutive attacks because constraints were imposed by the software and the memory of the computer.

Data conversion :

The data conversion technique was as follows:

Grid :

For the purpose of analysis, a grid of fifty-two squares long by thirty-two squares wide, as shown in **Figure 2.7**, was drawn on transparent graph paper and superimposed on to the diagram sheet,

Figure 2.4

Exhibit of the technique of recording data in a live match.

Figure 2.5

Example of notation used for an attacking move.

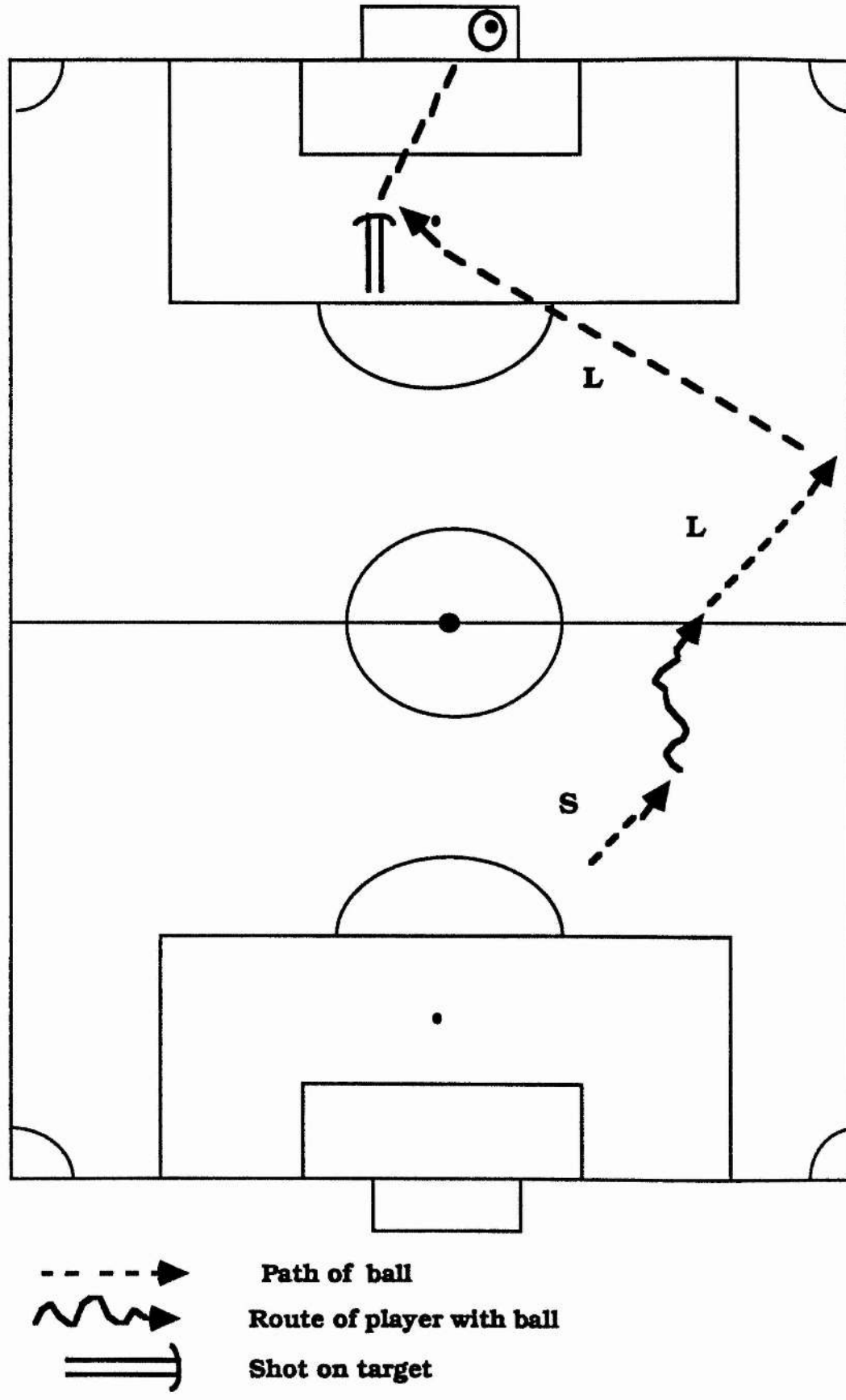
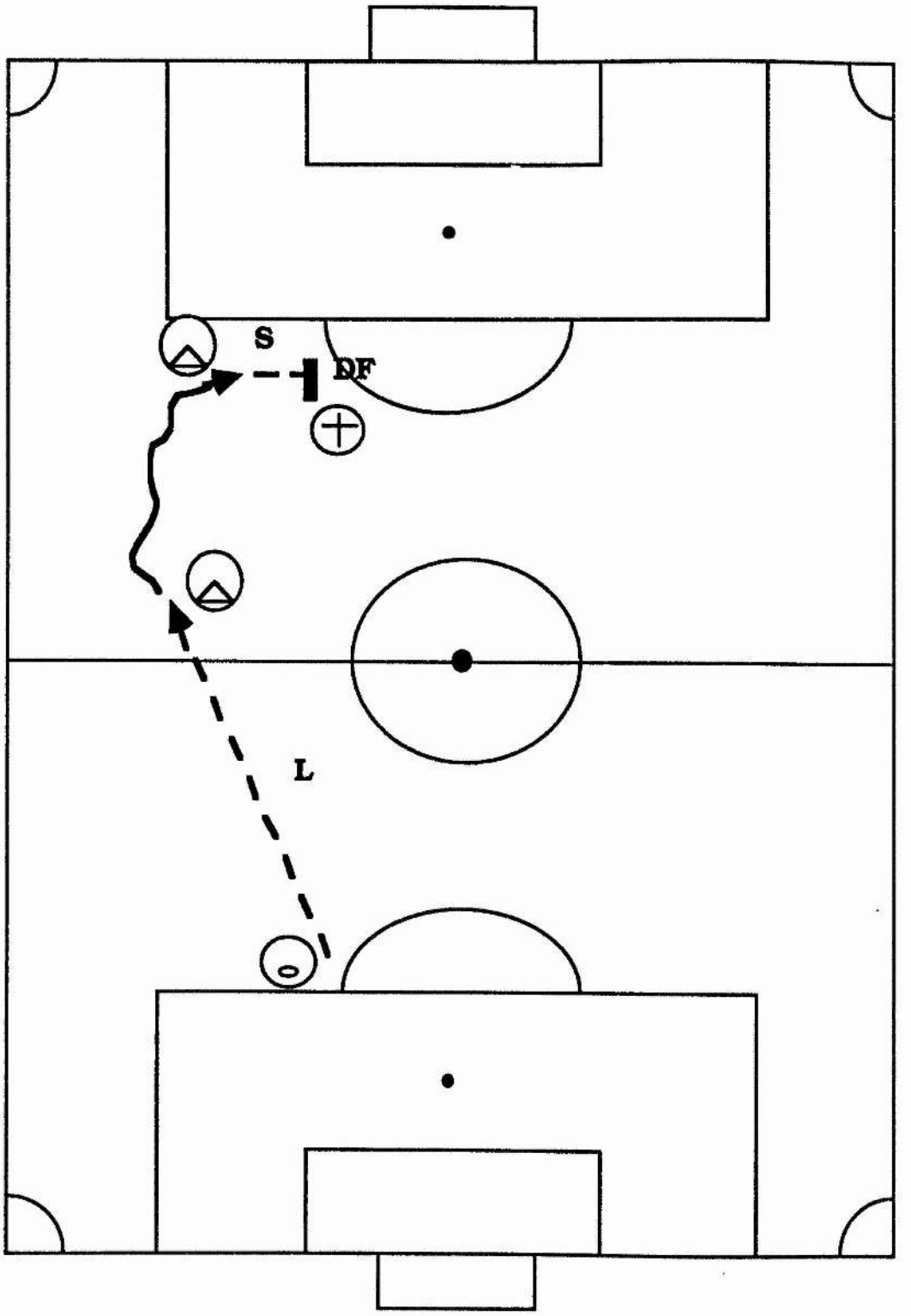


Figure 2.6

Example of notation used for a defensive move.



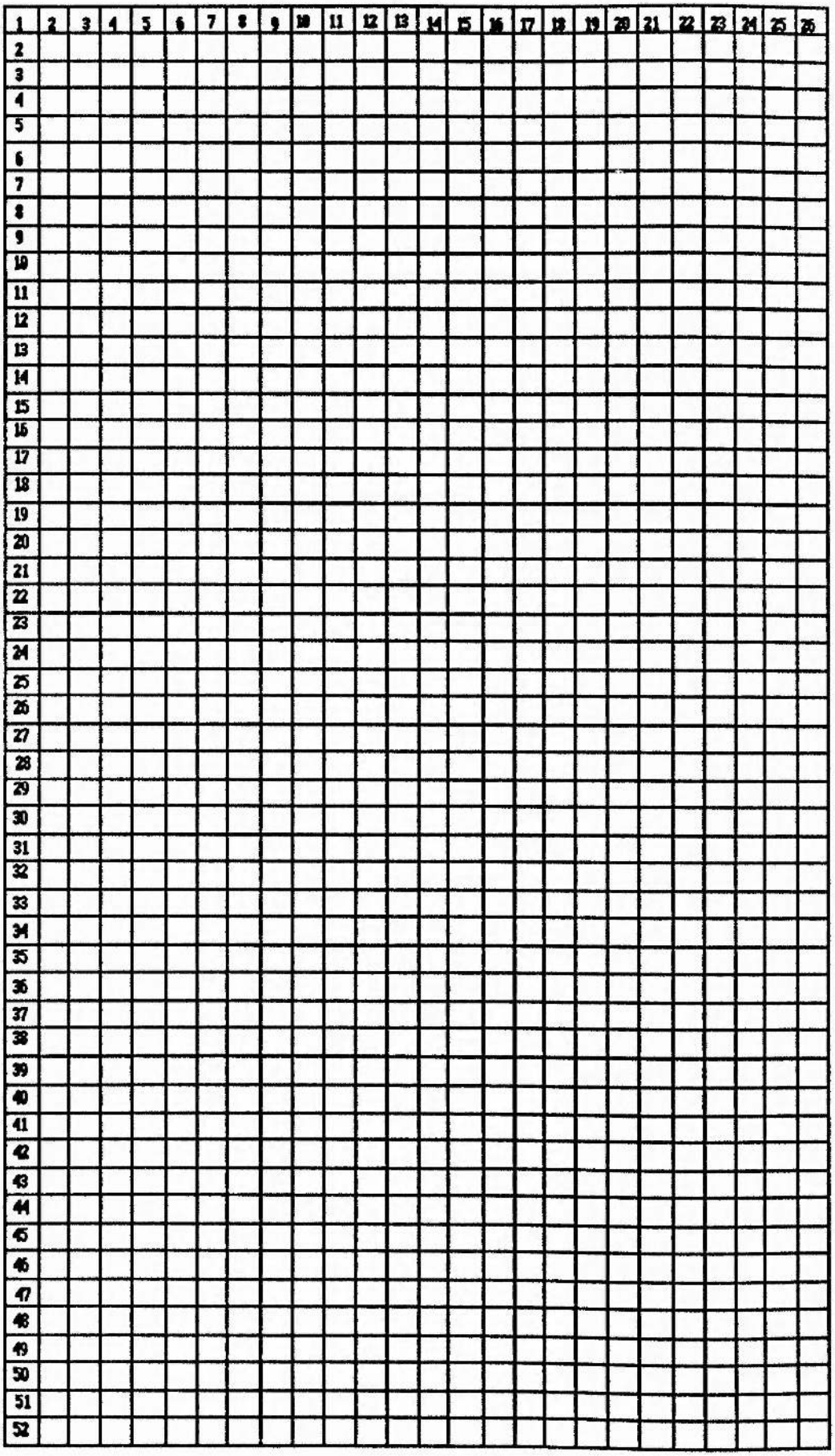
Attempted tackle by defence

Close marking by defence

No marking by defence

Figure 2.7

Grid of the pitch.



assuming a standard pitch size of one hundred and four metres in length and sixty-four metres in width. Each square was thus two by two metres, representing an area of four square metres. The length of the pitch therefore, was represented by fifty-two squares, each square representing two by two metres. The width of the pitch was represented by thirty-two squares, each square representing two by two metres.

It should be noted that the four square metres grid is the smallest measurement possible. It also gives a very good indication of the players position.

Procedure for data conversion :

Diagram sheets drawn by the paper and pencil method were converted into numerical data by the following technique. Each movement was analysed with respect to the separate, constituent ball movements, and, by using the grid, the starting and finishing points of each ball movement were noted down in terms of their **X** axis and **Y** axis co-ordinates. The data obtained was fed into the computer as follows:

(i) The title of each match.

(ii) The total number of attacks or defences for each match.

(iii) The total number of the **X** and **Y** co-ordinates for each attacking and defending move. Each **X** and **Y** co-ordinate corresponds to a change in movement patterns.

(iv) The **X** co-ordinate of the starting and finishing points for each attacking and defending move.

(v) The **Y** co-ordinate of the starting and finishing points for each attacking and defending move.

Examples of data input format are shown in **Tables 2.5** and **2.6.**

Data storage :

A separate file was created to hold the data for free attacking moves and free defending moves, at home and away situations in each match using the format described previously. Set plays, (corner-kicks, throw-ins and free-kicks) in attacking and defending situations which occurred in each match were separated from the ordinary movements and stored in separate files. These movements were converted through the same procedure into separate sets of data and fed into the computer as described above (see **Figure 2.8**).

Data analysis :

Once the data, of attacking and defending formation and set play movements at home and away, had been recorded and converted, they were fed into the computer. This data was analysed in the following ways:

Computer programs :

Given a large number of attacking and defending moves, the aim was to obtain a scatter diagram of points, each point representing one move; moves which were similar to one another being represented by points that are close together. This aim was achieved in two stages:

(1) A measure of the dissimilarity between each pair of attacks/defences was constructed by the program called **P1**. Each movement was summarised by a set of co-ordinates, representing positions at which there was a change in direction or type of movement of play, for example, the starting and finishing position of a

Table 2.5

Typical example of data and input format referring to attacking moves.

		Coding
(i)	Match No.1	(i) Title of a match.
(ii)	13	(ii) Refer to total of data.
(iii)	4	(iii) Refer to total number of the x and y co-ordinates.
(iv)	10 5 7 9	(iv) & (v) Refer to the 4 pair of x and y co-ordinates.
(V)	17 30 45 47	
	5	
	7 6 4 16 17	
	33 35 43 47 52	
	5	
	21 18 15 5 16	
	11 38 32 42 46	
	8	
	23 31 27 6 7 14 11 16	
	13 22 28 36 41 41 47 51	
	5	
	15 29 29 28 28	
	21 19 32 36 44	
	3	
	17 21 4	
	10 17 45	
	4	
	21 30 29 18	
	26 33 43 52	
	4	
	17 28 26 17	
	26 41 50 51	
	7	
	15 19 27 30 30 30 31	
	21 22 22 29 46 49 52	
	6	
	12 21 29 27 17 20	
	32 34 41 43 50 52	
	7	
	11 16 13 15 16 16 16	
	22 26 31 41 46 47 52	
	6	
	16 17 30 30 16 17	
	18 21 31 40 47 52	
	9	
	16 16 16 12 3 3 7 4 13	
	26 27 24 21 43 48 46 44 48	

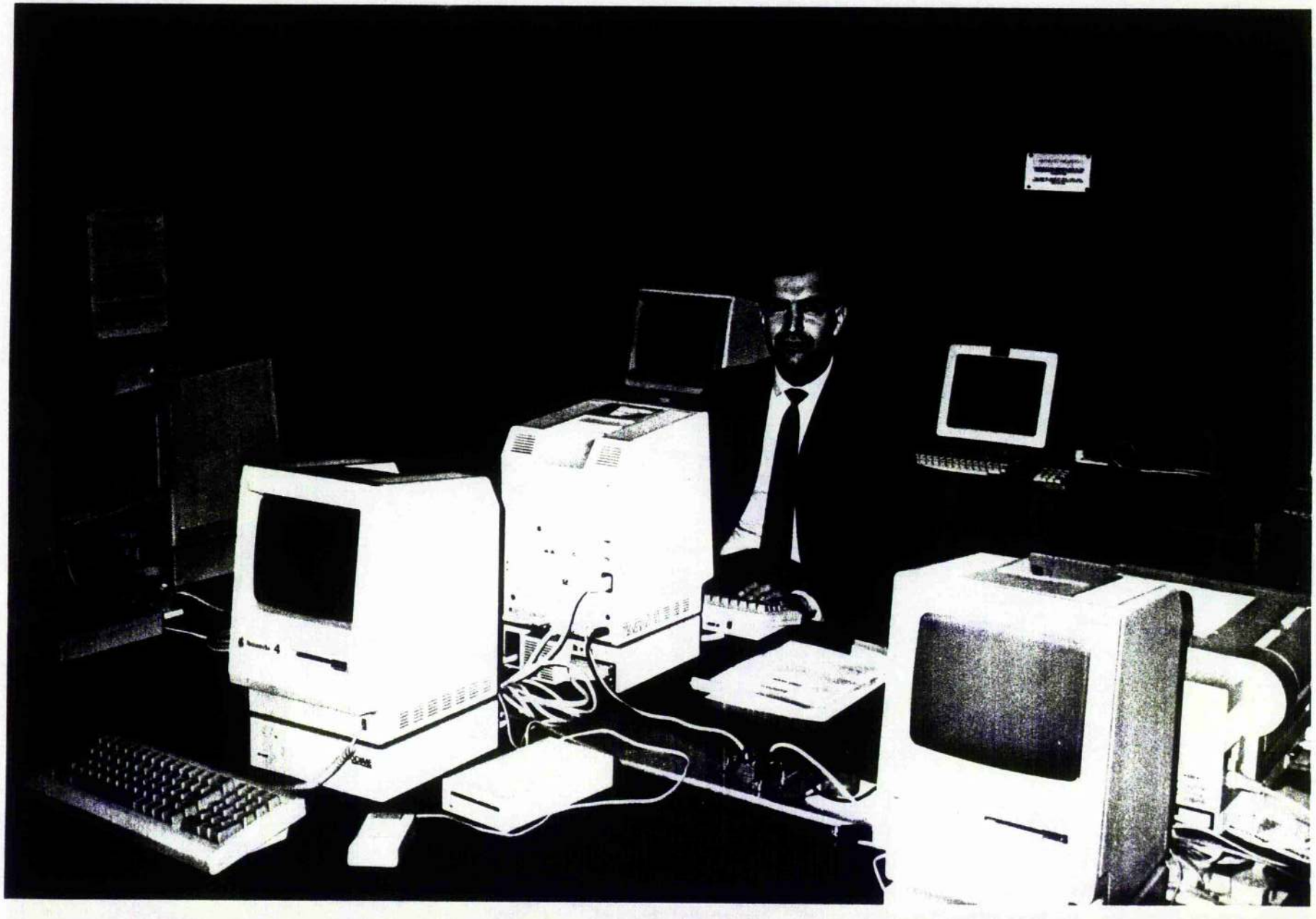
Table 2.6

Typical example of data and input format referring to defensive moves.

		Coding
(i)	Match No.1	(i) Title of a match.
(ii)	13	(ii) Refer to total of data.
(iii)	4	(iii) Refer to total number of the x and y co-ordinates.
(iv)	14 15 17 29	(iv) & (v) Refer to the 4 pair of x and y co-ordinates.
(v)	33 36 37 39	
	3	
	17 29 29	
	25 30 51	
	2	
	16 16	
	24 30	
	7	
	8 8 10 12 5 3 3	
	14 16 32 29 44 39 43	
	7	
	29 22 24 30 29 20 19	
	25 31 34 39 43 43 52	
	2	
	27 23	
	23 29	
	2	
	12 13	
	41 52	
	2	
	13 7	
	4 30	
	2	
	21 20	
	4 29	
	3	
	15 17 22	
	34 37 43	
	2	
	14 13	
	9 35	
	6	
	27 30 30 31 30 18	
	25 23 27 37 46 45	
	3	
	13 4 1	
	26 46 48	

Figure 2.8

Apparatus for data input and analysing process.



dribbling section, or the beginning and ending of a pass. Two movements were compared by merging the two sequences of locations so as to find the single sequence that minimised the discordance **'K'** defined below, while preserving the order within each sequence. The contribution of each position to the discordance was defined as the smaller of the two distances from it to the two positions in the other sequence that bracket it in the combined sequence. **'K'** equals the sum of this quantity over all positions in each sequence divided by the total number of positions in the two sequences. For example, consider comparing the sequences **(1, 2, 3, 4)** and **(A, B, C)** as shown in **Figure 2.9**. It was clear that the joint sequence is **(1, A, 2, 3, B, C, 4)**. The contribution of **A** to the discordance was the minimum of the two distances **d (A, 1)** and **d (A, 2)**, clearly **d (A, 2)**.

'K' = 1/7 [d(A,2) + d(B,3) + d(C,4) + d(1,A) + d(2,A) + d(3,B) + d(4,C)] (Gordon 1973).

(ii) A configuration of points was obtained, with the property that the distance between any pair of points approximated their pairwise dissimilarities. This was performed by another programme called **P2**. Given a matrix of dissimilarities **(K_{ij})**, which was assumed to correspond to interpoint distances between points in some configuration, one could envisage seeking this configuration of points by a process of triangulation = place point **1** and **2** a distance **K12** apart; locate point **3** at one of the intersections of (the circle centred at point **1** with radius **K13**) with (the circle centred at point **2** with radius **K2**) as shown in **Figure 2.10**.

However, the method of principal co-ordinates analysis aims to achieve the same result more reliably and efficiently, using eigenanalysis **(Gordon 1981)**. It should be noticed that there is no

Figure 2.9

Example of two movements compared.

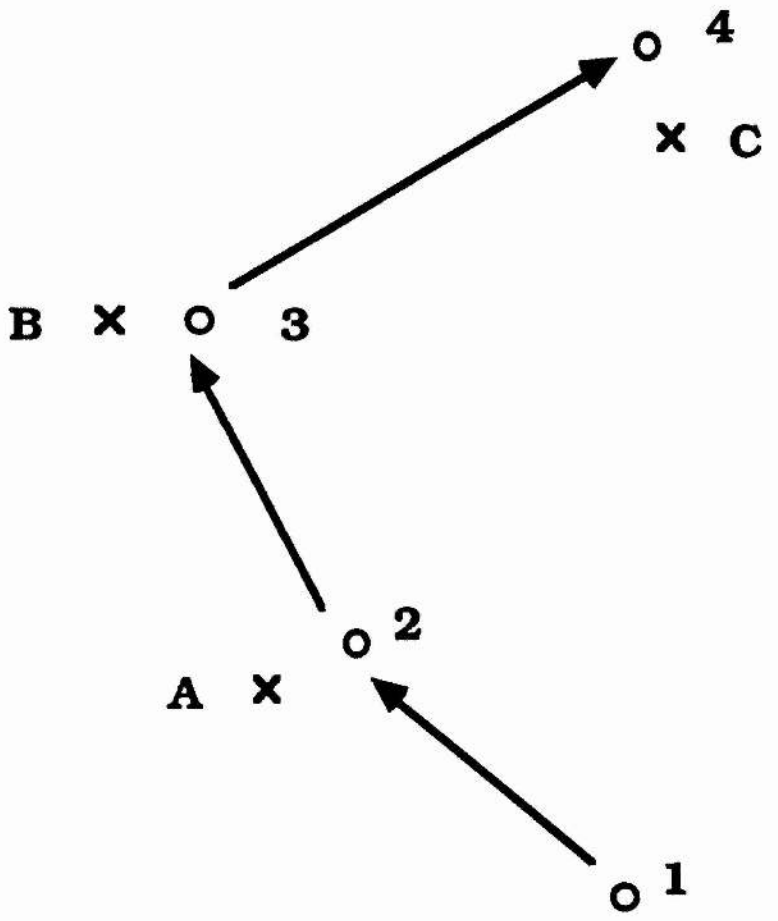
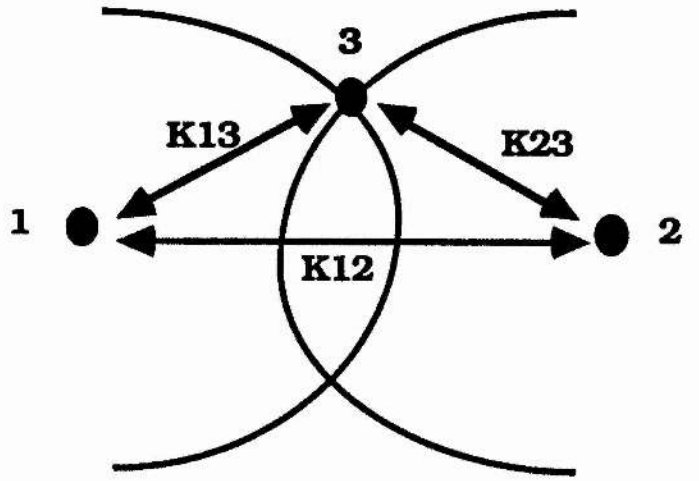


Figure 2.10

Example of dissimilarities among points.



guarantee that one can get a perfect fit in two dimensions. The two-dimensional representations provided are the best one can do, with respect to a mathematically-defined criterion.

Specification of the two computer programs :

These computer programs implement the method of classification analysis. In this case, classification is refers to the procedure of deciding to which distinct groups different points belong the representation of these groups is referred to as a classification. The prime aim of a classification is to discover whether distinct groups of points exist. Using this method, each move is represented by a point in a dimensional space; the number of dimensions is usually two or three. The co-ordinate analysis representation is arranged to have the property that moves which are similar to one another are represented by points which are close together. The representation is assessed by visual inspection in an attempt to establish whether or not the points fall into distinct, well separated clusters.

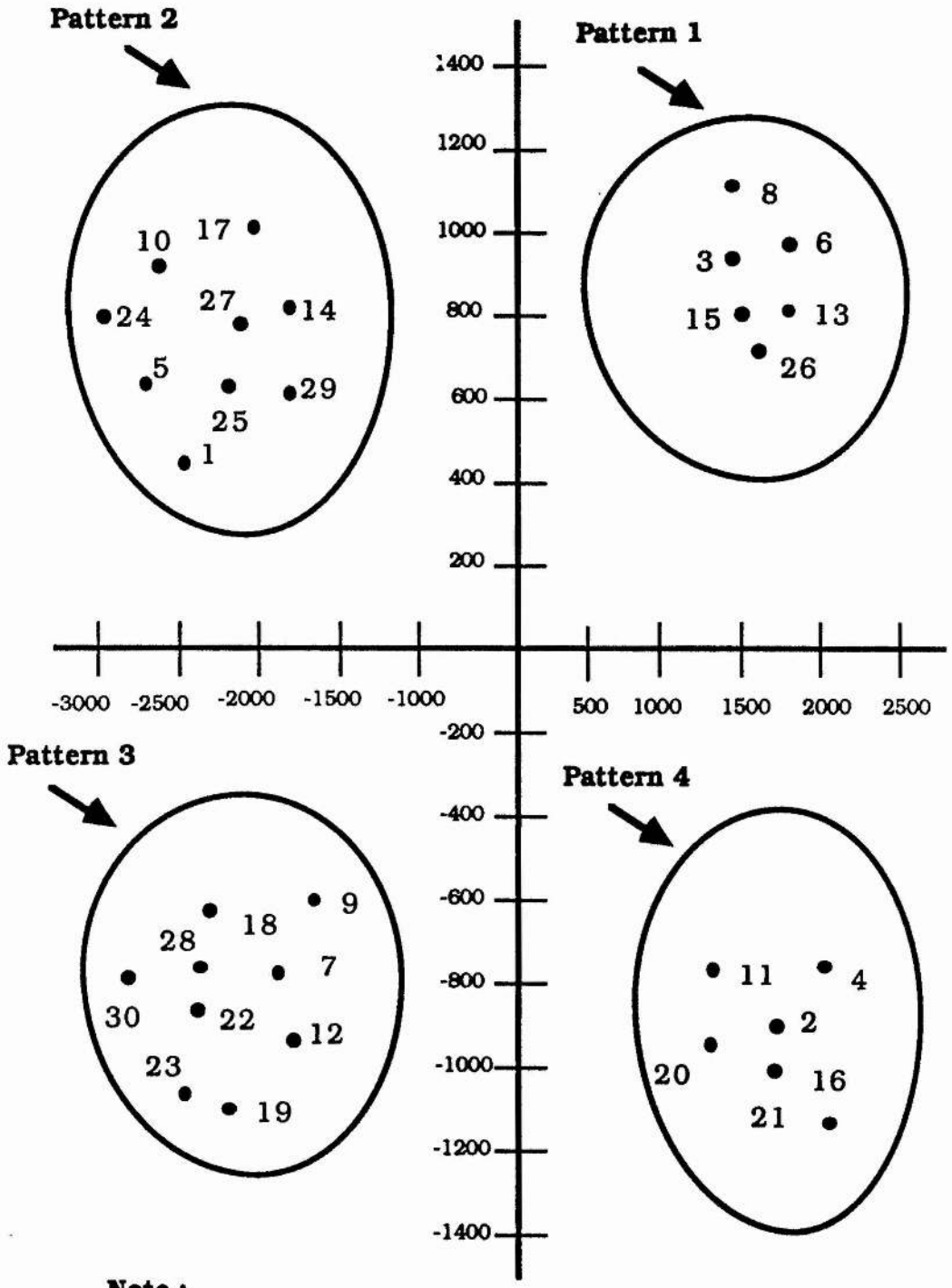
The two computer programs (**P.1** and **P.2**) are written in standard FORTRAN, but make use of routine F02WCF from the NAG library. As an example of their use, data from **Tables 2.5** and **2.6** are input to the first program which provides a list of eigenvalues. These are the input to the second program to produce a list of points, which can be displayed on either a VDU (T4010) or on a pen plotter (T4662) as shown in **Figure 2.11**.

Graphs :

Two graphs were produced per game; one for the attacking home side and the other for the attacking away side. Each graph was

Figure 2.11

Graph of one league match which is divided into four patterns.



Note :

- **Moves**
- **Moves within a pattern demonstrate similar moves.**

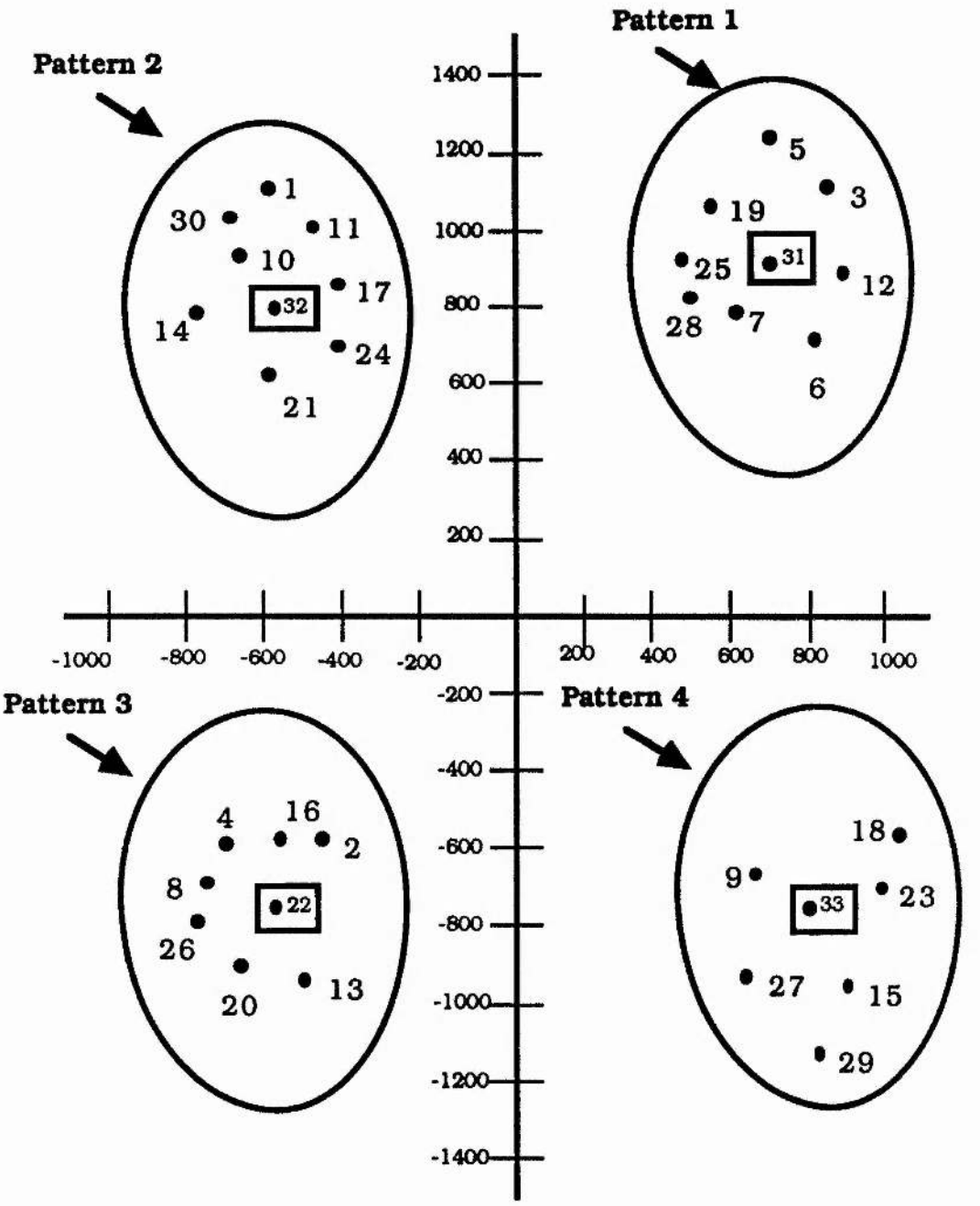
subjected to a visual cluster analysis, thereby grouping similar attacking moves with each other as shown in **Figure 2.11**. The method was supplemented by comparison with the original diagram sheets of the movements within each pattern. From each pattern for each individual match, a movement was selected which represented the means in that particular pattern. This movement, termed the optimum movement pattern, for that pattern, was selected by visual analysis, as shown in **Figure 2.12**. The optimum movements chosen from all the league matches were grouped into a new data set, one for each team. The programme, as had been used previously was run for this data. Using a similar cluster analysis technique to that above, these patterns could be classified into five clusters, shown in **Figure 2.13**. Each movement, from each match, was then classified into the aforementioned five clusters. A similar procedure was adopted for set plays (corner-kicks, throw-ins and free-kicks). Graphs were drawn accordingly, using programme **2**, and were subjected to the same cluster analysis in place of the five principal pattern-types found for the ordinary movements. The pattern types for corner-kicks and throw-ins from left and right sides of the pitch, as expected, were clustered separately as shown in **Figure 2.14** and **Figure 2.15** respectively. However, for free-kicks these points were so spread out on the graph that there was no obvious clustering, as shown in **Figure 2.16**. These have consequently been regarded as belonging to a single pattern type.

Final actions symbol :

It is necessary to analyse each outcome. In order to do this each free attacking move, each free defending move, each set play attacking

Figure 2.12

Example of a graph of a league match with representative attacks.

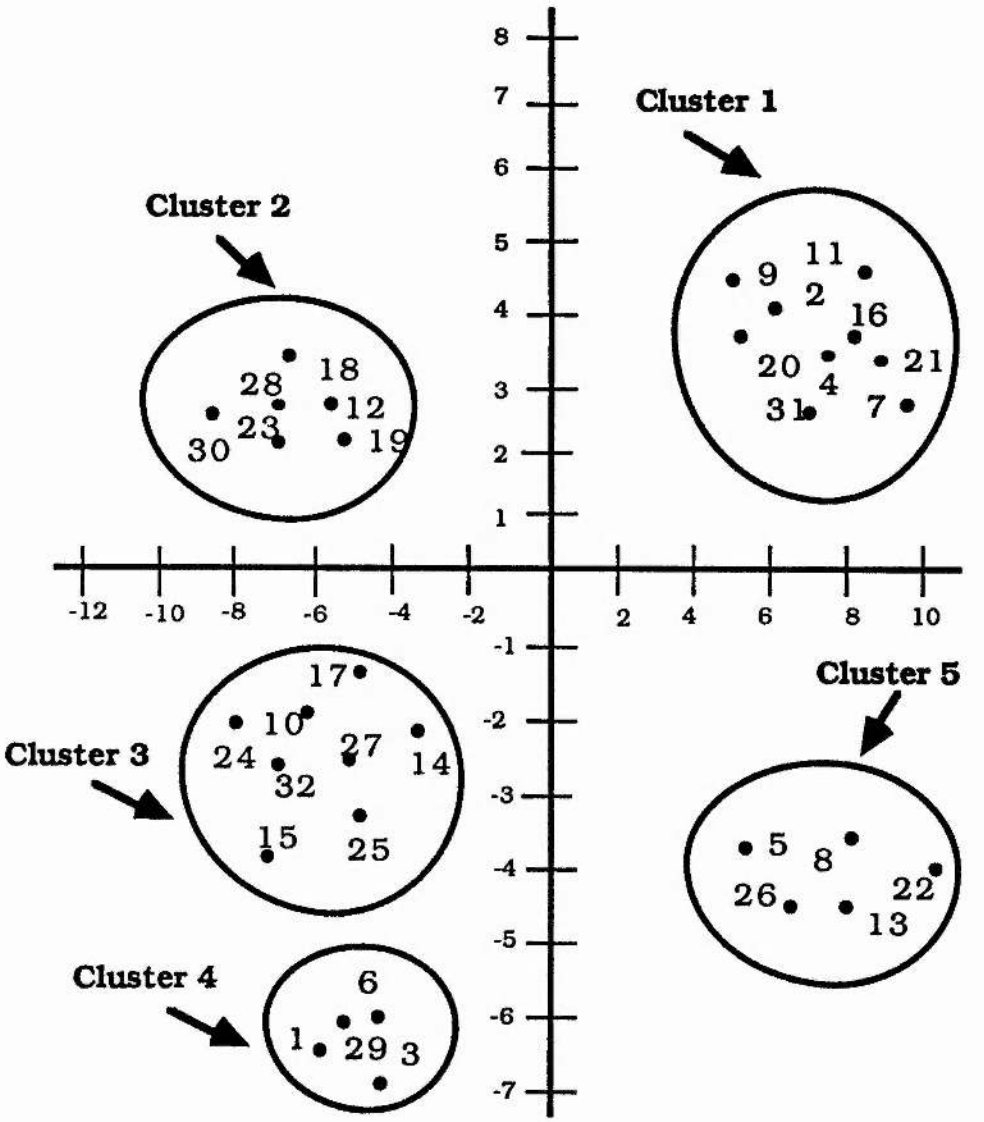


Note :

- **Moves**
- **Moves within a square demonstrate optimum moves for that particular patterns.**

Figure 2.13

Graph of five clusters of attacking patterns.

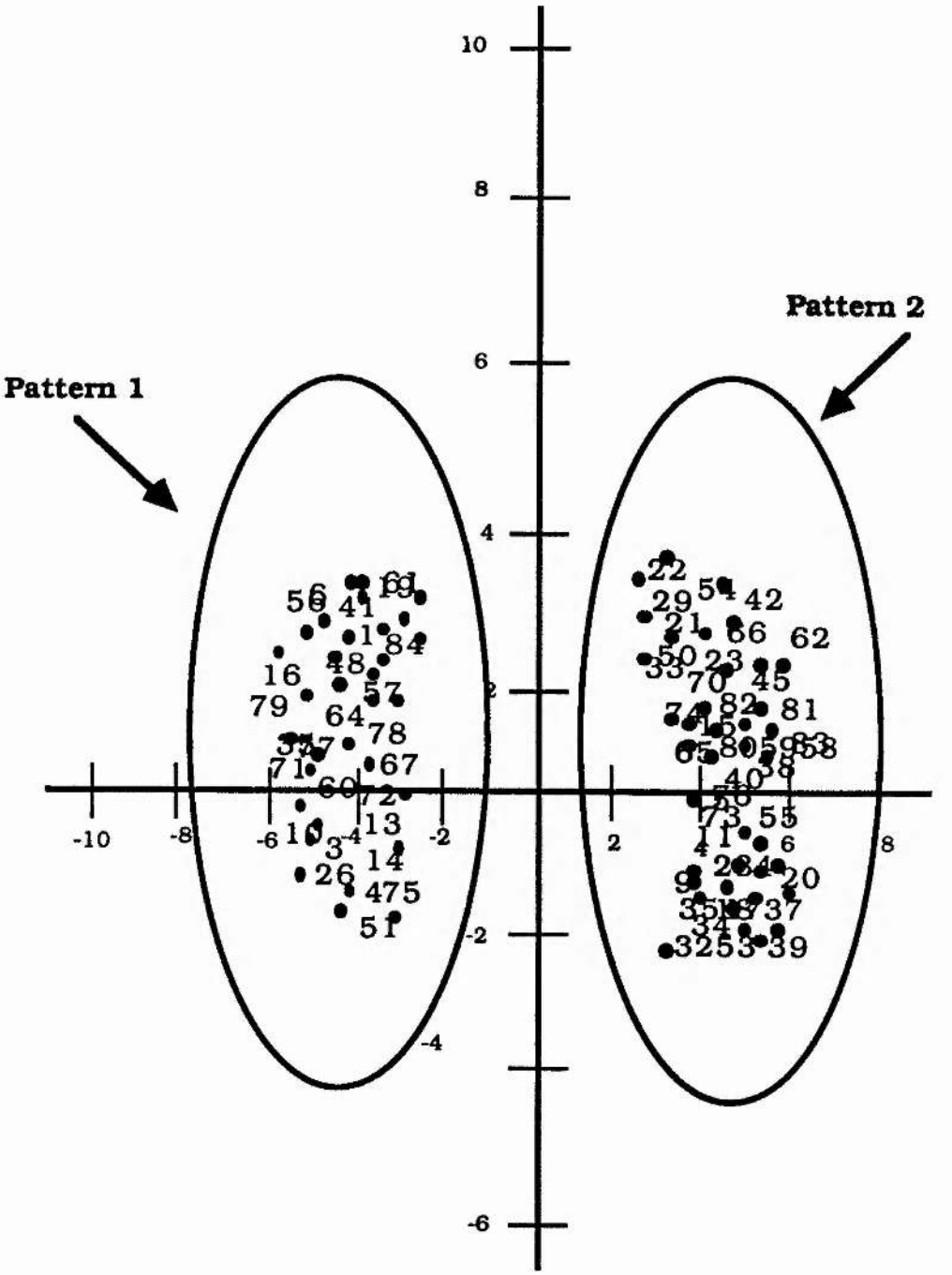


Note :

- **Pattern**
- **Patterns within a cluster demonstrate similar moves.**

Figure 2.14

Graph of corner-kicks with two patterns.

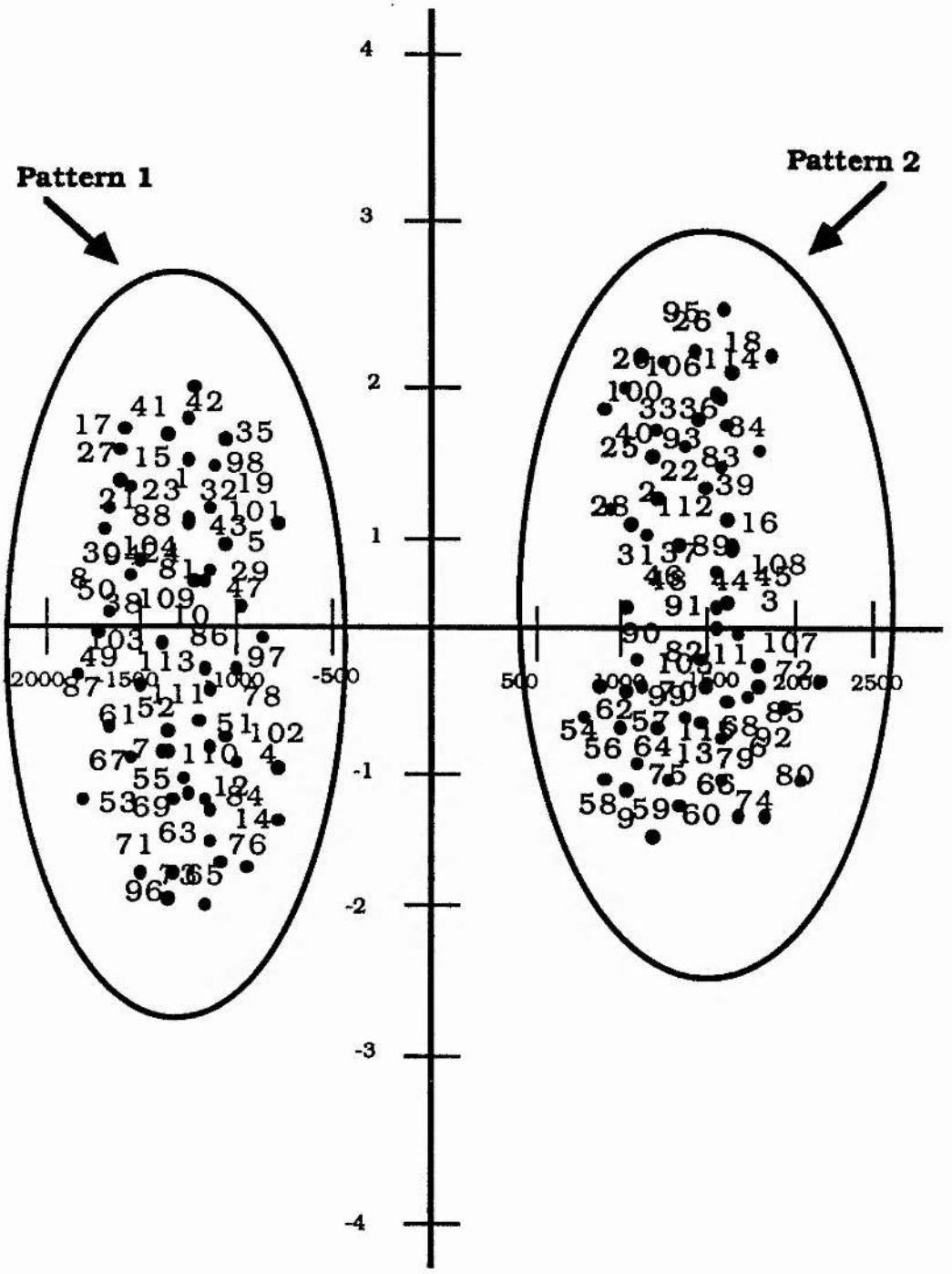


Note :

- **Moves within a pattern, demonstrating a pattern of play.**

Figure 2.15

Graph of throw-ins with two patterns.

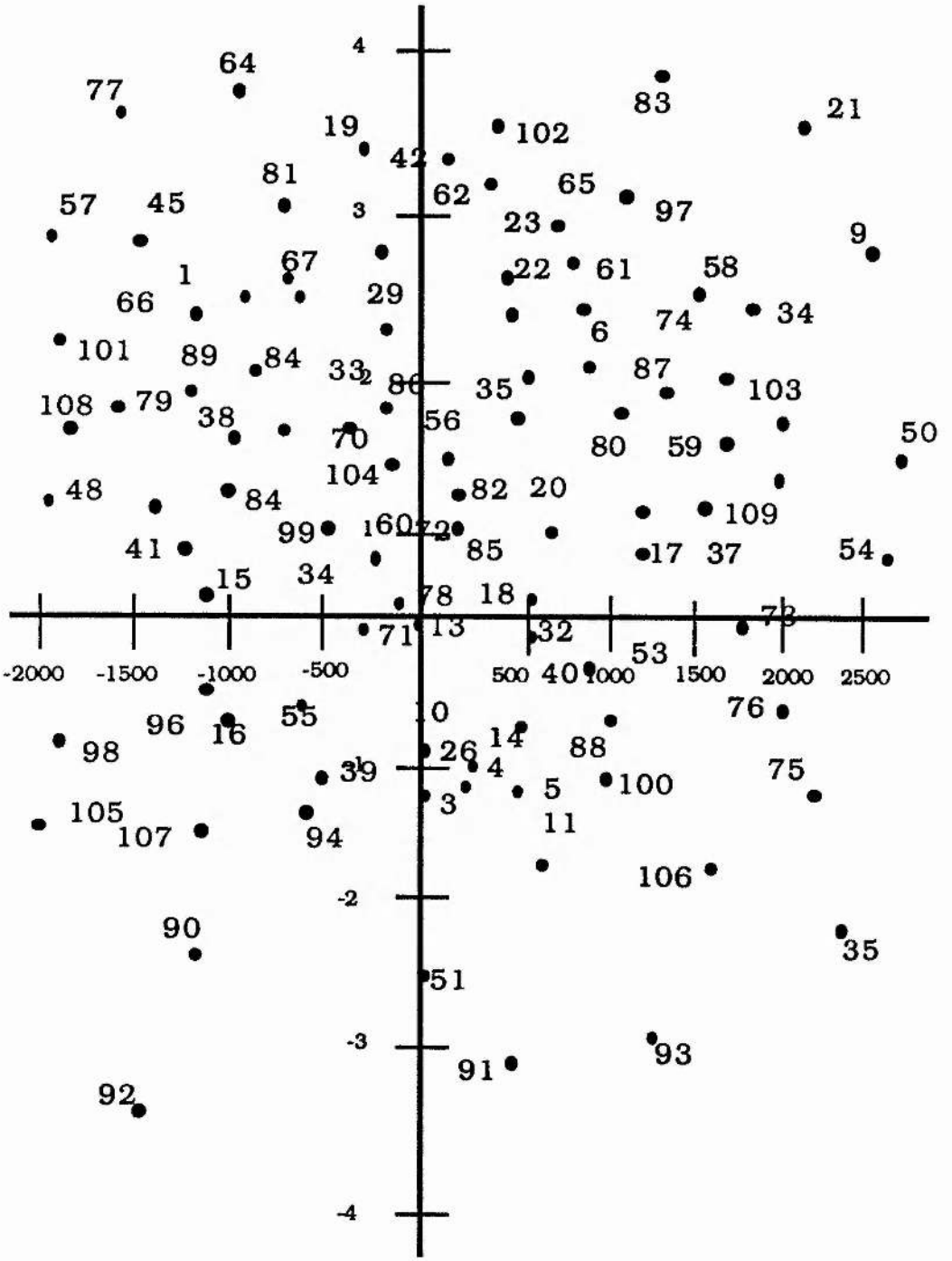


Note :

- **Moves within a pattern, demonstrating a pattern of play.**

Figure 2.16

Idealised example of a graph, showing free-kick movements.



- **Scatter moves demonstrating no obvious pattern of play.**

movement and each set play defending movement was analysed in terms of its final action. In all, ten different types of final action were determined and were classified numerically as shown in **Table 2.7.** Thus for each of the ordinary attacking movements, corner-kicks, throw-ins and free-kicks associated data were collated, concerning pattern types and final actions along with the number of long passes, (a pass greater than 10 metres), number of short passes, (a pass less than 10 metres), and dribbling sections. For each of the ordinary defending movements, corner-kicks, throw-ins and free-kicks, associated data were also collated concerning pattern types and final actions along with close marking (defenders who had covered the attacking players in possession of the ball or those receiving the ball), no marking (attacking players which were free from marking when they had possession of the ball or when they received the ball), attempted interceptions (defenders who tried to dispossess attackers, to kick or head the ball away before it reached them or to tackle them) and attempted tackles (defenders who tackled attackers, aiming to dispossess them by kicking the ball, head the ball or to gain possession of the ball) (see **Tables 2.8** and **2.9**). It should be noted that some passes, intended to be long passes were intercepted by an opponent. These were defined as long passes. Also it should be noted that in the types of pattern, corner-kicks and throw-ins, right and left hand refer to the side of the pitch from the point of view of the player facing the opposition goal.

Table 2.7

Symbols of final actions.

1	**Goal**
2	**Shot on target saved**
3	**Shot off target**
4	**Lost possession**
5	**Gain possession**
6	**Corner-kick**
7	**Throw-in**
8	**Off-side**
9	**Penalty**
10	**Free-kick**

Table 2.8

Analysis of attacking moves.

No. oF Move	Final Action	Type of Pattern	Long Passes	Short Passes	Dribbling Sections
1	4	4	3	2	0
2	4	3	1	0	1
3	2	4	3	0	0
4	4	4	2	1	1
5	2	1	2	1	2
6	4	4	1	0	0
7	4	4	3	2	2
8	4	4	1	0	0
9	4	4	1	0	0
10	4	4	1	0	0
11	2	4	1	0	0
12	3	4	2	0	0
13	1	2	1	2	1
14	3	4	2	0	2
15	3	2	1	1	1
16	4	4	3	1	1
17	1	4	2	1	1
18	10	2	1	0	1
19	2	1	3	1	1
20	3	4	3	2	1
21	4	4	1	0	0
22	3	3	0	0	1
23	2	4	1	0	0
24	1	2	1	0	1
25	4	4	2	2	2
26	3	1	0	1	1
27	6	1	1	0	1
28	3	2	0	1	0
29	4	2	1	0	1
30	10	1	0	1	2

Table 2.9

Analysis of defensive moves.

No. of Move	Final Action	Type of Pattern	Close Marking	No Marking	Attempted Interception	Attempted Tackle
1	5	2	1	0	0	1
2	5	1	1	0	0	1
3	5	2	1	0	0	1
4	5	1	2	0	0	1
5	6	4	1	1	0	0
6	2	4	0	1	0	0
7	5	4	1	0	0	1
8	5	2	1	0	0	1
9	5	2	1	0	0	1
10	10	4	1	1	0	0
11	5	4	2	0	0	1
12	10	2	1	1	0	0
13	7	4	1	1	0	1
14	5	4	1	0	0	1
15	5	1	1	0	0	1
16	8	1	1	1	0	0
17	6	1	1	1	0	0
18	5	1	1	0	0	1
19	5	1	1	0	0	1
20	5	2	1	0	0	1
21	5	1	1	0	0	1
22	2	1	0	2	0	0
23	5	2	1	0	0	1
24	5	1	1	0	0	1
25	8	1	1	1	0	0
26	3	1	0	1	0	0
27	6	1	1	1	0	0
28	3	2	0	1	0	0
29	5	2	1	0	0	1
30	10	3	1	1	0	1

CHAPTER THREE

A COMPARATIVE STUDY BETWEEN A LIVE MATCH ANALYSIS AND VIDEO ANALYSIS TECHNIQUES

3.1 INTRODUCTION :

3.2 METHODS :

Data source :

Notational analysis of live match :

Video analysis technique :

Apparatus :

Pilot work :

Data collections and recording of video analysis :

3.3 RESULTS :

3.4 DISCUSSION :

3.5 SUMMARY :

3.1 INTRODUCTION :

Match analysis may be defined as a fairly objective assessment: an observer can easily be trained to observe and record a player's performance in a match, particularly if he is provided with a suitable location from which he has a good view allowing him to interpret the events easily. This assessment can be made of any aspect of play and when carried out fully is known as match analysis. This statistical analysis of a match or a player can, when interpreted by a coach or manager, provide an accurate diagnosis of its/his strengths and weaknesses.

It is a widely accepted fact that improvements in performance are partially related to the quality of feedback given to players after a game. Moreover, this feedback should be given as soon after completion of the event as possible. However, if managers and coaches can give information based only upon subjective assessment then improvements in performance can not be optimised. Since one can only view the main parts of the game action most of the peripheral play action is missed. Consequently, the managers and coaches must base their feedback on practical information about an individual's performance during the game. This feedback is often inadequate and as such, the opportunity is missed to fully improve the player's performance in subsequent games.

Given the above problems with a qualitative analysis of team performance, what are the alternatives? The obvious answer is to quantify as many aspects of the game as possible. There are many aspects of quantification of performance which are familiar to all of us, namely goals scored; yet game results alone can not measure all of the specific features of play that are of concern to the managers and

coaches. Thus, other aspects of the game need to be quantified in order for the managers and coaches to evaluate and plan for subsequent coaching processes. A method of analysis needs to be defined that will objectively measure the players' behaviour during each game.

The major barriers to the successful and meaningful analysis of sports are caused by the need for efficiency, practicality and validity in the techniques of data collection and recording related information. This applies especially to complex team sports, such as soccer with all its different facets. Soccer can be described as a non-deterministic sport. That is, there is a large number of events giving a high degree of player choice of action, combined with a relatively high uncertainty of the other players' actions. Soccer requires the performance of a highly specific, predetermined event or sequence of events. Due to the greater complexity of interactions in a non-deterministic sport, analysis of this is more difficult. In addition, the problems of identifying important events during the game are more complicated.

To a cynic, match analysis may seem to be a long-winded way of finding out what the managers and coaches already know. It should be noted that most managers and coaches have a genuine desire to learn more about their sport, and now there is enough evidence to convince even the cynics that match analysis has an important role to play in the coaching process.

The best of all possible worlds, of course, is to combine the knowledge, experience and intuitive judgment of the sport with the accuracy, objectivity and rigour of a good match analysis system.

The present chapter is aimed at examining the suitability and accuracy of the methods used for obtaining objective data on patterns

of play for different standard soccer teams, and to examine the validity of watching and analysing live matches using the notational method of the study in comparison to video recording and subsequent analysis. It attempts to answer the following questions:

(i) Is filming of all the soccer players during a match successful and can it be used to study their patterns of play ?

(ii) How successful is filming the path of the ball in determining patterns of play in the game ?

(iii) How accurate and valid is a live match analysis technique compared with a video analysis technique ?

3.2 METHODS :

The detailed explanation of the method and the field work of the study was divided into the following sections:

Data source :

The data was based on the following games:

(i) Two Premier Division soccer reserve matches played at one of the professional parks in the Tayside region were observed and filmed.

(ii) Two first team university matches were observed and filmed.

(iii) Two amateur and semi-professional matches respectively were also filmed.

Notational analysis of live matches :

The same techniques were used as described in the Chapter Two, Section II, for recording, collecting and analysing the data for this system.

Video analysis technique :

The video analysis technique was as follows:

Apparatus :

The filming apparatus consisted of a small self-contained Panasonic portable colour video camera (WVP-A2E). It featured a high-band (3.9 MHZ) / inch integral strip filter (NEWVICON TM) tube. It received its power from a Panasonic portable video cassette recorder (NV-180 SERIES). The WVP-A2E is a high quality camera with an auto focus automatic light/iris control zoom lens that produces 280 lines of horizontal resolution luminance with recommended illumination of 140 footcandles (1400 LUX) at F4.0. It has a graphics display through a micro process which is able to select colour titles, data, time, stopwatch with lap time feature, record, fade and warning battery.

Pilot work :

The pilot work was as follows:

Filming analysis of the whole pitch within a camera frame :

After preparing all the filming equipment required and visiting most of the amateur and professional parks in the region a professional park was chosen as the most appropriate for filming. This was because firstly, there is some distance between the pitch and the stand so more of the pitch will fit into one frame of film. Secondly, it has a box specially built for television camera coverage of the game live on television.

A volunteer acted as a subject, conducting walking, jogging and running exercises on different parts of the pitch, while a wide angle

lens camera was mounted each time in different locations. A second wide angle lens camera was then brought in and positioned along side the first camera and then moved to other suitable places on the stand for filming in order to study all viewing possibilities. For analysis the film was replayed on a colour television monitor and the following points were noted:

(i) It was not possible to get the whole pitch within the camera frame, even using two cameras with wide angle lenses, each filming half of the pitch.

(ii) It was not possible from the film to identify the subject when viewed from such a distance. Therefore it is more difficult to identify the athletes in such a situation for analysis purposes.

Comparison between live and videotaping techniques :

Firstly, in order to examine the possibility of mapping out the path of a ball, the following pilot work was carried out. The pilot work involved analysis of two amateur and semi-professional soccer matches played in different parks. The camera had to constantly follow the movement of the ball keeping it within the frame for a whole match. It should be noted that since the aim of the experiment was to film only the path of the ball, the camera was positioned level with the middle of the pitch, and 10 metres from the touch line. This resulted in a very clear image of the path of the ball. It was noted from replays of the matches on a colour television, that the filming of the path of the ball in a match was very successful in terms of the quality of film produced. This was due to the ability of the camera frame to accommodate the ball and a sufficient area of the pitch at the same time.

Secondly, for the purpose of the comparison between a live match technique and a videotaping technique, two matches played at professional level at their professional park in the Tayside region and two university matches played at the university park in the Fife region were chosen and filmed. The videotape recorder, together with the camera mounted on a tripod, was positioned in a television camera crew gantry or in the middle of the pitch 10 metres outside the touch line at the parks (see **Figure 3.1)** which had no special place for filming. The filming technique was to get the ball and as much of the pitch as possible within the camera frame. The camera had constantly to follow the movement of the ball keeping it within the frame. It was found to be much easier with two people filming for alternate 10 minute periods, rather than one person filming the whole match alone. For the purpose of analysis the tape was replayed on a colour television monitor and it was indicated that the quality of the film produced was very clear and adequate for the analyses.

Data collections and recording of video analysis :

After the university and professional matches were viewed on a colour monitor using the notational technique described in the Chapter Two, Section II, the data was analysed using the same computer techniques described in the Chapter Two, Section II.

3.3 RESULTS :

For the purpose of the comparisons between video and live techniques, an attempt was made to find out which of these techniques was more suitable and reliable. For this reason, two of the reserve premier league matches and two of the university first team matches were filmed using the technique described previously. Volunteers helped in filming and the researcher analysed the same

Figure 3.1

Apparatus for video analysis.

match simultaneously using the techniques described in the Chapter Two, Section II, (live visual analysis technique). After recording the match the tape was replayed on a high quality colour monitor and the researcher analysed the video of the match again using the techniques described in the Chapter Two, Section II. The data of both techniques were collected, recorded and converted into numerical data, then fed into the computer, each as a separate file using the technique mentioned previously.

For the purpose of the analysis the computer programs were run for both sets of data, and the results of both techniques are shown in **Appendix A1 pp. 367–383**. These tables show that there were very few differences between the video recording and live match analysis techniques, the biggest difference being 0.003. It should be noted that the same researcher analysed both matches. It is possible that two different researcher may obtain somewhat larger differences between Eigenvalues.

3.4 DISCUSSION :

The pilot work indicated clearly that it is not possible to get the whole pitch within the camera frame in order to film all the soccer players during a match for studying their patterns of play. This finding supported the study undertaken by **Franks (1983)**. A 16 millimetre camera was placed 65 metres above a soccer field at an angle of 40 degrees from the centre of the field to the camera (the camera was located in a high rise university residence that overlooked the field). The camera speed was set at 1HZ. The cine films were projected at approximately 16% of life size and then digitised using a Namonics digitiser interfaced to Micro-Nova MP/200. Movements of each of the 22 players, the 3 officials and the ball were digitised. This involved the

recording of **X** and **Y** co-ordinates for 26 positions on one frame of film. **Franks** was unable to collect meaningful data for the following reasons. Firstly, the expense of continually monitoring performance is prohibitive. Secondly, the camera position has to be sufficiently elevated to reduce the error in converting acquired film distance to actual distance (a Fractional Linear Transformation computer program was used to transform the image distortion; the study that was described above recorded a bandwidth of error ±2 metres). Thirdly, the digitisation process is extremely time consuming. Finally, there is a difficulty in identifying the athletes when viewed from such a distance.

The pilot study showed that video recording of the path of the ball can be made successfully. This finding supported the results of several other researchers in which it was reported that filming one subject or object such as the ball at a time during soccer matches using film analysis can be done **(Ohashi et al. 1988; Withers et al. 1982; Reilly and Thomas 1976b; Ohashi 1979; Ali and Farrally 1988). Luhtanen (1988)** serves as an example. He conducted a study on the reliability of video observation of individual techniques used in soccer matches. He reported that the observations which can be considered acceptably accurate were the identification of the player, his location, movement direction and quality of performances.

As can be seen from the results of **Appendix A 1:1 pp. 368–375** for attacking moves and **Appendix A 1:2 pp. 376–383** for defensive moves the biggest difference between the video recording and live analysis techniques was 0.003. Therefore someone can use either technique, since both of them have produced similar results for such purposes.

However, there are both advantages and disadvantages in using

either technique. The video analysis technique had several advantages; (a) the ability to replay the match and make a more detailed study of a specific movement; (b) as a result the video analysis technique allows the researcher more time to assess each movement and therefore the whole game. Nevertheless there are some disadvantages to this technique; (a) from a practical point of view the equipment is difficult to carry, to locate and to set up; (b) some clubs are reluctant to give permission to have their matches filmed; (c) the equipment is expensive to run; (d) this method needs volunteers to help set up and use the equipment; (e) it is a time consuming method of analysis.

The visual analysis had several advantages; (a) it is as good as the video analysis technique, as the results showed that there were very few differences between the two techniques; (b) it is very cheap method; (c) it is a rapid analysis and less time consuming technique; (d) it does not need a long time to practice and master the technique in order to carry out the analysis. However, the only disadvantages of this technique would be the inability to replay the game if an error in recording occurred.

The visual analysis used in this study, produced surprisingly good data in comparison to the video analysis method. It might be expected that situations would arise to reduce accuracy, for example, the technique requires the researcher to look momentarily away from the ball in order to take note of it's movement and locations, and because the movement of the ball in certain situations is rapid and varied, there would be little time available to note down the movements. As mentioned above, the main drawback of the visual analysis method would be the inability to replay the game if an error in recording occurred. However, experience has shown that a well-trained person

produced negligible errors.

The aspects in which the live visual analysis is preferable to the video method are summarised below:

(i) It is less expensive and well-trained people could produce negligible errors in such analyses by using this technique.

(ii) The time consumed was less when using this technique compared with the other method because the observer will observe and record simultaneously whereas in the video method the observer can only film a match and recording will have to be done at a later date.

(iii) It will not require extra people to help with the observations or analysing process.

(iv) It may be easy to obtain permission from the clubs to do the analyses when using this technique.

3.5 SUMMARY :

In summary, this chapter has examined and discussed the suitability and accuracy of the methods the live match analysis technique compared with the video recording and subsequent analysis technique used for obtaining objective data on patterns of play for soccer teams. The results show that the video recording and live match analysis techniques produce the same results.

The live match analysis method has several advantages over the video recording method. It is quick and cheap, and it can be used effectively by a well trained observer involved in obtaining information – a well-trained observer's errors are negligible. It is useful for providing quickly stored and easily translated records, it allows statistics of success to be calculated quite easily, it will not require extra people to help with the observations or analysing process and it

may be easy to obtain permission from the clubs to do the analyses when using this technique.

In view of this, and because both techniques produce the same results the data for this study has been obtained by using the live match analysis technique.

CHAPTER FOUR

TEAM VARIATIONS IN OFFENSIVE PATTERNS OF PLAY

4.1 INTRODUCTION :

4.2 METHODS :

Source of data :

Statistical analysis :

4.3 RESULTS :

Part One - the top teams :
Team A :
Team B :

Part Two - the average team :
Team C :

Part Three - poorer teams :
Team D :
Team E :

4.4 DISCUSSION :

Free play analysis :

Comparison analysis :

Shooting analysis :

Set plays analysis :

Summary :

4.1 INTRODUCTION :

Much of the dissatisfaction with a team's performance arises from the tactical strategy employed. Soccer managers, coaches and other interested parties, including fans, are critical of errors made by the players, such as failure to select successful options at free-kicks or corners. **Thomson (1985)** emphasises the role of match analysis in the coaching process by stating that:

> **All coaches are analyzers (if not analysts). Even if the scope of their analysis is confined to subjective judgments based on what they witnessed, performance analysis is an essential aspect of every coach's job.**

Keen analysts are able to pinpoint weaknesses such as too few attacks along the wings or too few scoring opportunities created **(Reep and Benjamin 1968; Bate 1988; Banister et al. 1973)**. These problems may be the result of poor team composition, but are largely due to game strategy. The frequency of complaints and debate concerning team performance in these areas show the complex nature of the game, and the importance of making players fully aware of the extent of tactical capabilities in soccer.

A large number of variables with a high degree of player choice of action, combined with a relatively high uncertainty of other player's actions, multiple player interactions and unpredictable game patterns are typical features which apply especially to complex team sports such as soccer. Indeed part of the fascination of soccer is the conjecture generated among spectators about what might have been the outcome had a particular alternative strategy been adopted. Keen observers tend to form independent subjective opinions about the determinants of a game's progress and generally they vary greatly in

their conclusions.

The aim of this chapter is to identify attacking patterns of play and assess their success for each team. The main questions are:

(i) Are there similar patterns of play for all teams ?

(ii) Do different patterns of play produce different results ?

(iii) Which are the more important end results and which patterns of play produce them ?

(iv) Do these successful patterns of play occur equally in home and away matches ?

(v) Is the successful pattern of play seen equally in good and poor teams ?

4.2 METHODS :

The notational method and the field work for this study were explained in detail in Chapter Two Section II.

Source of data :

Data were collected on five Scottish premier soccer league teams. Attacking moves were analysed at home and away matches during the soccer season 1987–1988 (see **Table 4.1**).

The reason for choosing the above teams was to select two top teams (represented by teams **A** and **B**), one average team (represented by team **C**) and two poorer teams (represented by teams **D** and **E**). It should be noted that these teams were seeded according to their past three league season records.

The aim was to analyse forty games, involving eight matches at home and eight matches away for each team. As can be seen from **Table 4.1**,

Table 4.1

Matches and results of the teams whose attacking moves were analysed.

Team A

Matches	Home	Away
Won	5	5
Drawn	1	2
Lost	1	1

Team B

Matches	Home	Away
Won	3	3
Drawn	2	3
Lost	2	1

Team C

Matches	Home	Away
Won	4	4
Drawn	2	0
Lost	2	3

Team D

Matches	Home	Away
Won	2	0
Drawn	2	1
Lost	3	6

Team E

Matches	Home	Away
Won	2	1
Drawn	1	2
Lost	5	5

only thirty-seven matches were analysed. Some teams have only been analysed at seven matches at home and/or at seven matches away. This problem arose because matches coincided on the same day.

It is clearly shown from **Table 4.1** that team **A** had the best record of winning matches at home and away, and its performance was consistent in both situations, whereas teams **B** and **C** have fairly similar results overall, with team **C** performing better at home than in away matches. The poorer teams **D** and **E** had the worst record and they lost most of their matches at home and away. Team **D** had better results at home than away whereas team **E** performed consistently poorly in both situations. The tables of results for each team are presented in **Appendix A 2:1 pp. 385–390.**

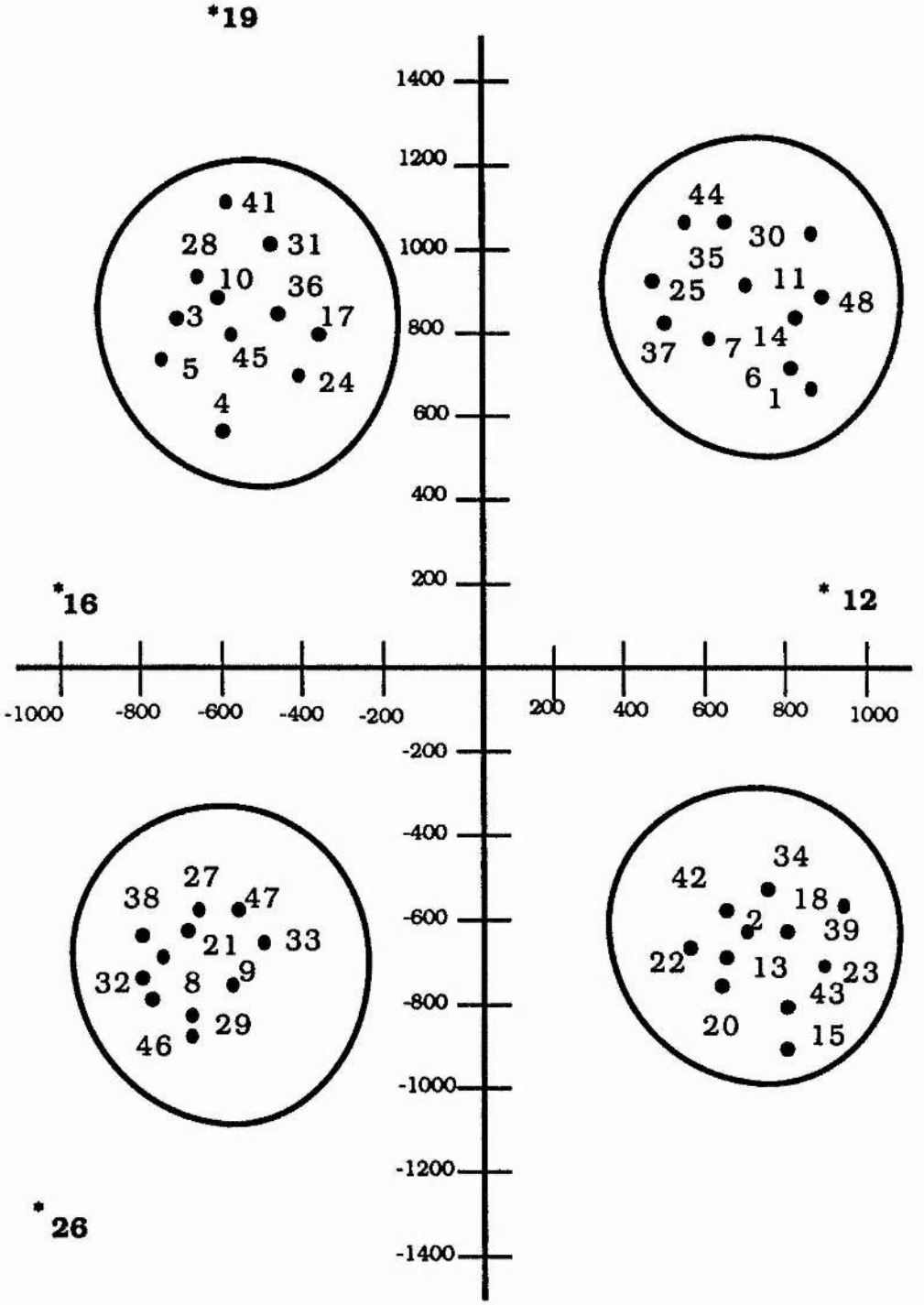
Statistical analysis :

Using the live match analysis technique which was outlined in Chapter Two Section II, data were obtained from thirty-seven matches of the Scottish Premier League during the 1987–1988 season. All the attacking moves at home and away matches were separated for each team. These were subjected to visual cluster analysis according to the technique outlined in Chapter Two Section II, thereby similar patterns of attack were identified as shown in **Figure 4.1.** Each pattern of play represented a number of attacks. However, there were a number of attacking moves which emerged from the analysis of patterns of play for all teams, as shown in **Figure 4.1**, which were unique in that they have little in common with other moves. Since these moves were unique, they were excluded from the analysis. The graphs of free attacks for each team are presented in **Appendix A 2:2 pp. 392–401.**

Having obtained the attacking patterns of play for all the teams during their home and away matches, they were categorised by one of

Figure 4.1

Idealised example of a graph, showing attacking movements. The four clusters represent similar movement patterns of play. The few unique attacking moves have little in common with other moves.



Note :

- Moves within a cluster demonstrating a pattern of play.
- * Moves which are unique having little in common with other moves. (i.e. moves 12, 16, 19 & 26)

ten final actions (as shown in Chapter Two **Table 2.8**) and subjected to statistical analysis using **SPSS-X (Nie et al. 1975)** to see if there are any significant relationships between patterns of play and final actions.

4.3 RESULTS :

For a clearer understanding of the results of this study, the results of each team were first treated individually and analysed as follows:

Part One - the top teams :

Team A :

During the soccer season 1987-1988 the team was analysed playing seven matches at home and eight matches away (see **Table 4.1**). For the purpose of analysis the team's attacking performance at home was separated from its attacking performance away and the two were analysed in the following manner:

Analysis of performance during home matches :

Patterns of play during home matches :

Out of a large number of attacking moves, there were five patterns of the play in home matches. Each of these patterns of play represented a distinct attacking move as follows:

(i) Pattern AH.1 An attack initiated from the inside of the defensive half of the pitch close to the left side of the penalty arc, moving towards the left side, then towards the centre line, then close to the penalty area of the offensive half where it is terminated by interception by a defensive player. This pattern is typical of 56 attacking moves.

(ii) Pattern AH.2 An attack initiated from the middle of the defensive

half of the pitch, moving towards the left side line, then moving along the left wing of the offensive half of the pitch, closing in on the left side line of the penalty area, and terminated by crossing from this position to the penalty area for shooting. This pattern is typical of 35 attacking moves.

(iii) Pattern AH.3 An attack initiated from the defensive half of the pitch, close to the right side line of the penalty area, moving along the right wing of the offensive half of the pitch, closing in on the penalty area and terminated by crossing from this position to the penalty area for shooting. This pattern is typical of 41 attacking moves.

(iv) Pattern AH.4 An attack initiated from the inside of the penalty area on the defensive half of the pitch, close to the right side line, moving along the right side line, then moving along the right wing, approaching the right side line of the penalty area of the offensive half of the pitch and terminated by a defensive player. This pattern is typical of 40 attacking moves.

(v) Pattern AH.5 An attack initiated from the middle of the defensive half of the pitch close to the penalty area, moving towards the left, then moving briefly towards the penalty area of the offensive half, and terminated by a defensive player. This pattern is typical of 38 attacking moves.

It should be noted that the graphs which typify each pattern of play, in home and in away matches, for all the teams, have been numbered and coded separately for easy identification (**see Appendix A 2:3 & A 2:4 pp. 402–451**).

Final actions with patterns of play :

In order to examine the success of these distinct patterns of play, the outcome of each attack was identified and tabulated (**Table 4.2**). This two–way table of counts consists of number of cells. Each cell contains the number of attacks using that pattern of play which produced the specified final actions (see **Table 2.8**). The row totals show the total number of attacks producing each final action, and the column totals show the total number of attacks using each pattern of play. For example, from Pattern AH.1, arose 0 occurrences of final action 1, 0 occurrences of final action 2, 1 occurrence of final action 3,....., 0 occurrences of final action 10, out of a total of 56 attacking moves which was 26.7% of all attacking moves for all patterns of play (i.e. Patterns AH.1–AH.5). Statistical analysis using the chi-squared test was carried out to see if any significant relationships occurred. In general for all the teams the relationship between patterns of play and final actions are shown to be high by the chi–squared test (i.e. the relationship between the types of pattern and final actions for the team **A** in home matches indicated a significant relationship (χ^2 = 77.02 ; $P < 0.001$)). However, since more than 20% of all cells have an expected frequency of less than 5 the mathematical assumptions upon which the chi-squared test is based are not met. Despite this consequent invalidation, it should be noted that the significance level 0.001 is high and may be indicative of a relationship between the two variables if a greater number of measures had been taken. The nature of the categories prevents them from being combined in order to raise the expected frequencies of the final actions in order to meet the criteria for the test.

Table 4.2

Summary of the frequency distribution of free attacks between final actions and patterns of play for all attacking moves in seven home matches for team A. (Value of chi-squared statistic = 77.02 ; P < 0.001).

Final actions	Patterns of play					Row total
	AH.1	AH.2	AH.3	AH.4	AH.5	%
1	0	6	4	0	0	10 4.8
2	0	5	5	0	0	10 4.8
3	1	2	6	6	2	17 8.1
4	39	15	14	20	20	108 51.4
6	0	2	6	3	3	14 6.7
7	11	3	2	6	10	32 15.2
8	5	1	1	4	3	14 6.7
10	0	1	3	1	0	5 2.4
Total No. of attacks %	56 26.7	35 16.7	41 19.5	40 19.0	38 18.1	210 100.0

From **Table 4.2**, which indicates the relationship between the final actions and patterns of play for 210 attacks in the seven home matches, the undernoted observations were made:

(i) Patterns AH.2 and AH.3 produced the final actions 1 and 2 more often than the other patterns of play. (Final actions 1 and 2 are shooting at the goal). These final actions taken together were produced in 31% and 22% of all attacks using these patterns.

(ii) The most common outcome of Patterns AH.1, AH.4 and AH.5 was final action 4, (final action 4 representing lost of possession) and this occurred more often than for any other patterns of play. 70% of Pattern AH.1, 50% of Pattern AH.4 and 53% of Pattern AH.5 produced final action 4. The distribution of their final actions was markedly similar.

(iii) Pattern AH.3 mainly produced final actions 1 and 2, and also it has produced final action 6 (final action 6 representing a corner-kick).

Clearly, the results of the above observations show that Patterns AH.2 and AH.3 were the most effective patterns of play since they provided most of the goals and most of the shots on target of all the patterns of play. They produced all 20 shots on target. It should also be noted that Patterns AH.1, AH.4 and AH.5 were the least successful since they did not produce any shooting opportunity out of 134 attacking moves. However, Pattern AH.3 did produce a considerable number of corner-kicks and shots on goal, the effectiveness of these corner-kicks will be examined in detail later in this chapter. It should not be assumed that an attack is fruitless if the end result is not a shot on goal. It may produce a corner-kick or a free-kick which could lead to a scoring opportunity. This should be borne in mind when later results are examined.

The most and least successful attacking patterns of play for team **A**

during home matches have now been identified and it is desired to assess how frequently these patterns of play appeared in each of those matches which were analysed in relation to the result of the match. This can be seen in **Figure 4.2**, which shows that Patterns AH.2 and AH.3 appeared more frequently in those matches which were won than in those matches which were lost. Patterns AH.1 and AH.5 appeared in all of the matches played but were repeated in a greater number in those matches which were lost than in those matches which were won. Pattern AH.4 was found in regular distribution in all of the matches. It should be noted that the total number of attacking moves in those matches which were won were greater than the total number of attacking moves in those matches which were lost.

Analysis of performance during away matches :

Patterns of play during away matches :

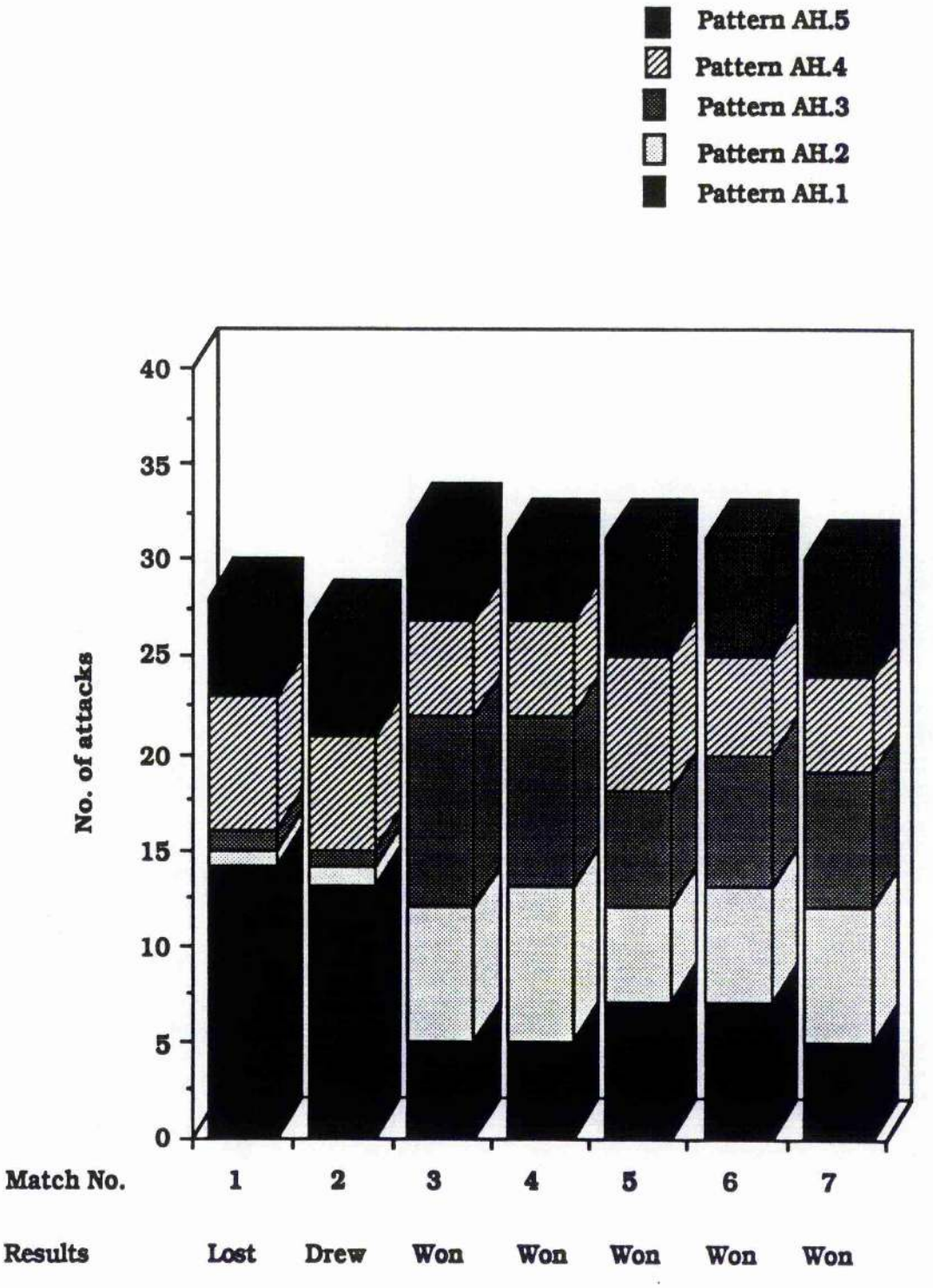
Out of a large number of attacking moves, there were five patterns of the play in away matches. Each of these patterns of play represented a number of attacking move as follows:

(i) Pattern AA.1 An attack initiated from the inside of the defensive half of the pitch, moving towards the right side of the centre line, then moving along the right wing of the offensive half, then towards the penalty area and terminated by shooting. This pattern is typical of 50 attacking moves.

(ii) Pattern AA.2 An attack initiated from the defensive half of the pitch close to the left side of the penalty arc, moving towards the left side line, then towards the centre line along the left wing of the offensive half of the pitch approaching almost as far as to the left side of the penalty area and terminated by interception by a defensive player. This pattern is typical of 56 attacking moves.

Figure 4.2

Summary of the association between frequencies of patterns of play from free attacks in home matches for team A.



(iii) Pattern AA.3 An attack initiated from the inside the centre circle on the defensive half of the pitch, moving towards the left side of the centre line, then towards the penalty area and terminated by shooting. This pattern is typical of 46 attacking moves.

(iv) Pattern AA.4 An attack initiated from close to the middle of the defensive half of the pitch, moving towards the centre line, then, by a number of passes inside the offensive half of the pitch, towards the penalty arc and terminated by interception by a defensive player. This pattern is typical of 37 attacking moves.

(v) Pattern AA.5 An attack initiated from inside the penalty area on the defensive half of the pitch close to the right side line, moving towards the middle, then approaching the right side of the penalty area of the offensive half of the pitch and then terminated by interception by a defensive player. This pattern is typical of 37 attacking moves.

Final actions with patterns of play :

From **Table 4.3**, which indicates the relationship between the final actions and patterns of play, the undernoted observations were made:

(i) Patterns AA.1 and AA.3 produced the final actions 1 and 2 more often than the other patterns of play. (Final actions 1 and 2 are shooting at the goal). These final actions taken together were produced in 24% and 22% of all attacks using these patterns.

(ii) The most common outcome of Patterns AA.2 and AA.4 was final action 4, (final action 4 representing lost of possession) and this occurred more often than for any other patterns of play. 66% of Pattern AA.2 and 54% of Pattern AA.4 produced final action 4. Nevertheless, Pattern AA.4 has also produced a considerable number of final actions 3 and 6 (final actions 3 and 6 representing a shot off target and a corner-kick respectively).

Table 4.3

Summary of the frequency distribution of free attacks between final actions and patterns of play for all attacking moves in eight away matches for team A.

Final actions	Patterns of play					Row total
	AA.1	AA.2	AA.3	AA.4	AA.5	%
1	4	0	6	0	0	10 4.4
2	8	0	4	0	0	12 5.3
3	3	4	2	5	3	17 7.5
4	20	37	18	20	15	110 48.7
6	7	3	4	5	6	25 11.1
7	7	10	9	1	6	33 14.6
8	1	2	2	4	5	14 6.2
10	0	0	1	2	2	5 2.2
Total No. of attacks %	50 22.1	56 24.8	46 20.4	37 16.4	37 16.4	226 100.0

(iii) Pattern AA.5 usually produced final action 4, although in 16% of attacks it produced final action 6.

Clearly, the results of the above observations on the five patterns of play show that Patterns AA.1 and AA.3 were the most distinctive patterns of play since they provided most of the goals and most of the shots on target of all the patterns of play. They produced all 22 shots on target. It should also be noted that Patterns AA.2 and AA.4 were the least successful since they did not provide any shooting opportunity out of 93 attacking moves. However, Patterns AA.4 and AA.5 did produce a considerable number of corner-kicks and the effectiveness of these corner-kicks will be examined in detail later in this chapter.

From **Figure 4.3**, which indicates how frequently these patterns of play appeared in each match, it can be seen that Patterns AA.1 and AA.3 appeared more frequently in those matches which were won than in those matches which were lost. Patterns AA.2 and AA.4 appeared in all of the matches played but were repeated in a greater number in those matches which were lost than in those matches which were won. Pattern AA.5 was found in all of the matches but it was repeated in a greater number in those matches which were won than in those matches which were drawn or lost. It should be noted that the total number of attacking moves in those matches which were won was greater than the total number of attacking moves in those matches which were drawn or lost.

Shooting analysis during home and away matches :

It was considered desirable to assess the relationships between shots on/off target for free attacking moves with the results of the matches. These relationships are shown in **Figures 4.4** and **4.5** from which the following points emerge:

Figure 4.3

Summary of the association between frequencies of patterns of play from free attacks in away matches for team A.

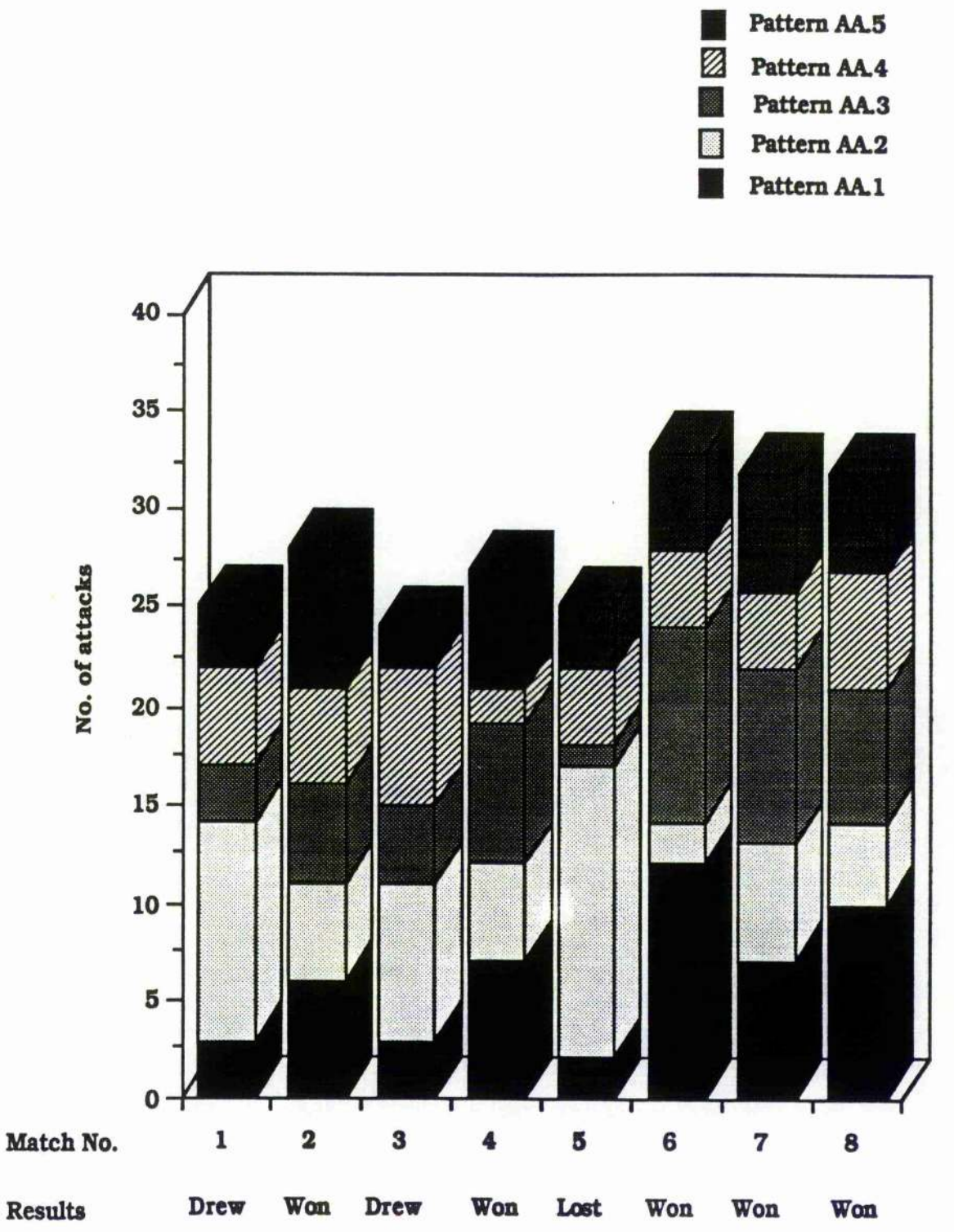


Figure 4.4

Summary of the relationships between home matches and shots on or off target for team A.

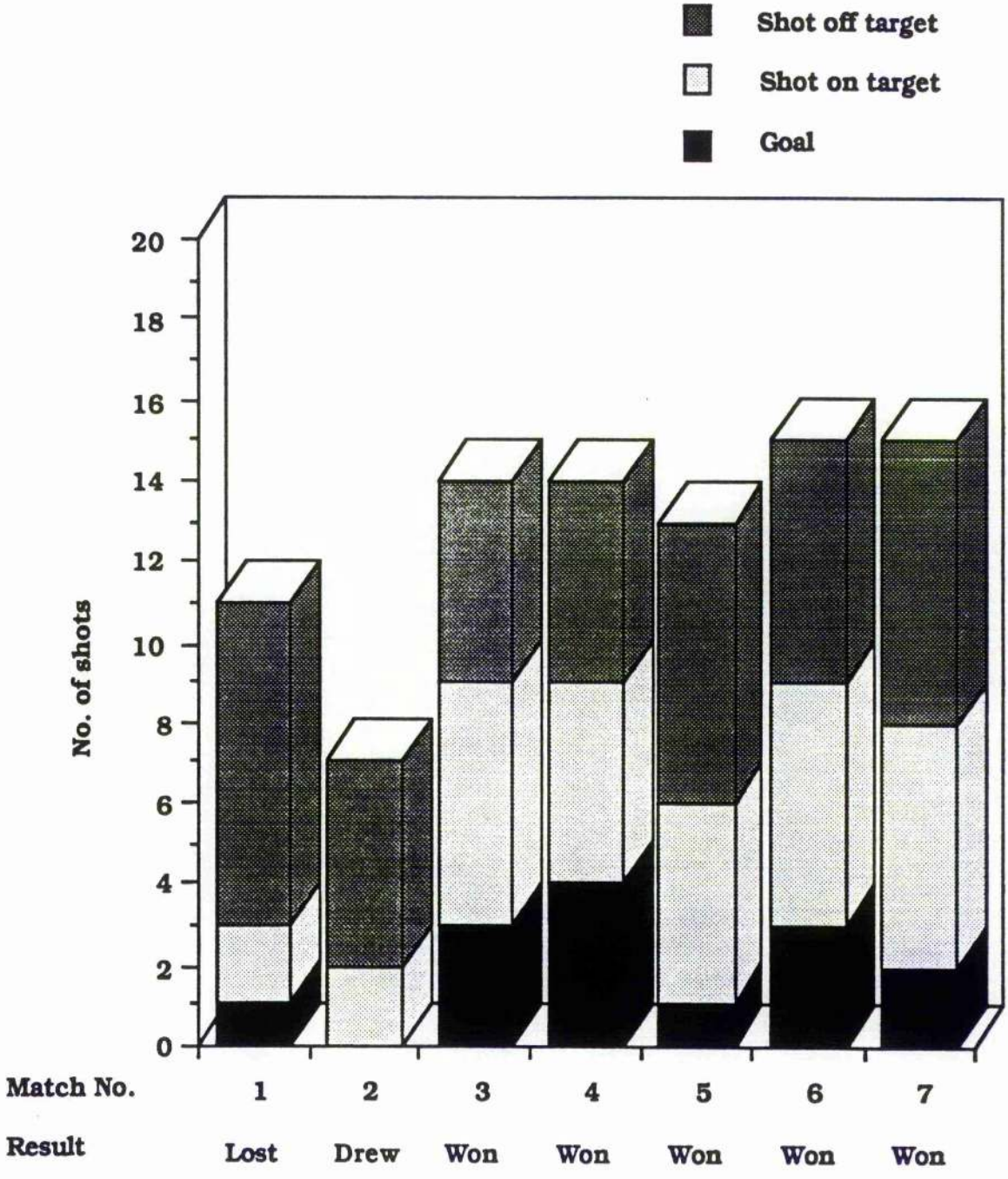
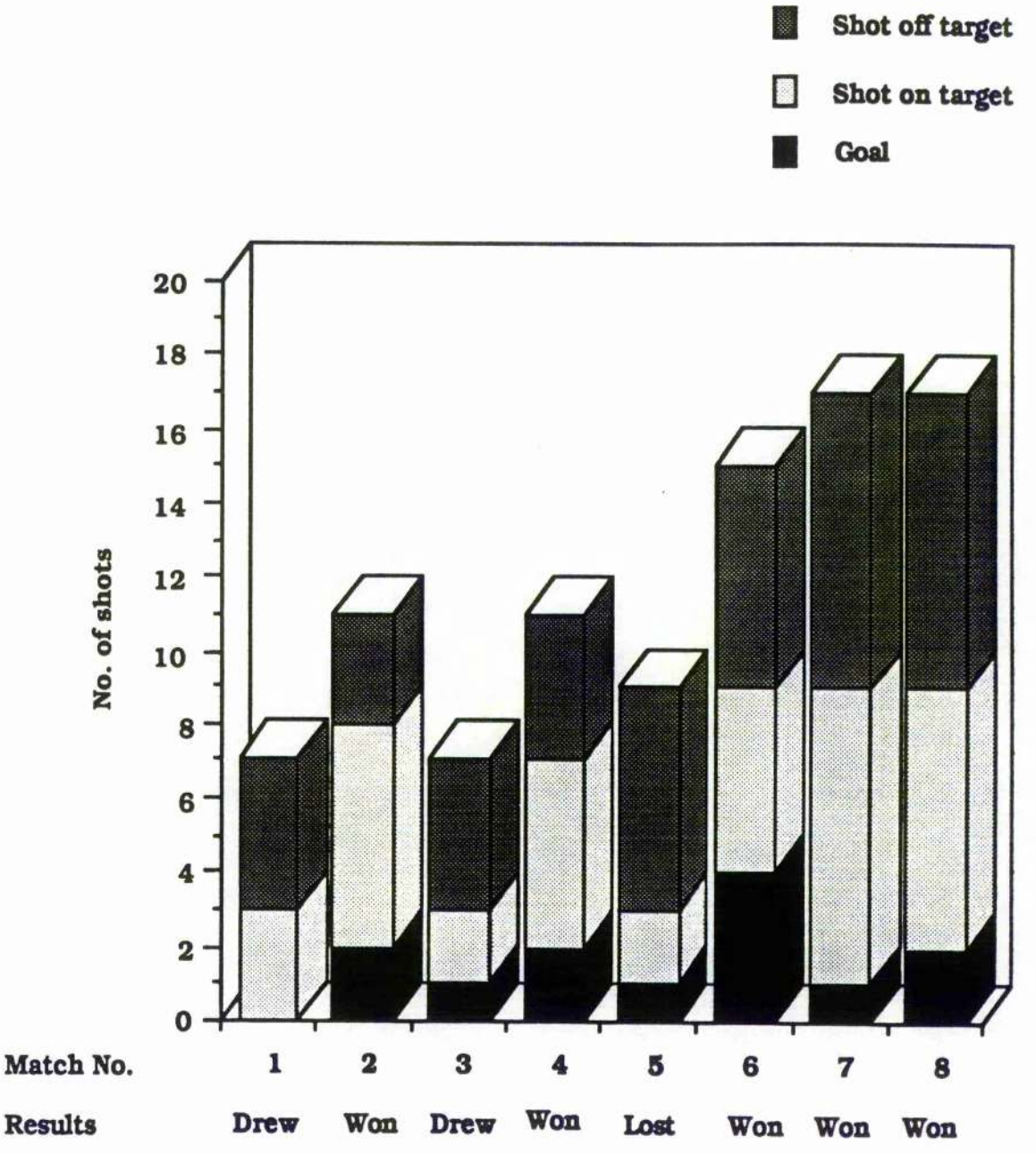


Figure 4.5

Summary of the relationships between away matches and shots on or off target for team A.



(i) Those matches which were won had a greater total number of shots than those matches which were drawn or lost. This indicates that in successful games the team produced more shots from free attacks.
(ii) Those matches which were won had a greater total number of shots on target than those matches which were drawn or lost.

Summary of analysis of performance during home and away matches :

In summary, the analysis of patterns of play for team **A** during its home and away matches showed that there were five distinct patterns of play in the seven home matches and also five distinct patterns of play in the seven away matches analysed. The results during home matches showed that Patterns AH.2 and AH.3 were the most successful while Patterns AH.1, AH.4 and AH.5 were the least successful. However, Pattern AH.3 concluded more often with shots on target and corner-kicks.

The results for away matches showed that Patterns AA.1 and AA.3 were the most successful while Patterns AA.2 and AA.4 were the least successful. Patterns AA.4 and AA.5 often concluded with corner-kicks. However, the successful patterns of play appeared more often in those matches which were won than in those which were drawn or lost in both home and away situations.

The analysis of shooting showed that there was a greater total number of shots in those matches which were won than in those which were drawn or lost. Those matches which were won also had a greater total number of shots on target than those matches which were drawn or lost.

Analysis of performance during set plays :

Using the theory outlined in Chapter Two Section II, two patterns of play were found for both corner-kicks and throw-ins. These two patterns of play correspond to corner-kicks and throw-ins taken on the right side or on the left side of the pitch, Pattern 1 (corner-kicks on the right) represents 59 corner-kicks; Pattern 2 (corner-kicks on the left) represents 72 corner-kicks. Pattern 1 (throw-ins on the right) represents 96 throw-ins; Pattern 2, (throw-ins on the left) represents 118 throw-ins. For free-kicks, no obvious types of pattern of play emerged. For this reason, all 209 free-kicks are taken into account and are considered as 209 unique movements.

An analysis of the relationship between final actions and patterns of play for corner-kicks and throw-ins, was carried out using the chi-squared test. This indicated that there was no significant relationship between patterns of play and final actions (χ^2 = 1.45 and 3.23 for corner-kicks and throw-ins respectively, $P > 0.05$). Clearly, corner-kicks and throw-ins taken from either side of the pitch are not producing significantly different outcomes. In general for all the teams the relationship between patterns of play and final actions are shown to be not significant by the chi-squared test. The tables of set plays movements for each team are presented in **Appendix 2:5 pp. 452 –467.**

Since analysis of set plays for team **A** showed that there were no significant differences between corner-kicks taken from either side of the pitch and between throw-ins taken from either side of the pitch, it was considered desirable to examine short corner-kicks, long throw-ins and direct free-kicks which were taken by direct shots on

target. In general for all the teams, there were very few short corner-kicks, long throw-ins and direct free-kicks which were direct shots at the goal employed by the teams. Because of the lack of data it was not possible to carry out the proper statistical analysis, (for example team **A** had employed 11 long throw-ins out of the total 214 throw-ins, team **B** had employed 9 long throw-ins out of the total 185, team **D** had employed 4 long throw-ins out of the total 173 throw-ins....etc. see **Appendix 2:5 pp. 454–463**). However, the data were analysed as shown below.

Shooting analysis :

Although no relationship has been found between the patterns of play of offensive set pieces and the outcome of each move, it is worth examining further the effectiveness of set pieces. Furthermore, it was considered desirable to assess the relationships between shots on/off target for set plays with the results of the home and away matches which were analysed. From **Figure 4.6**, which indicates the relationships between frequency of shooting in set plays and the results of the matches analysed, the following points have emerged:

(i) Those matches which were won had a greater total number of shots on target from set plays than those which were drawn or lost.

(ii) The total number of set plays per se gave no indication of success.

(iii) Despite the team having more throw-ins and free-kicks away from home, there were more shots on target at home.

The relationships between long corner-kicks (consisting of a single cross into the opposition goal area) and short corner-kicks (consisting of a number of short passes) with shots on/off target were examined. It was found that corner-kicks which included a greater number of short passes were providing more shooting opportunities. Although the team

Figure 4.6

Summary of the association between shots at goal from set pieces and the results of the matches for team A.

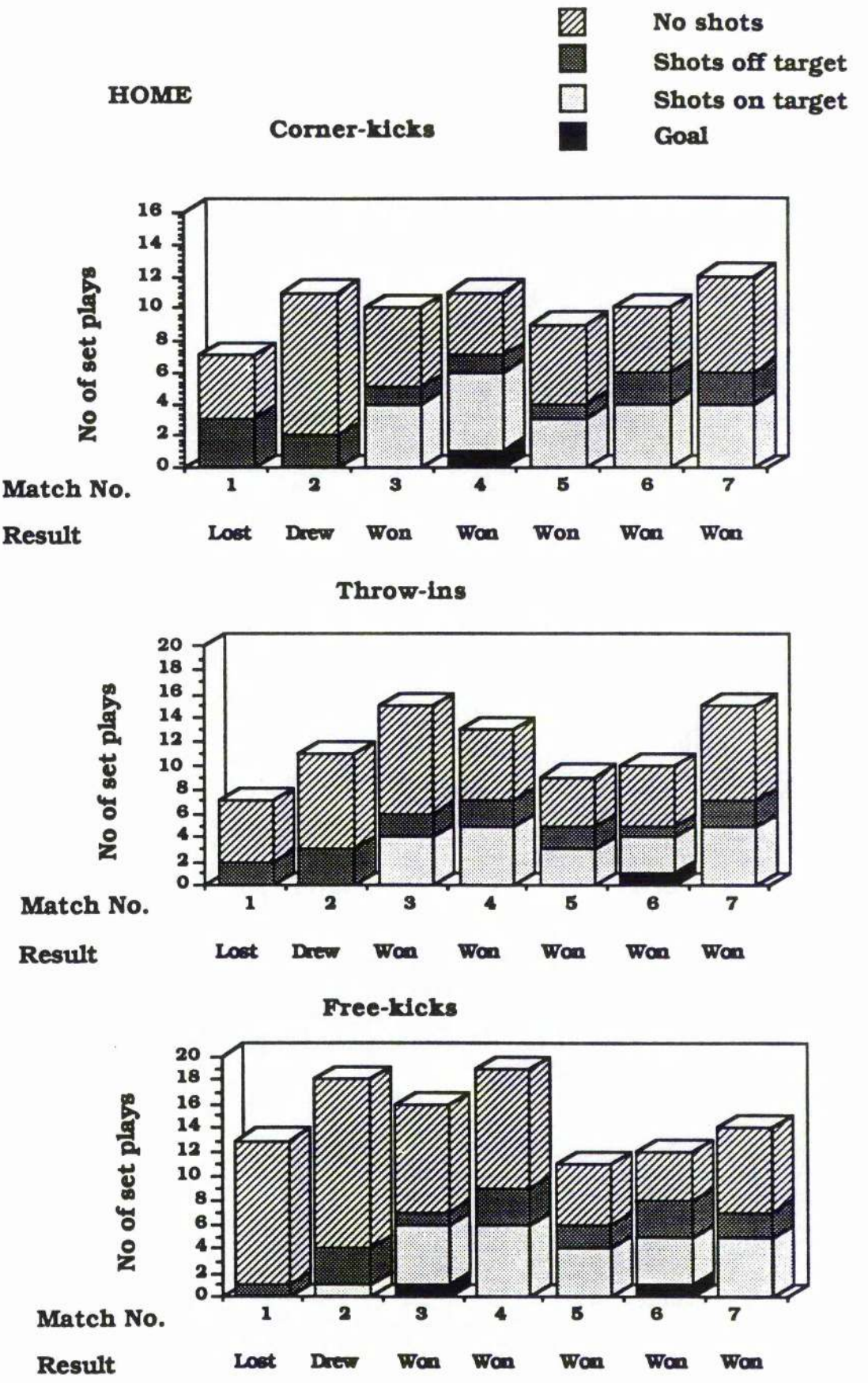
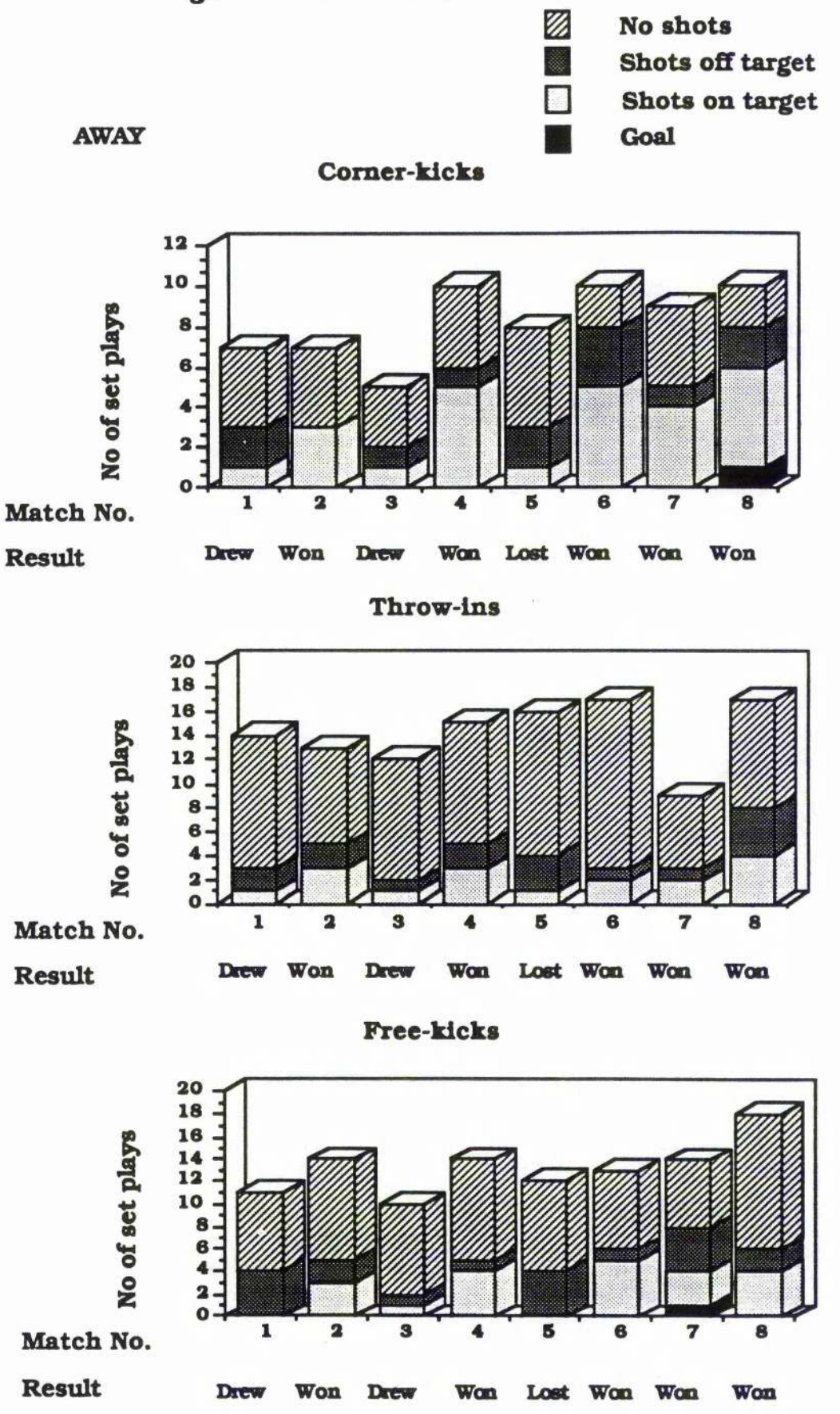


Figure 4.6 Continued.



had played a greater number of long corner-kicks (88 long corner-kicks employed) than short corner-kicks (44 short corner-kicks employed), there were more shots on target from short corner-kicks. Short corner-kicks produced 27 shots on target out of the total of 39 shots on target see **Appendix A 2:5 pp. 453.**

In addition, a useful assessment was made of the relationships between long throw-ins (throw-ins are often taken in the attacking third of the pitch and thrown into the oppositions penalty area for shooting) and short throw-ins (throwing the ball to a colleague in order to bring the ball into play and not lose possession, which always starts as an short attacking move) with shots on/off target. It was found that short throw-ins produced more shooting opportunities than long throw-ins. Short throw-ins produced 30 shots on target out of the total of 33 shots on target **see Appendix A 2:5 pp. 454.** It should be noted that the team had employed a greater number of short throw-ins (203 short throw-ins employed) than long throw-ins (11 long throw-ins employed).

Furthermore, it was interesting to evaluate the relative effectiveness of free-kicks taken in front of the opposition goal by direct shots on target in relation to free-kicks taken as a lay-off to another player. It was found that the free-kicks which taken as direct shots on goal did produce more shots on target. Free-kicks which taken by shots on goal produced 28 shots on target out of the total of 43 shots on target **see Appendix A 2:5 pp. 455.** It should be noted that the team had employed a greater number of free-kicks which were taken as a lay-off to another player (166 free-kicks employed as a lay-off to another player) than free-kicks which taken directly by shot on goal (43 free-kicks employed as a direct shot on goal).

In summary, the analysis of set plays for the team **A** showed that

there was a greater number of shots on target (a) from short corner-kicks rather than from long corner-kicks, (b) short throw-ins rather than long throw-ins and (c) from direct shots at the goal from free-kicks rather than from lay-offs to another player.

Team B :

During the soccer season 1987–1988 the team was analysed playing seven matches at home and seven matches away (see **Table 4.1**). For the purpose of analysis the team's attacking performance at home was separated from its attacking performance away and the two were analysed in the following manner:

Analysis of performance during home matches :

Patterns of play during home matches :

Out of a large number of attacking moves, there were five patterns of play in home matches. Each of these patterns of play represented a distinct attacking move as follows:

(i) Pattern BH.1 An attack initiated from the middle of the defensive half of the pitch, closing in on the left side of the offensive penalty arc, and terminated from this position by shooting. This pattern is typical of 35 attacking moves.

(ii) Pattern BH.2 An attack initiated from the defensive half of the pitch close to the right side line, moving along the right wing in the offensive half of the pitch towards the corner flag on the right side and terminated by crossing from this position to the penalty area for shooting. This pattern is typical of 31 attacking moves.

(iii) Pattern BH.3 An attack initiated from the inside of the penalty area on the defensive half of the pitch, moving towards the middle of

the offensive half of the pitch and then terminated by interception by a defensive player. This pattern is typical of 33 attacking moves.

(iv) Pattern BH.4 An attack initiated from the inside of the penalty area on the defensive half of the pitch, closing in on the right side of the penalty arc of the offensive half of the pitch by a number of passes and terminated from this position by a defensive player. This pattern is typical of 36 attacking moves.

(v) Pattern BH.5 An attack initiated from the defensive half of the pitch, moving towards the left side line, moving along the left wing of the offensive half of the pitch towards the left side of the penalty area and terminated by crossing from this position to the penalty area for shooting. This pattern is typical of 30 attacking moves.

Final actions with patterns of play :

From **Table 4.4**, which indicates the relationship between the final actions and patterns of play, the undernoted observations were made:

(i) Patterns 2 and 5 were the only patterns to produce final actions 1 and 2. (Final actions 1 and 2 are shooting at the goal). These final actions taken together were produced in 36% and 43% of all attacks using these patterns, respectively.

(ii) The most common outcome of Patterns BH.1, BH.3 and BH.4 was final action 4, (final action 4 representing lost of possession) and this occurred more often than for any other patterns of play. 57% of Pattern BH.1, 61% of Pattern BH.3 and 61% of Pattern BH.4 produced final action 4. The distribution of their final actions was markedly similar.

Clearly, the results of the above observations show that Pattern BH.2 and BH.5 were the most effective patterns of play since they provided most of the goals and most of the shots on target of all the patterns of

Table 4.4

Summary of the frequency distribution of free attacks between final actions and patterns of play for all attacking moves in seven home matches for team B.

Final actions	Patterns of play					Row total
	BH.1	BH.2	BH.3	BH.4	BH.5	%
1	0	2	0	0	5	7 4.2
2	0	9	0	0	8	17 10.3
3	3	4	3	4	3	17 10.3
4	20	9	20	22	7	78 47.3
6	2	3	3	3	4	15 9.1
7	5	3	2	6	2	18 10.9
8	2	0	3	0	0	5 3.0
10	3	1	2	1	1	8 4.8
Total No. of attacks %	35 21.2	31 18.8	33 20.0	36 21.8	30 18.2	165 100.0

play. They produced all 24 shots on target. It should also be noted that Patterns BH.1, BH.3 and BH.4 were the least successful since they did not provide any shooting opportunity out of 104 attacking moves.

The most and least successful attacking patterns of play for team **B** during home matches have now been identified and it is desired to assess how frequently these patterns of play appeared in each of those matches which were analysed in relation to the result of the match. This can be seen in **Figure 4.7**, which shows that Patterns BH.2 and BH.5 appeared more frequently in those matches which were won than in those matches which were lost. Patterns BH.1, BH.3 and BH.4 appeared in all of the matches played but were repeated in a greater number in those matches which were lost than in those match which were won. It should be noted that the total number of attacking moves in those matches which were won was greater than the total number of attacking moves in those matches which were lost.

Analysis of performance during away matches :

Patterns of play during away matches :

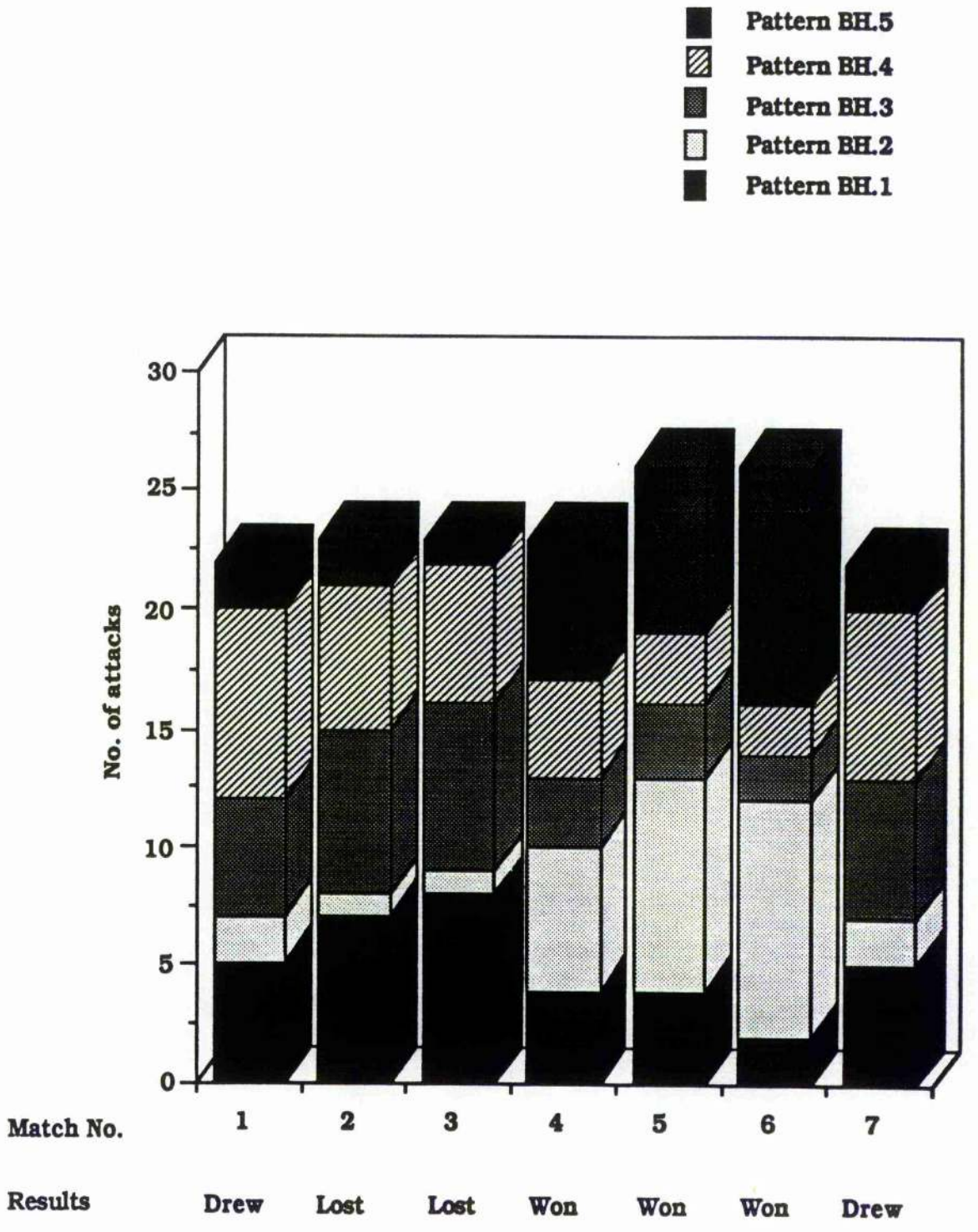
Out of a large number of attacking moves, there were five patterns of play in away matches. Each of these patterns of play represented a number of attacking move as follows:

(i) Pattern BA.1 An attack initiated from close to the middle of the defensive half of the pitch, moving towards the offensive half of the pitch close to the right side line, moving along the right wing towards the right side of the goal line and then terminated by crossing from this position to the penalty area for shooting. This pattern is typical of 28 attacking moves.

(ii) Pattern BA.2 An attack initiated from the defensive half of the

Figure 4.7

Summary of the association between frequencies of patterns of play from free attacks in home matches for team B.



pitch close to the left side of the penalty area, moving towards the left and then towards the penalty arc of the offensive half of the pitch where it is terminated by interception by a defensive player. This pattern is typical of 43 attacking moves.

(iii) Pattern BA.3 An attack initiated from the defensive half of the pitch close to the right side of the penalty arc, moving forward along the right wing closing in on the penalty arc of the offensive half of the pitch, and then terminated from this position by a defensive player. This pattern is typical of 34 attacking moves.

(iv) Pattern BA.4 An attack initiated from the middle of the defensive half of the pitch, close to the left side line, moving forward along the left wing of the offensive half of the pitch by a number of passes and terminated by crossing from this position to the penalty area for shooting. This pattern is typical of 34 attacking moves.

(v) Pattern BA.5 An attack initiated from the defensive half of the pitch, moving towards the middle, then moving towards the penalty area of the offensive half of the pitch and then terminated by interception by a defensive player. This pattern is typical of 55 attacking moves.

Final actions with patterns of play :

From **Table 4.5**, which indicates the relationship between the final actions and patterns of play, the undernoted observations were made:

(i) Patterns BA.1 and BA.4 were the only patterns to produce final actions 1 and 2. (Final actions 1 and 2 are shooting at the goal). These final actions taken together were produced in 39% and 21% of all attacks using these patterns, respectively.

(ii) The most common outcome of Patterns BA.2, BA.3 and BA.5 was final action 4, (final action 4 representing lost of possession) and this

Table 4.5

Summary of the frequency distribution of free attacks between final actions and patterns of play for all attacking moves in eight away matches for team B.

Final actions	Patterns of play					Row total
	BA.1	BA.2	BA.3	BA.4	BA.5	%
1	4	0	0	2	0	6 3.1
2	7	0	0	5	0	12 6.2
3	2	4	5	3	5	19 9.8
4	8	25	18	10	29	90 46.4
6	0	1	3	6	4	14 7.2
7	2	7	0	1	10	20 10.3
8	0	6	6	3	2	17 8.8
10	5	0	2	4	5	16 8.2
Total No. of attacks %	28 14.4	43 22.2	34 17.5	34 17.5	55 28.4	194 100.0

occurred more often than for any other patterns of play. 58% of Pattern BA.2, 53% of Pattern BA.3 and 53% of Pattern BA.5 produced final action 4.

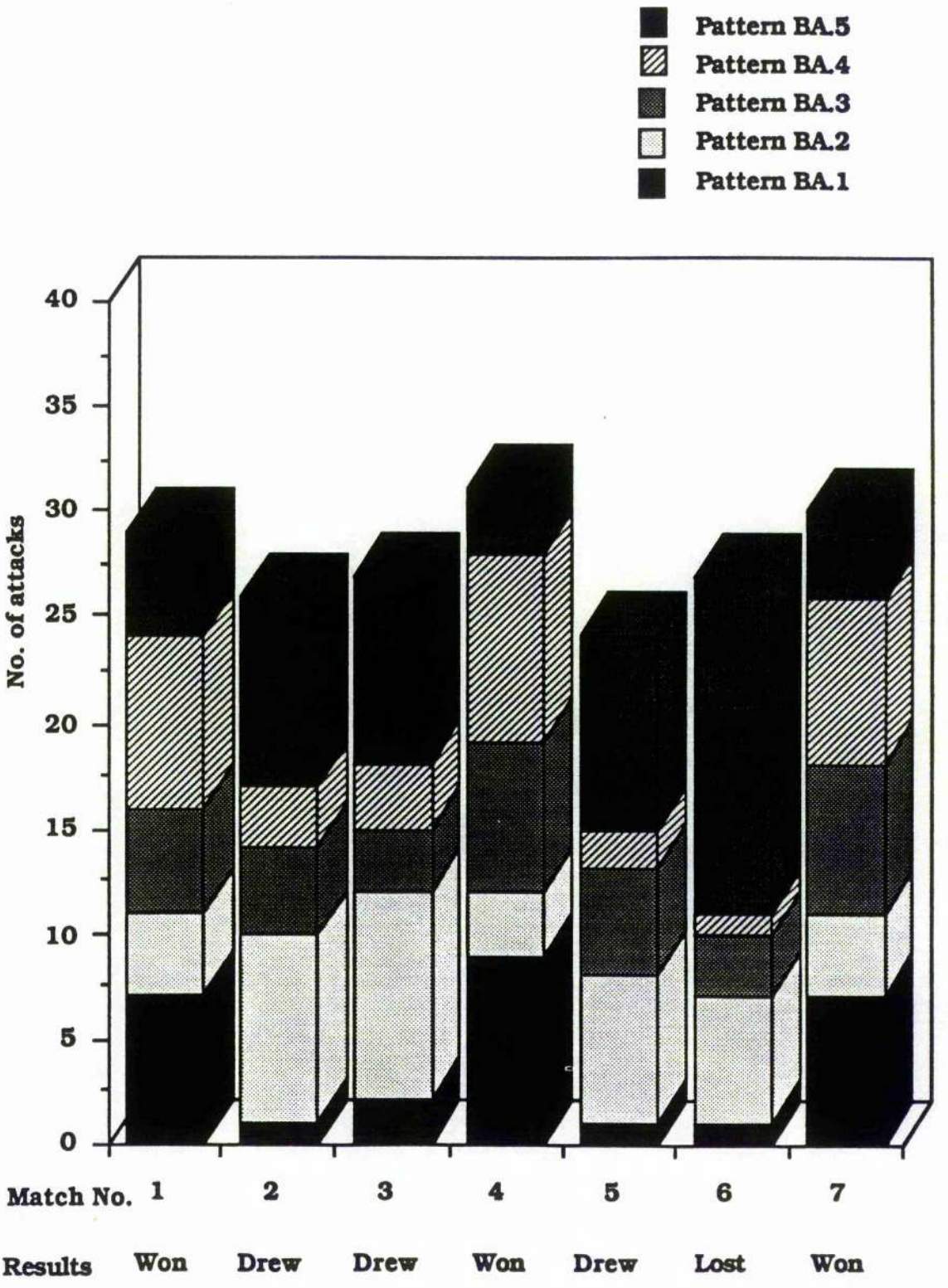
(iii) Pattern BA.5 has a fairly similar distribution of final actions to Patterns BA.2 and BA.3, with final action 4 being the most common outcome. However, it produced final actions 6, 7 and 10 more frequently than other outcomes. (Final actions 6, 7 and 10 are representing corner-kicks, throw-ins and free-kicks respectively).

Clearly, the results of the above observations show that Patterns BA.1 and BA.4 were the most effective patterns of play since they provided most of the goals and most of the shots on target of all the patterns of play. They produced all 18 shots on target. It should also be noted that Patterns BA.2, BA.3 and BA.5 were the least successful since they did not provide any shooting opportunity out of 132 attacking moves. Despite Pattern BA.5 being less successful, it did produce a considerable number of corner-kicks and free-kicks. The effectiveness of these corner-kicks and free-kicks will be examined in detail later in this chapter.

The most and least successful attacking patterns of play for team **B** during away matches have now been identified and it is desired to assess how frequently these patterns of play appeared in each of those matches which were analysed in relation to the result of the match. This can be seen in **Figure 4.8**, which shows that Patterns BA.1 and BA.4 appeared more frequently in those matches which were won than those matches which were lost. Patterns BA.3 and BA.2 appeared in all of the matches played but were repeated in a greater number in the matches which were drawn than in those matches which were won.

Figure 4.8

Summary of the association between frequencies of patterns of play from free attacks in away matches for team B.



Paradoxically Patterns BA.2 and BA.3 occurred less often in the match which was lost than in those matches which were drawn. However, the differences were only slight. Pattern BA.5 was found in all of the matches but it was repeated in a greater number in those matches which were drawn than in those matches which were won and was very common in the one match which was lost. It should be noted that the total number of attacking moves in those matches which were won was greater than the total number of attacking moves in those matches which were drawn or lost.

Shooting analysis during home and away matches :

The relationships between shots on/off target for free attacking moves with the results of the matches were assessed. These relationships are shown in **Figures 4.9** and **4.10** from which the following points emerge:

(i) Those matches which were won had a greater total number of shots than those matches which were drawn or lost. This indicates that in successful games the team produced more shots from free attacks.

(ii) Those matches which were won had a greater total number of shots on target than those matches which were drawn or lost.

Summary of analysis of performance during home and away matches :

The analysis of patterns of play for team **B** during its home and away matches showed that there were five distinct patterns of play in the seven home matches and also there were five distinct patterns of play in the seven away matches analysed. The results during home matches showed that Patterns BH.2 and BH.5 were the most successful while Patterns BH.1, BH.3 and BH.4 were the least successful.

The results for away matches showed that Patterns BA.1 and BA.4

Figure 4.9

Summary of the relationships between home matches and shots on or off target for team B.

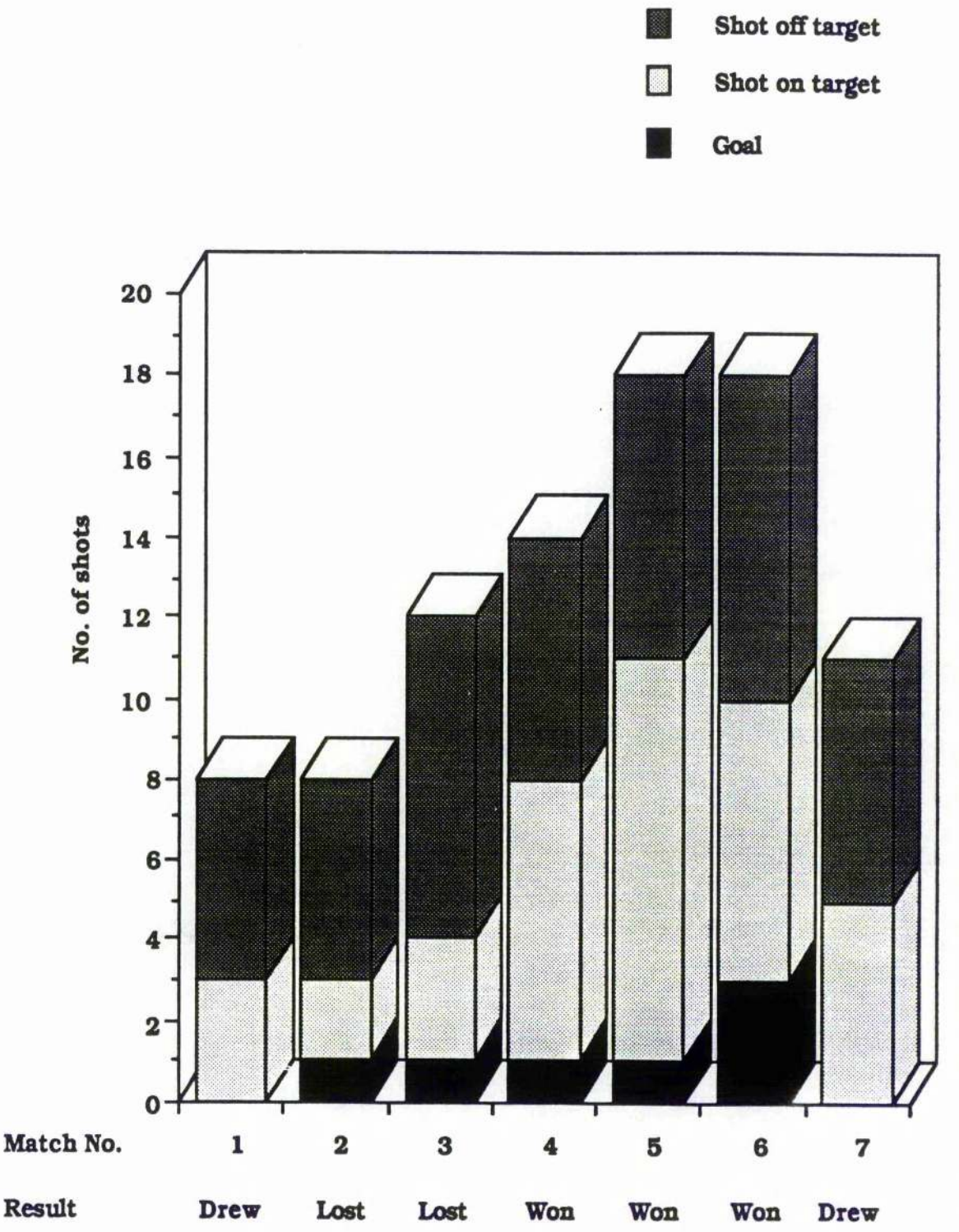
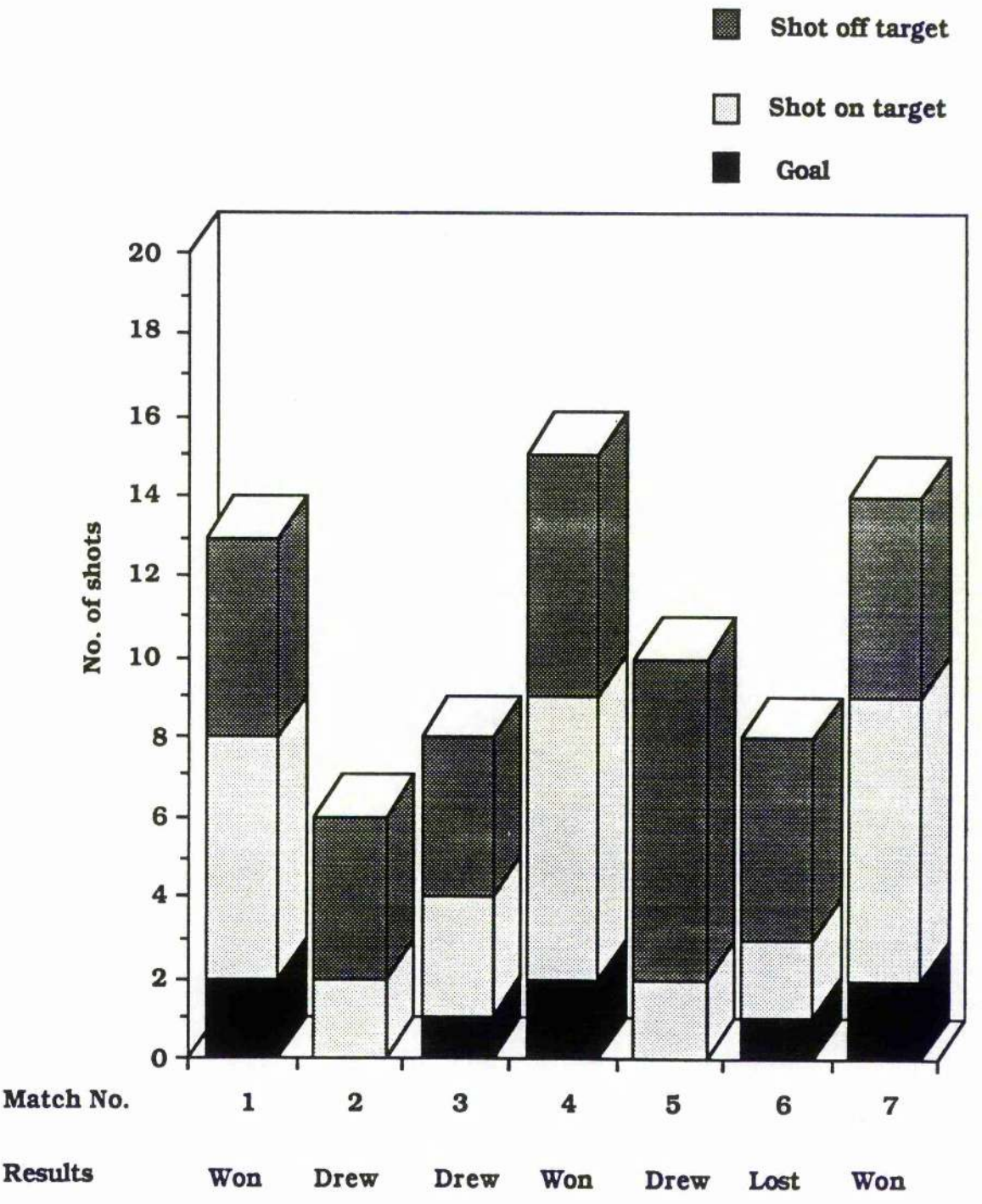


Figure 4.10

Summary of the relationships between away matches and shots on or off target for team B.



were the most successful while Patterns BA.2, BH.3 and BA.5 were the least successful. However, Pattern BA.5 concluded more often with corner-kicks, throw-ins or free-kicks. It should also be noted that Pattern BH.4 did produce a considerable number of corner-kicks. The successful patterns of play appeared more often in those matches which were won than in those matches which were lost in both home and away matches – in common with the findings for team **A.**

The analysis of shooting showed that there was a greater total number of shots in those matches which were won than in those which were drawn or lost. Those matches which were won also had a greater total number of shots on target than those matches which were drawn or lost – again in common with the findings for team **A.**

Analysis of performance during set plays :

Shooting analysis :

Although no relationship has been found between the patterns of play of offensive set pieces and the outcome of each move, it is worth examining further the effectiveness of set pieces. Furthermore, it was considered desirable to assess the relationships between shots on/off target for set plays with the results of the home and away matches which were analysed. From **Figure 4.11**, which indicates the relationships between frequency of shooting in set plays and the results of the matches analysed, the following points have emerged:

(i) Those matches which were won had a greater total number of shots on target from set plays than those which were drawn or lost.

(ii) The total number of set plays per se gave no indication of success.

(iii) Despite the team having more corner-kicks away from home, there were more shots on target at home.

Figure 4.11

Summary of the association between shots at goal from set pieces and the results of the matches for team B.

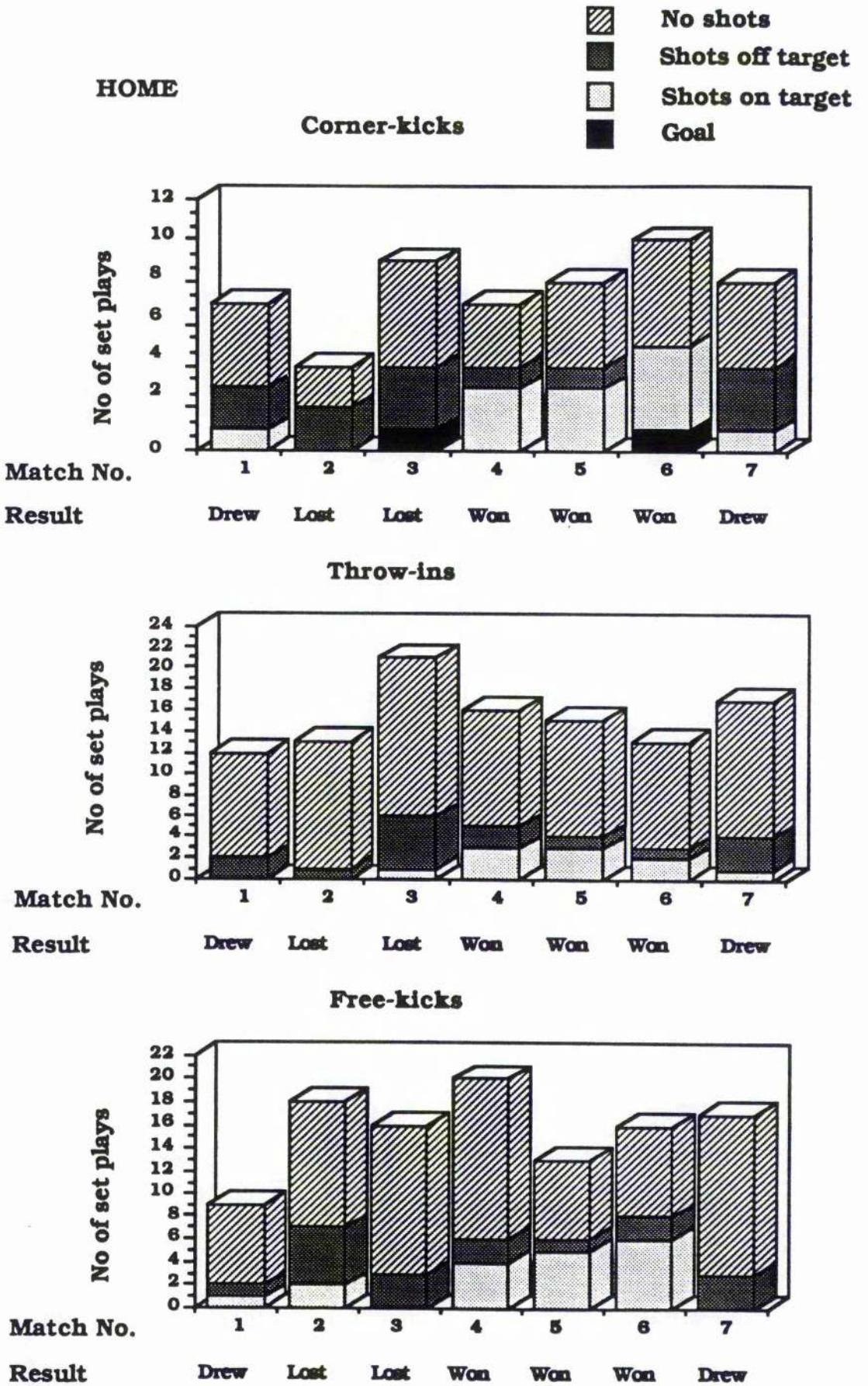
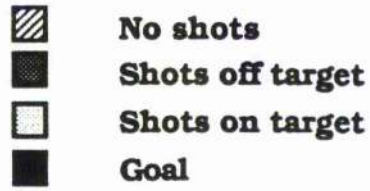
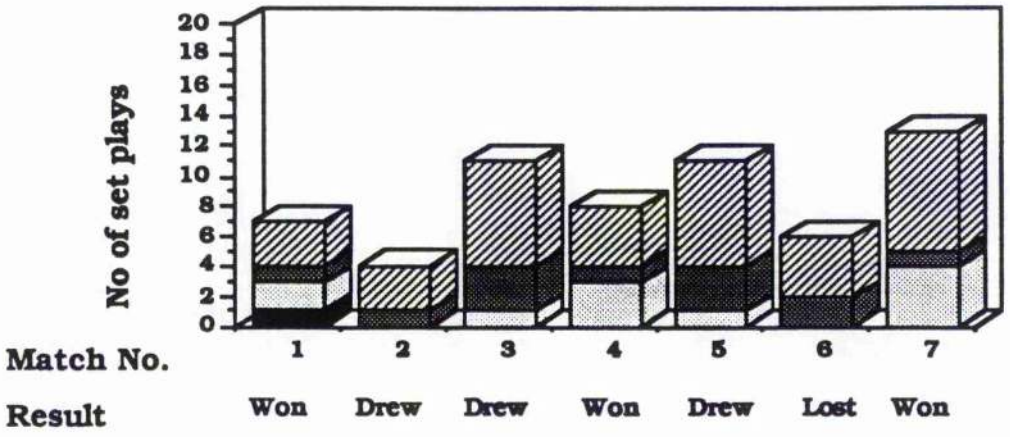


Figure 4.11 Continued.

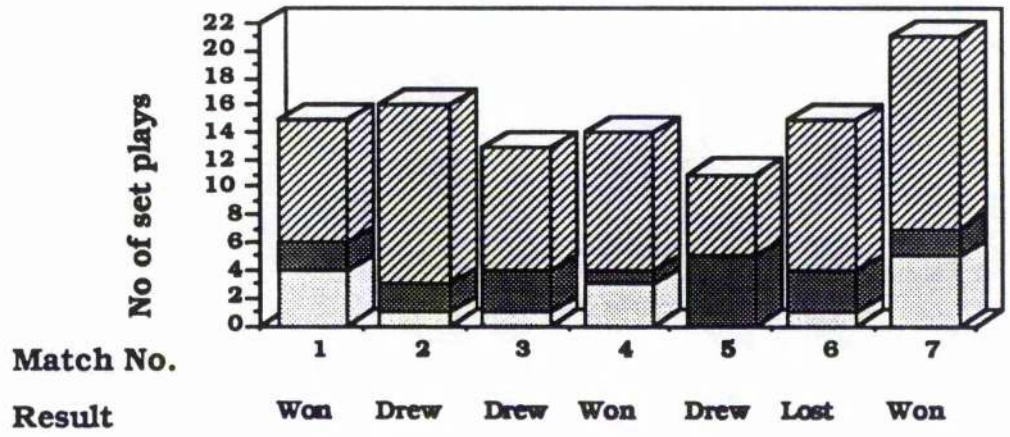


AWAY

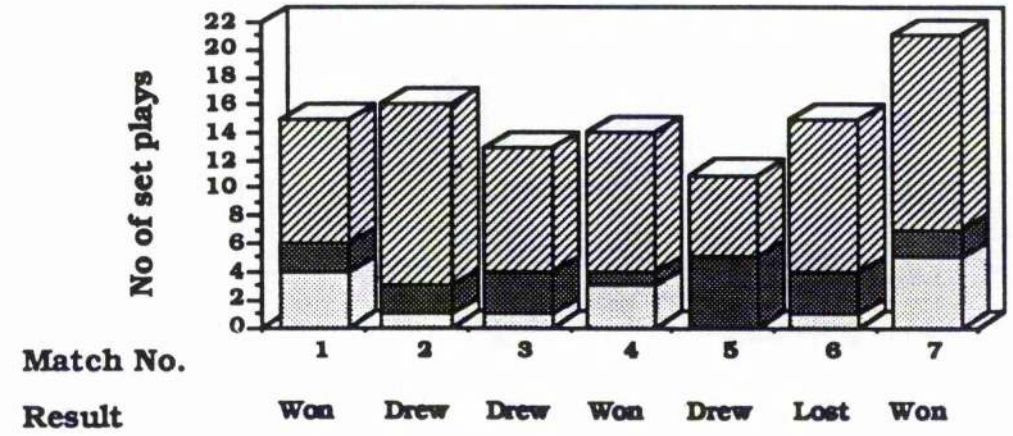
Corner-kicks



Throw-ins



Free-kicks



The relationships between long corner-kicks (consisting of a single cross into the opposition goal area) and short corner-kicks (consisting of a number of short passes) with shots on/off target were examined. It was found that corner-kicks which included a greater number of short passes were providing more shooting opportunities. Although the team had played a greater number of long corner-kicks (65 long corner-kicks employed) than short corner-kicks (39 short corner-kicks employed), there were more shots on target from short corner-kicks. Short corner-kicks produced 17 shots on target out of the total of 25 shots on target see **Appendix A 2:5 pp. 456.**

In addition, a useful assessment was made of the relationships between long throw-ins (throw-ins taken in the attacking third of the pitch and thrown into the opposition's penalty area for shooting) and short throw-ins (throw-ins to a colleague, which starts an ordinary attacking move) with shots on/off target. It was found that short throw-ins were more successful in producing shooting opportunities than long throw-ins. Short throw-ins produced 21 shots on target out of the total of 23 shots on target see **Appendix A 2:5 pp. 457.** It should be noted that the team had employed a greater number of short throw-ins (176 short throw-ins employed) than long throw-ins (9 long throw-ins employed).

Furthermore, it was interesting to evaluate the relative effectiveness of free-kicks taken in front of the opposition goal by direct shots on target in relation to free-kicks taken as a lay-off to another player. It was found that the free-kicks which were taken as a lay-off to another player did produce more shots on target than free-kicks which were taken directly as shots on goal. Free-kicks which were taken as a lay-off to another player produced 22 shots on target out of the total of 30 shots on target **see Appendix A 2:5 pp. 458.** It should be

noted that the team had employed a greater number free-kicks which were taken as a lay-off to another player (167 free-kicks employed as a lay-off to another player), than free-kicks directly taken as shots on goal (38 free-kicks employed as a direct shot on goal).

In summary, the analysis of set plays for the team **B** showed that there was a greater number of shots on target (a) from short corner-kicks rather than from long corner-kicks, (b) short throw-ins rather than long throw-ins and (c) from lay-offs to another player rather than from direct shots at the goal from free-kicks.

Part Two - the average team :

Team C :

During the soccer season 1987–1988 the team was analysed playing eight matches at home and seven matches away (see **Table 4.1**). For the purpose of analysis the team's attacking performance at home was separated from its attacking performance away and the two were analysed in the following manner:

Analysis of performance during home matches :

Patterns of play during home matches :

Out of a large number of attacking moves, there were five patterns of play in home matches. Each of these patterns of play represented a distinct attacking move as follows:

(i) Pattern CH.1 An attack initiated from inside the defensive half of the pitch close to the right side of the penalty area, moving up towards the centre spot, then towards the right side of the penalty area of the offensive half, and from this position to the penalty area for shooting. This pattern is typical of 44 attacking moves.

(ii) Pattern CH.2 An attack initiated from the middle of the defensive half of the pitch close to the left side of the penalty area, moving up towards the centre line, then towards the penalty arc of the offensive half and terminated by interception by a defensive player. This pattern is typical of 44 attacking moves.

(iii) Pattern CH.3 An attack initiated from the defensive half of the pitch close to the left side of the penalty area, moving up towards the centre line and briefly along the left wing, terminated by crossing from this position to the offensive penalty area for shooting. This pattern is typical of 38 attacking moves.

(iv) Pattern CH.4 An attack initiated from inside the penalty area on the defensive half of the pitch, moving briefly towards the right side line close to the centre line and then towards the offensive penalty area. It is terminated by interception by a defensive player. This pattern is typical of 45 attacking moves.

(v) Pattern CH.5 An attack initiated from inside the penalty area of the defensive half of the pitch, moving up towards the offensive penalty area and terminated by interception by a defensive player. This pattern is typical of 62 attacking moves.

Final actions with patterns of play :

From **Table 4.6**, which indicates the relationship between the final actions and patterns of play, the undernoted observations were made:

(i) Only Patterns CH.1, CH.3 and CH.5 produced the final actions 1 and 2. (Final actions 1 and 2 are shooting at the goal). These final actions taken together were produced in 34%, 26% and 8% of all attacks using these patterns, respectively.

(ii) The most common outcome of Patterns CH.2 and CH.4 was final

Table 4.6

Summary of the frequency distribution of free attacks between final actions and patterns of play for all attacking moves in eight away matches for team C.

Final actions	Patterns of play					Row total
	CH.1	CH.2	CH.3	CH.4	CH.5	%
1	6	0	4	0	2	12 5.2
2	9	0	6	0	3	18 7.7
3	5	1	5	1	3	15 6.4
4	11	35	13	33	30	123 52.8
6	9	0	6	1	2	18 7.7
7	2	5	2	6	12	27 11.6
8	0	2	1	1	1	5 2.1
10	2	1	1	3	8	15 6.4
Total No. of attacks %	44 18.9	44 18.9	38 16.3	45 19.3	62 26.6	233 100.0

action 4, (final action 4 representing lost of possession) and this occurred more often than for any other patterns of play. 80% of Pattern CH.2 and 73% of Pattern CH.4 produced final action 4. The distribution of their final actions was markedly similar.

(iii) Pattern CH.5 usually produce final action 4, although in 13% of attacks it produced final action 10 (final action 10 representing a free-kick). It also produced final actions 1 and 2.

(vi) Pattern CH.1 produced a considerable number of final actions 1 and 2. In 21% of attacks it produced final action 6 (final action 6 representing a corner-kick).

Clearly, the results of the above observations show that Patterns CH.1 and CH.3 were the most effective patterns of play since they provided most of the goals and most of the shots on target of all the patterns of play. They produced 25 shots on target out of the total of 30 shots on target from all five patterns of play. It should also be noted that Patterns CH.2 and CH.4 were the least successful since they did not provide any shooting opportunity out of 89 attacking moves. Although Pattern CH.1 mainly produced shots on goal, it did also produce a considerable number of corner-kicks. Nevertheless, Pattern CH.5 produced some shots on goal and also produced a considerable number of free-kicks. The effectiveness of these corner-kicks and free-kicks will be examined in detail later in this chapter.

The most and least successful attacking patterns of play for team **C** during home matches have now been identified and it is desired to assess how frequently these patterns of play appeared in each of those matches which were analysed in relation to the result of the match.

This can be seen in **Figure 4.12**, which shows that Patterns CH.1, CH.3 and CH.5 appeared more frequently in those matches which were won than in those matches which were drawn or lost. Patterns CH.2 and CH.4 appeared in all of the matches played but were repeated in a greater number in those matches which were lost than in those matches which were won. The similar distribution of the two patterns in the games won is quite remarkable.

Analysis of performance during away matches :

Patterns of play during away matches :

Out of a large number of attacking moves, there were five patterns of play in away matches. Each of these patterns of play represented a number of attacking move as follows:

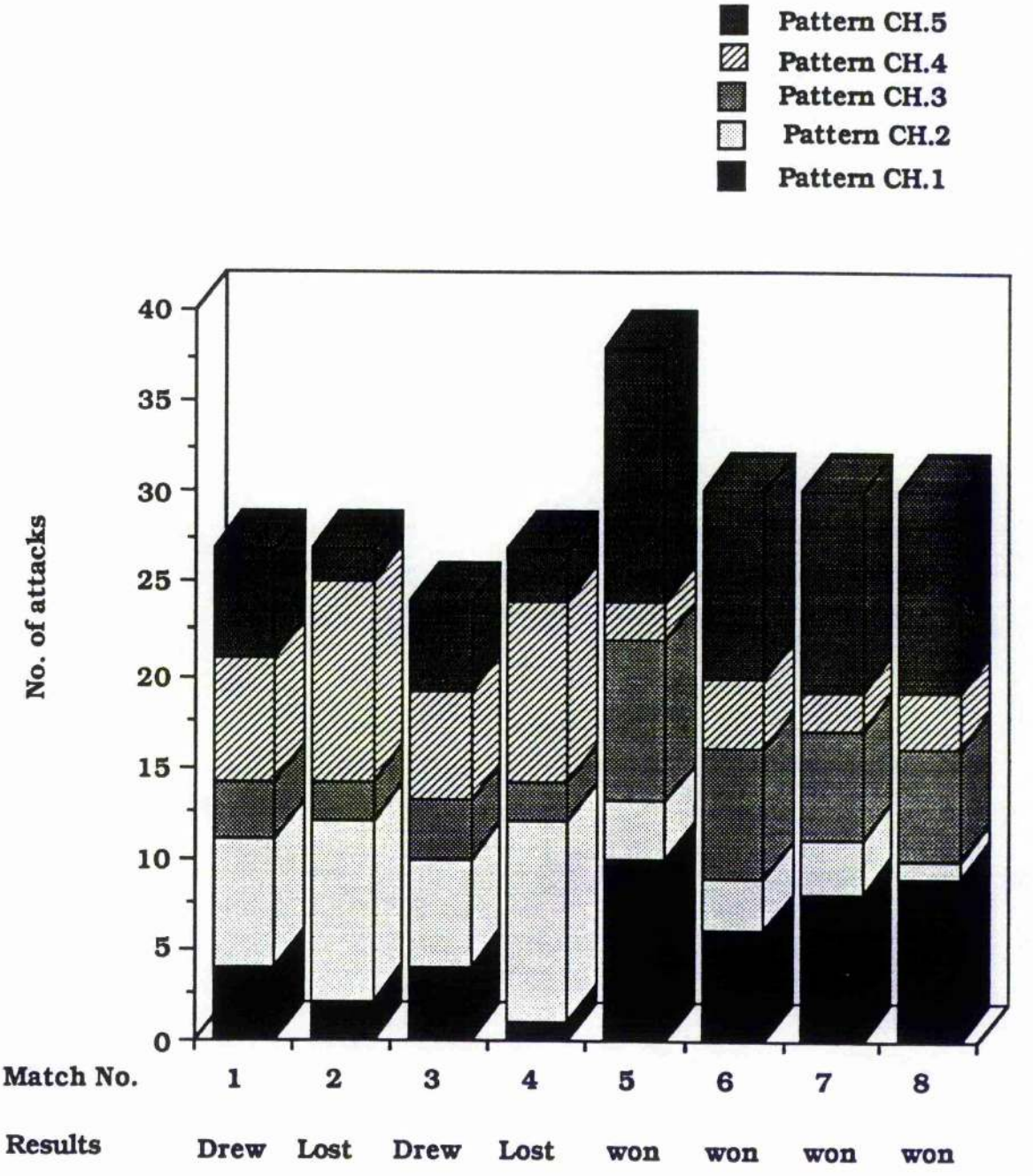
(i) Pattern CA.1 An attack initiated from inside the defensive half of the pitch close to the left side of the penalty area, moving up towards the centre line, then towards the penalty arc on the defensive half by a number of passes. It is terminated by shooting. This pattern is typical of 60 attacking moves.

(ii) Pattern CA.2 An attack initiated from the defensive half of the pitch close to the penalty arc, moving up towards the centre line, moving up the offensive half and then towards the offensive half's penalty area and terminated by shooting. This pattern is typical of 35 attacking moves.

(iii) Pattern CA.3 An attack initiated from inside the penalty area of the defensive half of the pitch, moving towards the right side line, then along the right side line towards the centre line, then towards the offensive penalty area and terminated by shooting. This pattern is typical of 26 attacking moves.

Figure 4.12

Summary of the association between frequencies of patterns of play from free attacks in home matches for team C.



(iv) Pattern CA.4 An attack initiated from inside the penalty area on the defensive half of the pitch, moving up towards the offensive penalty area. It is terminated by interception by a defensive player. This pattern is typical of 49 attacking moves.

(v) Pattern CA.5 An attack initiated from inside the defensive half of the pitch close to the right side of the penalty area, moving towards the centre line of the pitch, then, by a number of passes towards the right side line of the penalty area and terminated by interception by a defensive player. This pattern is typical of 49 attacking moves.

Final actions with patterns of play :

From **Table 4.7**, which indicates the relationship between the final actions and patterns of play, the undernoted observations were made:

(i) Pattern CA.3 produces the final actions 1 and 2 more often than the other patterns of play. (Final actions 1 and 2 are shooting at the goal). These final actions taken together were produced in 42% of all attacks using this pattern.

(ii) The most common outcome of Patterns CA.1 and CA.4 was final action 4, (final action 4 representing lost of possession) and this occurred more often than for any other patterns of play. 70% of Pattern CA.1 and 74% of Pattern CA.4 produced final action 4. The distribution of their final actions was markedly similar, except that Pattern CA.1 more frequently produced final action 3 (final action 3 representing shot off target).

(iii) Patterns CA.2 and CA.5 did produce final actions 1 and 2. These final actions taken together were produced in 14% and 16% of all attacks using these patterns respectively.

(iv) Patterns CA.2 and CA.5 have a fairly similar distribution of final

Table 4.7

Summary of the frequency distribution of free attacks between final actions and patterns of play for all attacking moves in eight away matches for team C.

Final actions	Patterns of play					Row total
	CA.1	CA.2	CA.3	CA.4	CA.5	%
1	0	1	8	0	1	10 4.6
2	0	4	3	0	7	14 6.4
3	7	0	1	0	3	11 5.0
4	42	23	12	36	24	137 62.6
6	2	1	1	2	4	10 4.6
7	7	2	1	5	5	20 9.1
8	0	2	0	3	1	6 2.7
10	2	2	0	3	4	11 5.0
Total No. of attacks %	60 27.4	35 16.0	26 11.9	49 22.4	49 22.4	219 100.0

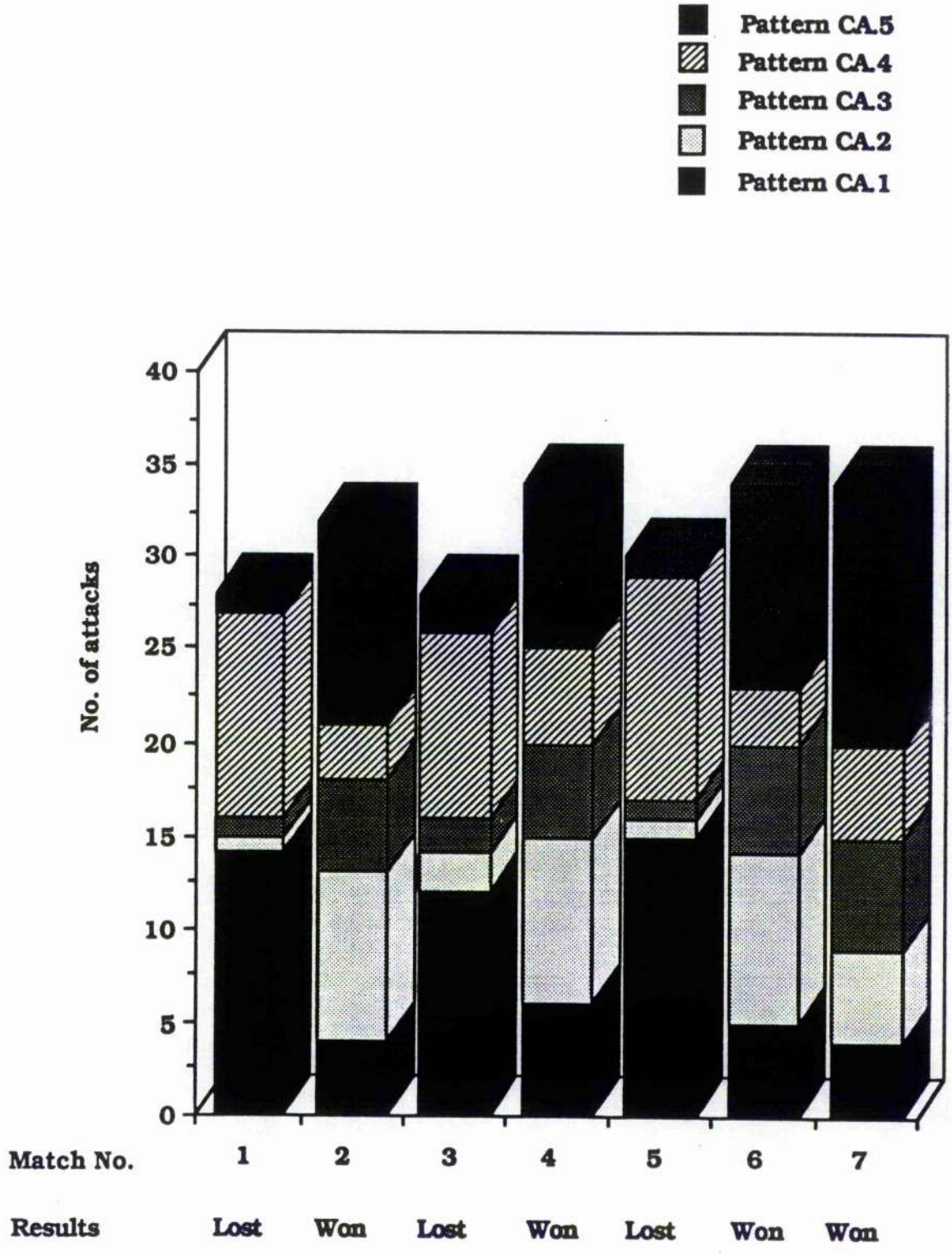
actions, with final action 4 being the most common outcome. Pattern CA.5 did produce final actions 6, 7 and 10 more frequently than other outcomes. (Final actions 6, 7 and 10 are representing corner-kicks, throw-ins and free-kicks respectively). However, Patterns CA.2 and CA.5 did produce scoring opportunities.

Clearly, the results of the above observations show that Pattern CA.3 was the most effective pattern of play since it provided most of the goals and most of the shots on target of all the patterns of play and it did so from fewer attacks. It produced 11 shots on target out of the total of 24 shots on target from all five patterns of play. It should also be noted that Patterns CA.1 and CA.4 were the least successful since they did not provide any shooting opportunity out of 84 attacking moves. However, Patterns CA.2 and CA.5 did produce some shots on goal. Nevertheless, Pattern CA.5 produced a considerable number of corner-kicks and free-kicks. The effectiveness of these corner-kicks and free-kicks will be examined in detail later in this chapter.

From **Figure 4.13**, which indicates how frequently these patterns of play appeared in each match, it can be seen that Pattern CA.3 appeared more frequently in those matches which were won than in those matches which were lost. Patterns CA.1 and CA.4 appeared in all of the matches played but were repeated in a greater number in those matches which were lost than in those matches which were won. Patterns CA.2 and CA.5 are similar to Pattern CA.1, being found in all of the matches but repeated in a greater number in those matches which were won than in those matches which were lost. It should be noted that the total number of attacking moves in those matches which were

Figure 4.13

Summary of the association between frequencies of patterns of play from free attacks in away matches for team C.



won was greater than the total number of attacking moves in those matches which were lost, indicating that in successful games the team attacked more often.

Shooting analysis during home and away matches :

The relationships between shots on/off target for free attacking moves with the results of the matches were assessed. These relationships are shown in **Figures 4.14** and **4.15** from which the following points emerge:

(i) Those matches which were won had a greater total number of shots than those matches which were drawn or lost, indicating that in successful games the team produced more shots from free attacks.

(ii) Those matches which were won had a greater total number of shots on target than those matches which were drawn or lost.

(iii) Those matches which were won had a greater percentage of the shots on target than those matches which were drawn or lost.

Summary of analysis of performance during home and away matches :

The analysis of patterns of play for team **C** during its home and away matches showed that there were five distinct patterns of play in the seven home matches and also there were five distinct patterns of play in the seven away matches analysed. The results showed that Patterns CH.1, CH.3 and CH.5 were the most successful while Patterns CH.2 and CH.4 were the least successful. However, Patterns CH.1 and CH.5 concluded more often with corner-kicks and free-kicks respectively.

The results for away matches showed that Pattern CA.3 was the most successful while Patterns CA.1 and CA.4 were the least successful. Patterns CA.2 and CA.5 were also successful in producing shots on goal and concluded more often with corner-kicks and free-kicks. The

Figure 4.14

Summary of the relationships between home matches and shots on or off target for team C.

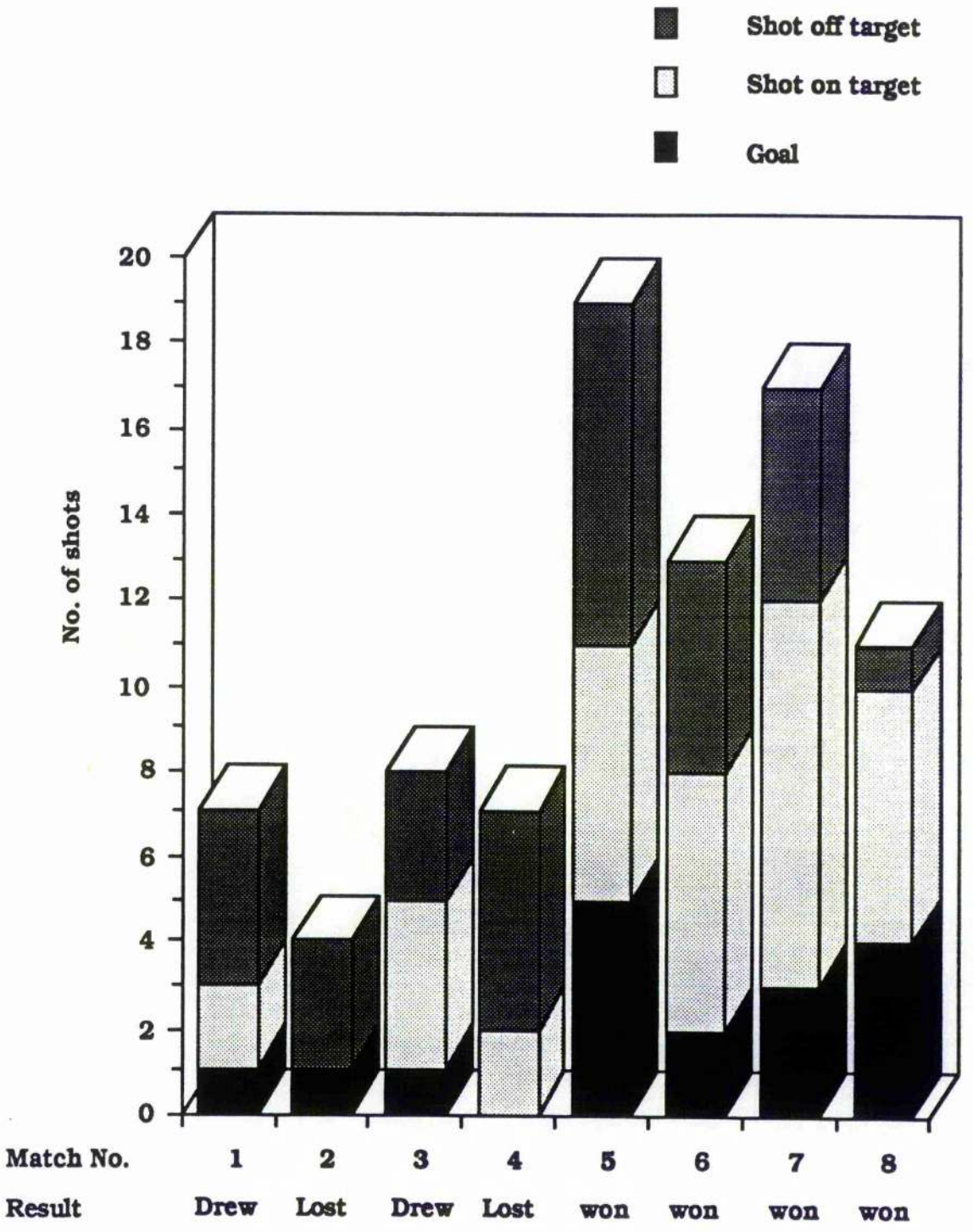
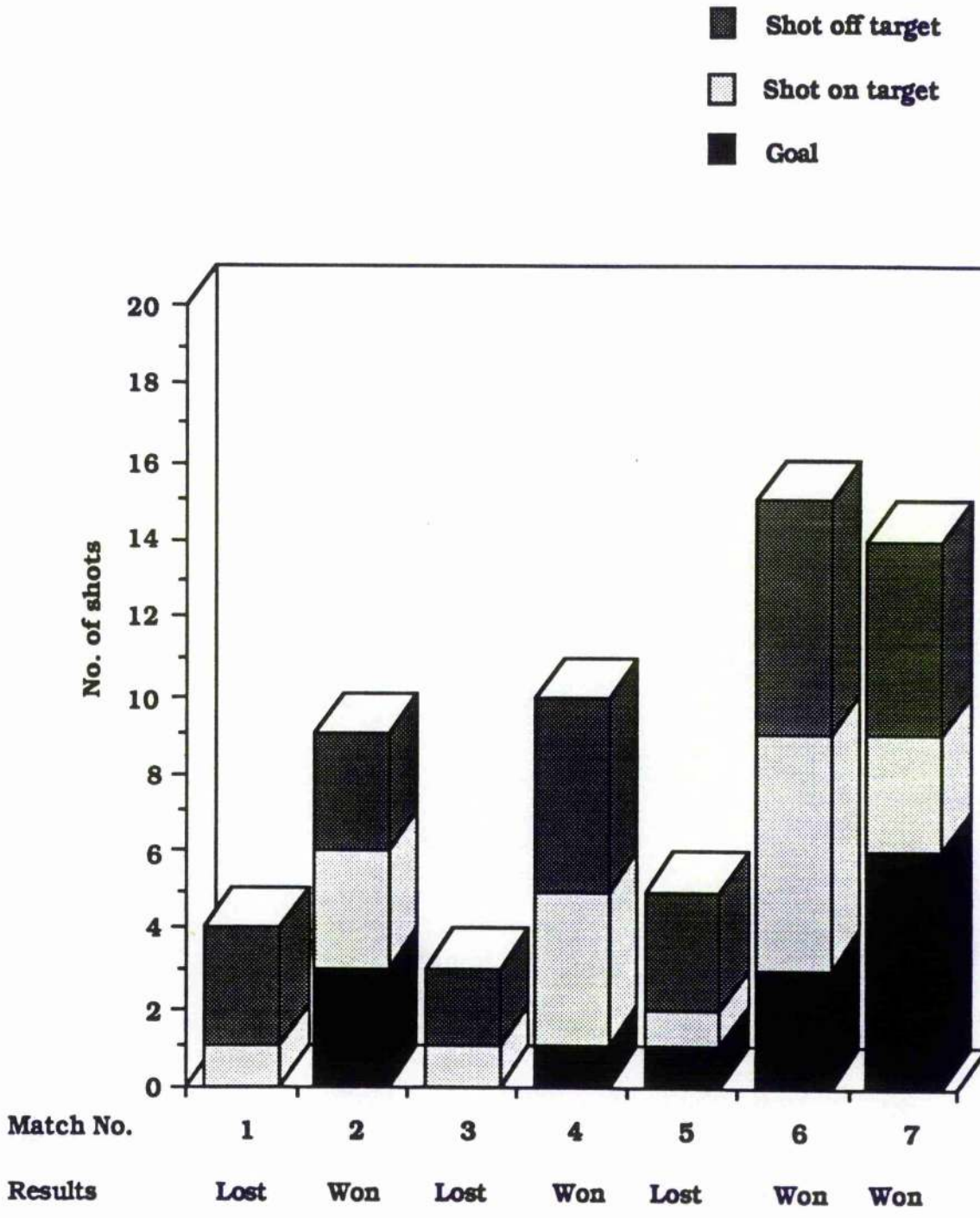


Figure 4.15

Summary of the relationships between away matches and shots on or off target for team C.



successful patterns of play appeared more often in those matches which were won than in those matches which were lost for both home and away matches – in common with the findings for the top teams, **A** and **B**.

The analysis of shooting showed that there was a greater total number of shots in those matches which were won than in those which were drawn or lost and in those matches which were won there was a greater total number of shots on target than in those matches which were drawn or lost. However, those matches which were won also had a greater percentage of the shots on target than in those matches which were drawn or lost.

Analysis of performance during set plays :

Shooting analysis :

Although no relationship has been found between the patterns of play of offensive set pieces and the outcome of each move, it is worth examining further the effectiveness of set pieces. Furthermore, it was considered desirable to assess the relationships between shots on/off target for set plays with the results of the home and away matches which were analysed. From **Figure 4.16**, which indicates the relationships between frequency of shooting in set plays and the results of the matches analysed, the following points have emerged:

(i) Those matches which were won had a greater total number of shots on target from set plays than those which were drawn or lost.

(ii) The total number of set plays per se gave no indication of success.

(iii) The team had more shots on target from set plays in home matches than in away matches.

The relationships between long corner-kicks (consisting of a single

Figure 4.16

Summary of the association between shots at goal from set pieces and the results of the matches for team C.

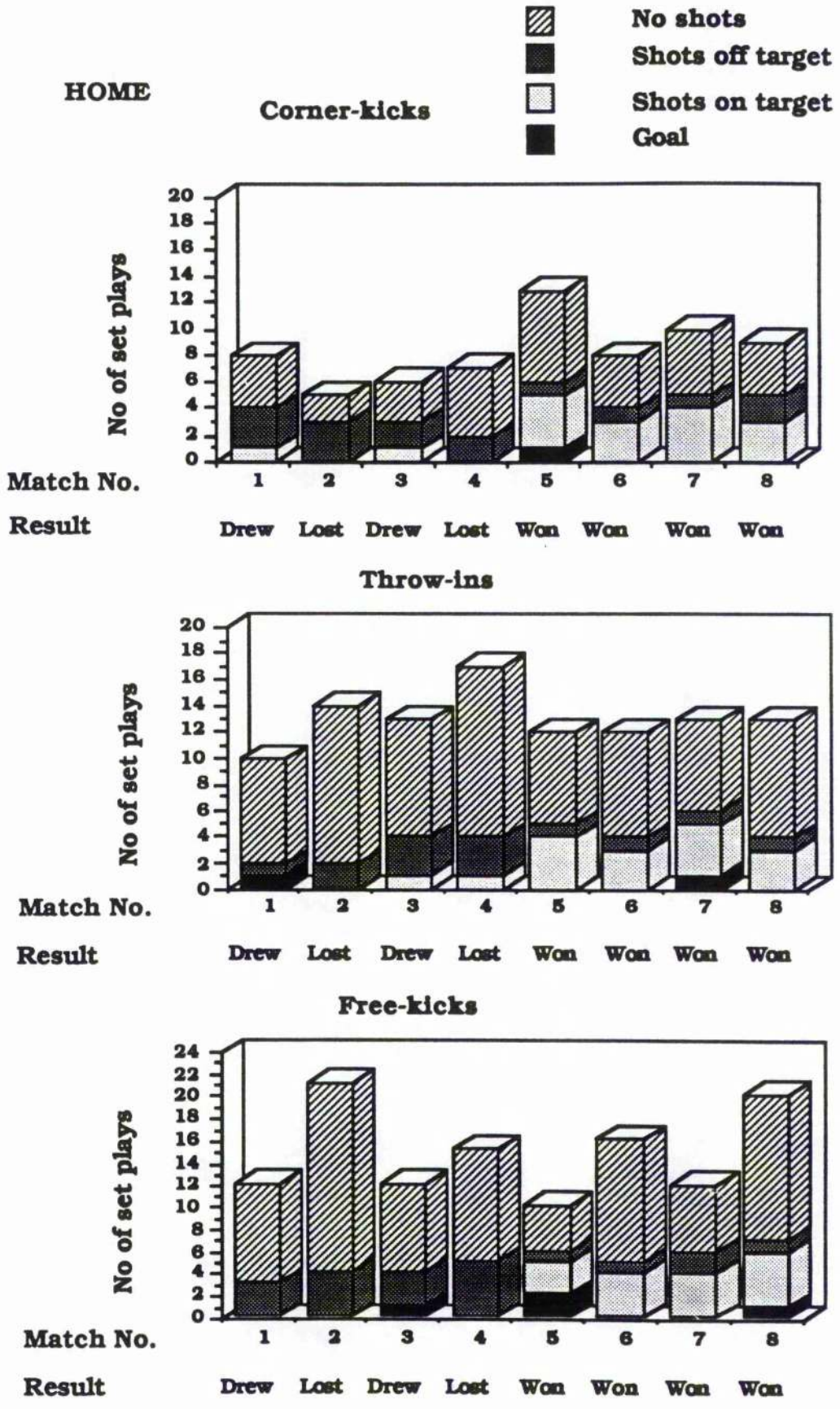
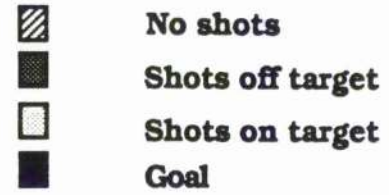
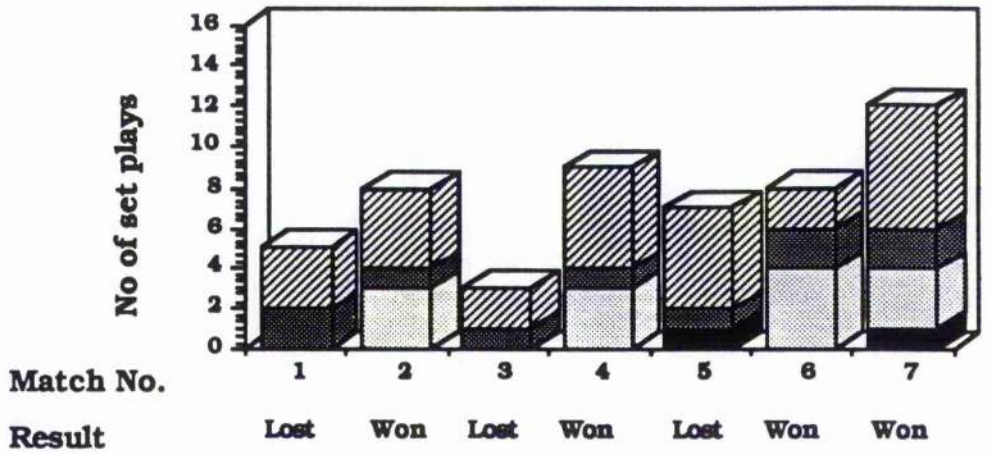


Figure 4.16 Continued.

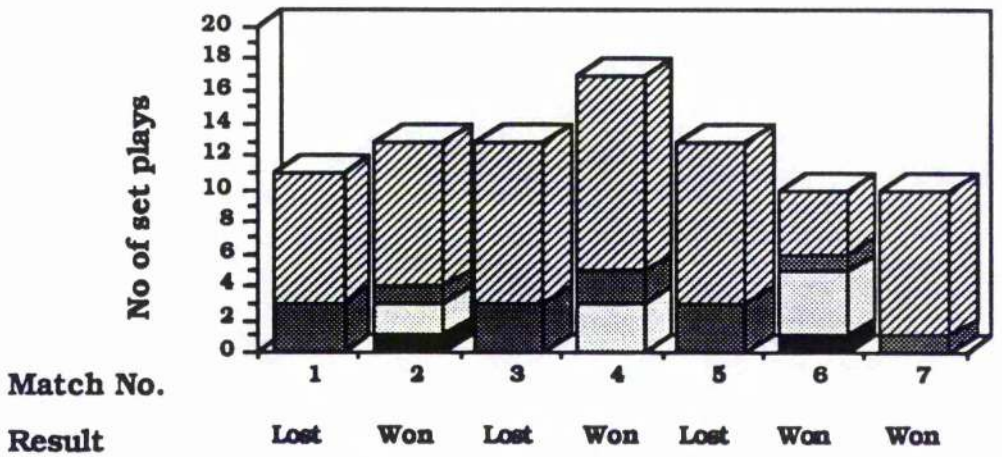


AWAY

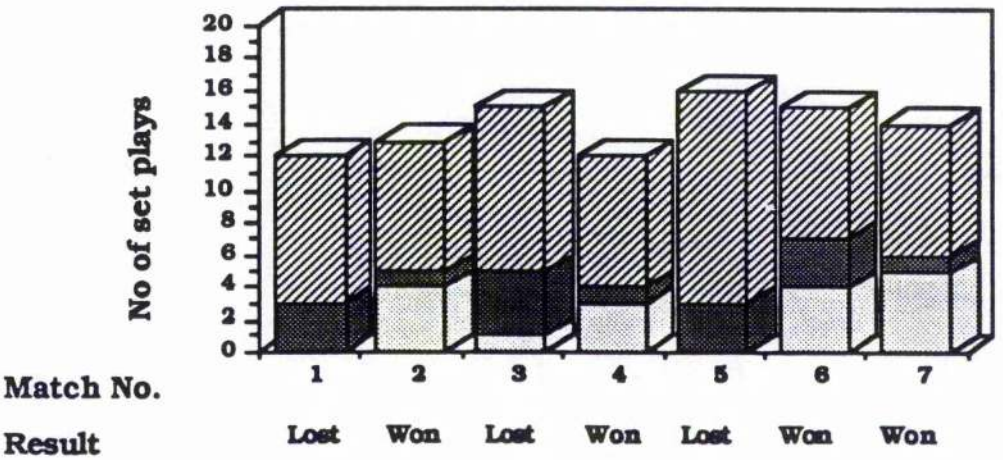
Corner-kicks



Throw-ins



Free-kicks



cross into the opposition goal area) and short corner-kicks (consisting of a number of short passes) with shots on/off target were examined. It was found that corner-kicks which included a greater number of short passes were providing more shooting opportunities. Although the team had played a greater number of long corner-kicks (91 long corner-kicks employed) than short corner-kicks (28 short corner-kicks employed), there were more shots on target from short corner-kicks. Short corner-kicks produced 19 shots on target out of the total of 29 shots on target **see Appendix A 2:5 pp. 459.**

In addition, a useful assessment was made of the relationships between long throw-ins (throw-ins taken in the attacking third of the pitch and thrown into the oppositions penalty area for shooting) and short throw-ins (throw-ins to a colleague, which starts an ordinary attacking move) with shots on/off target. It was found that short throw-ins were more successful in producing shooting opportunities than long throw-ins. Short throw-ins produced 27 shots on target out of the total of 29 shots on target **see Appendix A 2:5 pp. 460.** It should be noted that the team had employed a greater number of short throw-ins (172 short throw-ins employed) than long throw-ins (11 long throw-ins employed).

Furthermore, it was interesting to evaluate the relative effectiveness of free-kicks taken in front of the opposition goal by direct shots on target in relation to free-kicks taken as a lay-off to another player. It was found that the free-kicks which were taken as a lay-off to another player were more successful in producing shooting opportunities than free-kicks which were taken directly as shots on goal. Free-kicks which were taken as a lay-off to another player produced 28 shots on target out of the total of 34 shots on target **see Appendix A 2:5 pp. 461.** It should be noted that the team had employed a greater

number of free-kicks which were taken as a lay-off to another player (199 free-kicks employed as a lay-off to another player) than free-kicks directly taken by shots on goal (16 free-kicks employed as direct shot on goal).

In summary, the analysis of set plays for the team **C** showed that there was a greater number of shots on target (a) from short corner-kicks rather than from long corner-kicks, (b) short throw-ins rather than long throw-ins and (c) from lay-offs to another player rather than from direct shots at the goal from free-kicks.

Part three - the poorer teams :

Team D :

During the soccer season 1987–1988 the team was analysed playing seven matches at home and seven matches away (see **Table 4.1**). For the purpose of analysis the team's attacking performance at home was separated from its attacking performance away and the two were analysed in the following manner:

Analysis of performance during home matches :

Patterns of play during home matches :

Out of a large number of attacking moves, there were four patterns of play in home matches. Each of these patterns of play represented a distinct attacking move as follows:

(i) Pattern DH.1 An attack initiated from inside the penalty area on the defensive half of the pitch, moving up towards the centre line and terminated, just after crossing into the offensive half, by a defensive player. This pattern is typical of 79 attacking moves.

(ii) Pattern DH.2 An attack initiated from left of the centre circle on

the defensive half of the pitch, moving up towards the centre line, then towards the offensive penalty area and terminated by shooting. This pattern is typical of 32 attacking moves.

(iii) Pattern DH.3 An attack initiated near the middle of the defensive half of the pitch close to the penalty arc, moving up towards the centre spot, then towards the penalty arc of the offensive half and terminated by a defensive player. This pattern is typical of 40 attacking moves.

(iv) Pattern DH.4 An attack initiated from the defensive half of the pitch close to the right side line, moving towards the centre line, and terminated by crossing from this position towards the right side of the offensive penalty area of the offensive half of the pitch where it is intercepted by a defensive player. This pattern is typical of 59 attacking moves.

Final actions with patterns of play :

From **Table 4.8**, which indicates the relationship between the final actions and the patterns of play, the undernoted observations were made:

(i) Pattern DH.2 produced the final actions 1 and 2 more often than the other patterns of play. (Final actions 1 and 2 are shooting at the goal). These final actions taken together were produced in 31% of all attacks using this pattern.

(ii) The most common outcome of Patterns DH.1 and DH.4 was final action 4 (final action 4 representing lost of possession), and this occurred more often than for any other patterns of play. 63% of Pattern DH.1 and 49% of Pattern DH.4 produced final action 4. They also produced a considerable number of other final actions 6, 7, 8 and 10. (Final actions 6, 7, 8 and 10 are representing corner-kick,

Table 4.8

Summary of the frequency distribution of free attacks between final actions and patterns of play for all attacking moves in eight away matches for team D.

Final actions	Patterns of play				Row total
	DH.1	DH.2	DH.3	DH.4	%
1	0	4	0	0	4 1.9
2	0	6	1	0	7 3.3
3	2	0	3	4	9 4.3
4	50	15	28	29	122 58.1
6	5	2	4	4	15 7.1
7	13	3	1	15	32 15.2
8	7	2	2	2	13 6.2
10	2	0	1	5	8 3.8
Total No. of attacks %	79 37.6	32 15.2	40 19.0	59 28.1	210 100.0

throw-in, off-side and free-kick respectively).

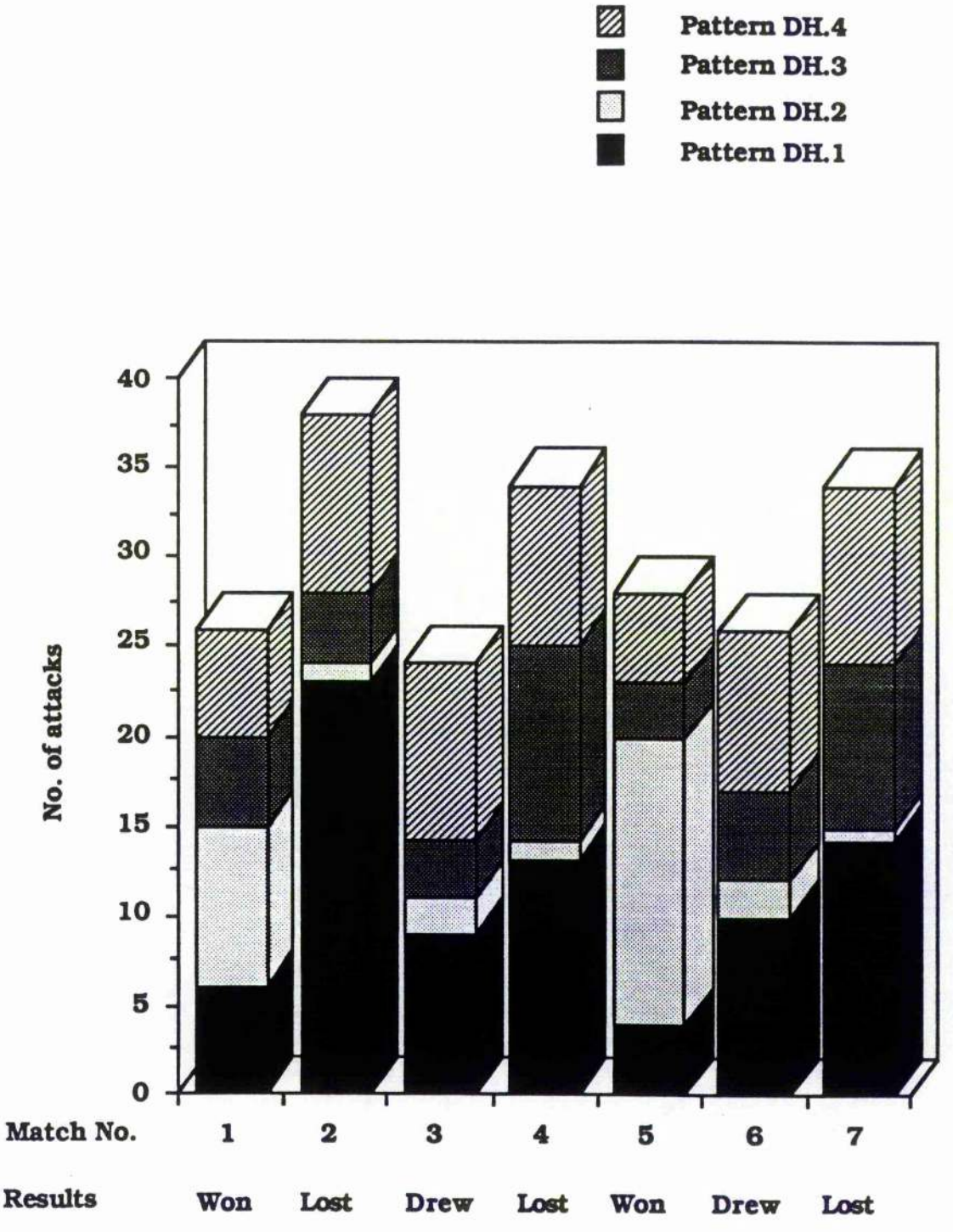
(iii) Pattern DH.3 mainly produced final action 4, although in 10% of attacks it produced final action 6. (Final action 6 represents a corner-kick).

Clearly, the results of the above observations show that Pattern DH.2 was by far the most effective pattern of play since it produced 10 shots on target out of the total of 11 shots on target from all four patterns of play and did so from only 32 attacks. It should also be noted that Patterns DH.1, DH.3 and DH.4 were the least successful since they did not provide any shooting opportunity out of 138 attacking moves. However, Pattern DH.3 did produce one shot on target out of 40 attacking moves, but it also produced a considerable number of set pieces and the effectiveness of these set pieces will be examined in detail later in this chapter.

The most and least successful attacking patterns of play for team **D** during home matches have now been identified and it is desired to assess how frequently these patterns of play appeared in each of those matches which were analysed in relation to the result of the match. This can be seen in **Figure 4.17**, which shows that Pattern DH.2 appeared more frequently in those matches which were won than in those which were lost. It is also revealed that Pattern DH.1 appeared in all of the matches played but it was repeated in a greater number in those matches which were lost than in those matches which were won. Patterns DH.3 and DH.4 were found in a regular distribution in most of the matches which were played although it might be argued that Pattern DH.3 occurred more often in games lost than won. It should be noted that the total number of attacking moves in those

Figure 4.17

Summary of the association between frequencies of patterns of play from free attacks in home matches for team D.



matches which were won were less than the total number of attacking moves in those matches which were lost, clearly the total number of attacks per se was not indicative of success.

Analysis of performance during away matches :

Patterns of play during away matches :

Out of a large number of attacking moves, there were four patterns of play in away matches. Each of these patterns of play represented a number of attacking move as follows:

(i) Pattern DA.1 An attack down the left side initiated from inside the defensive half of the pitch, moving up towards the centre line, then towards the penalty arc of the offensive half and terminated by a defensive player. This pattern is typical of 38 attacking moves.

(ii) Pattern DA.2 An attack initiated from the defensive half of the pitch close to the penalty arc, moving up towards the centre spot, then towards the left side of the penalty area of the offensive half and terminated by interception by a defensive player. This pattern is typical of 58 attacking moves.

(iii) Pattern DA.3 An attack initiated from inside the penalty area on the defensive half of the pitch, approaching half way between the centre line and the penalty area of the offensive half and terminated by interception by a defensive player. This pattern is typical of 69 attacking moves.

(iv) Pattern DA.4 An attack initiated from the middle of the pitch close to the right side line, moving briefly along the right wing, then towards the penalty area of the offensive half and terminated by shooting. This pattern is typical of 29 attacking moves.

Final actions with patterns of play :

From **Table 4.9**, which indicates the relationship between the final actions and the patterns of play, the undernoted observations were made:

(i) Pattern DA.4 produced final action 2 more often than the other patterns of play. (Final action 2 represents shot on target). Indeed, only 1 shot on target was produced from all the other attacking moves.

(ii) Patterns DA.1, DA.2 and DA.3 produced final action 4 more often than the other final actions, (final actions 4 representing lost of possession). 66% of Pattern DA.1, 73% of Pattern DA.2 and 71% of Pattern DA.3 produced final action 4.

(iii) Pattern DA.1 usually produced final action 4, although in 10% of attacks it produced final action 6. (Final action 6 represents a corner-kick).

Clearly, the results of the above observations show that Pattern DA.4 was the most effective pattern of play since it produced most shots on target of all the patterns of play. It produced 9 shots on target out of the total of 10 shots on target from all four patterns of play. Patterns DA.1, DA.2 and DA.3 were the least successful since they only provided 1 shooting opportunity out of 165 attacking moves. However, Pattern DA.1 did produce a considerable number of corner-kicks and the effectiveness of these corner-kicks will be examined in detail later in this chapter.

The most and least successful attacking patterns of play for team **D** during away matches have now been identified and it is desired to assess how frequently these patterns of play appeared in each of those

Table 4.9

Summary of the frequency distribution of free attacks between final actions and patterns of play for all attacking moves in eight away matches for team D.

Final actions	Patterns of play				Row total
	DA.1	DA.2	DA.3	DA.4	%
2	0	0	1	9	10 5.2
3	3	4	1	4	12 6.2
4	25	42	49	9	125 64.4
6	4	1	1	1	7 3.6
7	2	9	7	4	22 11.3
8	2	2	7	1	12 6.2
10	2	0	3	1	6 3.1
Total No. of attacks %	38 19.6	58 29.9	69 35.6	29 14.9	194 100.0

matches which were analysed in relation to the result of the match. This can be seen in **Figure 4.18**, which shows that Pattern DA.4 appeared more frequently in match six which was drawn than those matches which were lost. Patterns DA.1, DA.2 and DA.3 were relatively evenly distributed in all of the matches played. It should be noted that the total number of attacking moves in the match which was drawn was less than the total number of attacking moves in those matches which were lost.

Shooting analysis during home and away matches :

The relationships between shots on/off target for free attacking moves with the results of the matches were assessed. These relationships are shown in **Figures 4.19** and **4.20** from which the following points emerge:

(i) Those matches which were won had a greater total number of shots than those matches which were drawn or lost. Note the contrast with the number of attacks, indicating that in successful games the team produced more shots from fewer free attacks.

(ii) Those matches which were won had a greater total number of shots on target than those matches which were drawn or lost.

(iii) Those matches which were won had a greater percentage of the shots on target than those matches which were drawn or lost.

Summary of analysis of performance during home and away matches :

The analysis of patterns of play for team **D** during its home and away matches showed that there were four distinct patterns of play in the seven home matches and also there were four distinct patterns of play in the seven away matches analysed. The results showed that Pattern DH.2 was the most successful pattern of play while Patterns DH.1,

Figure 4.18

Summary of the association between frequencies of patterns of play from free attacks in away matches for team D.

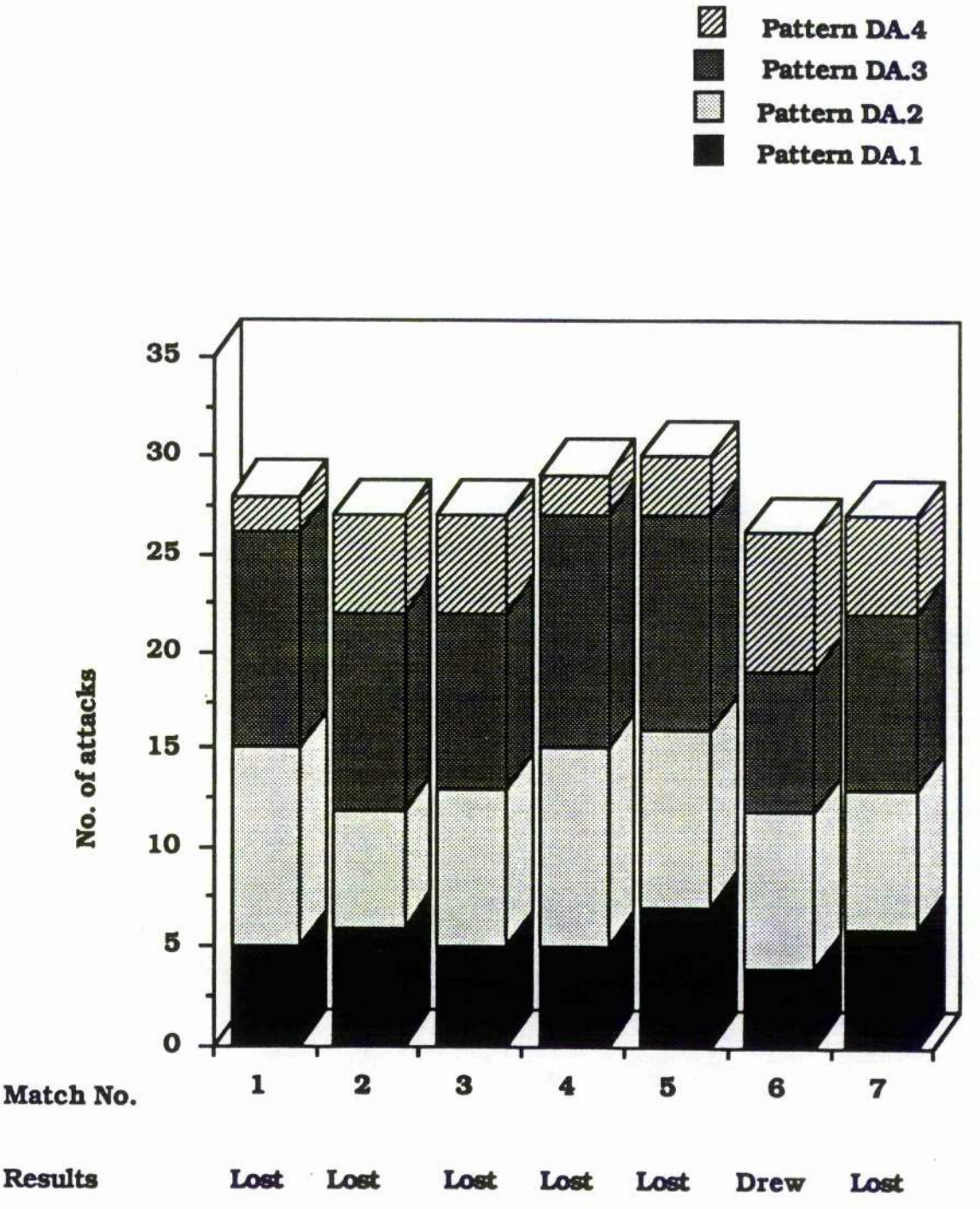


Figure 4.19

Summary of the relationships between home matches and shots on or off target for team D.

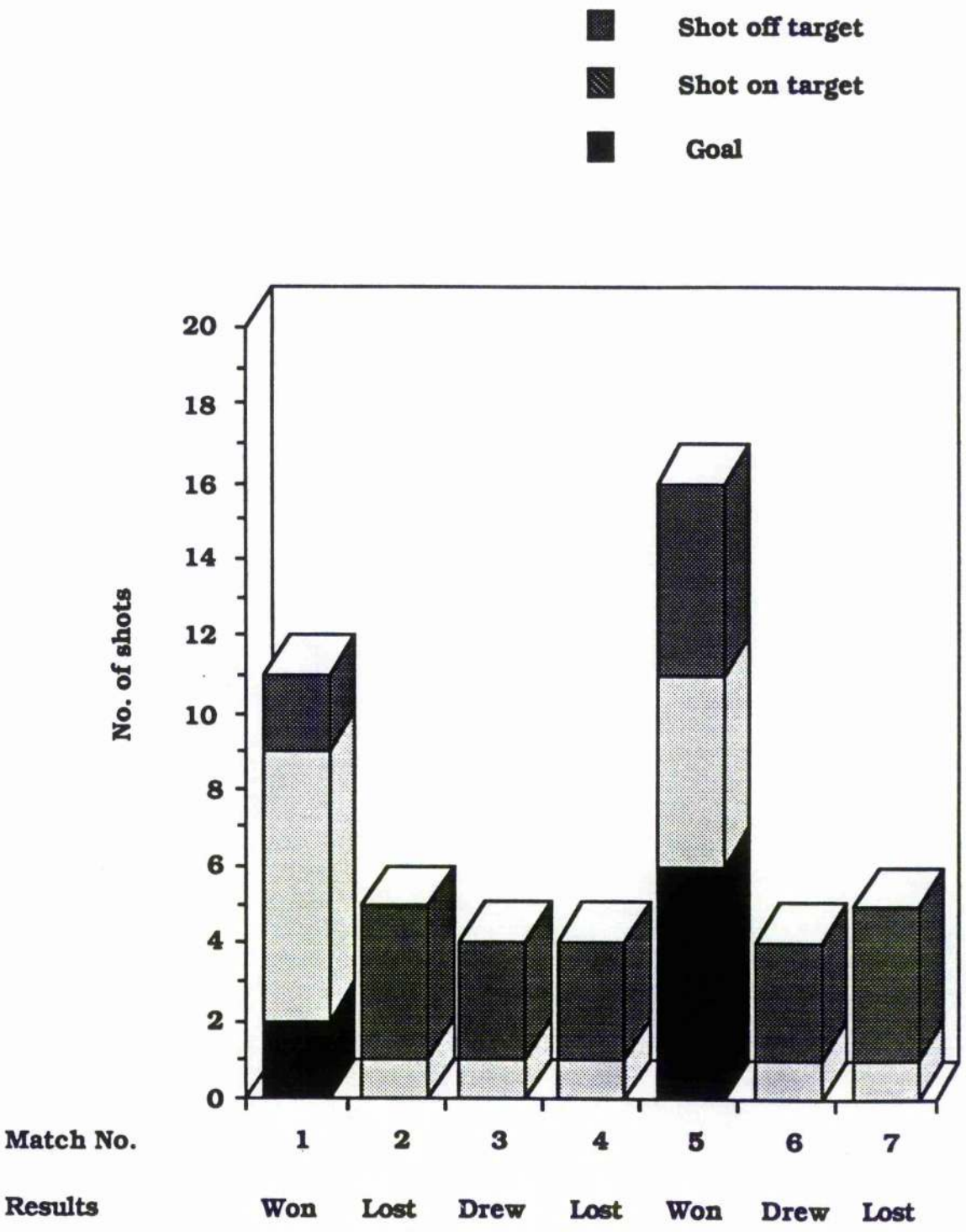
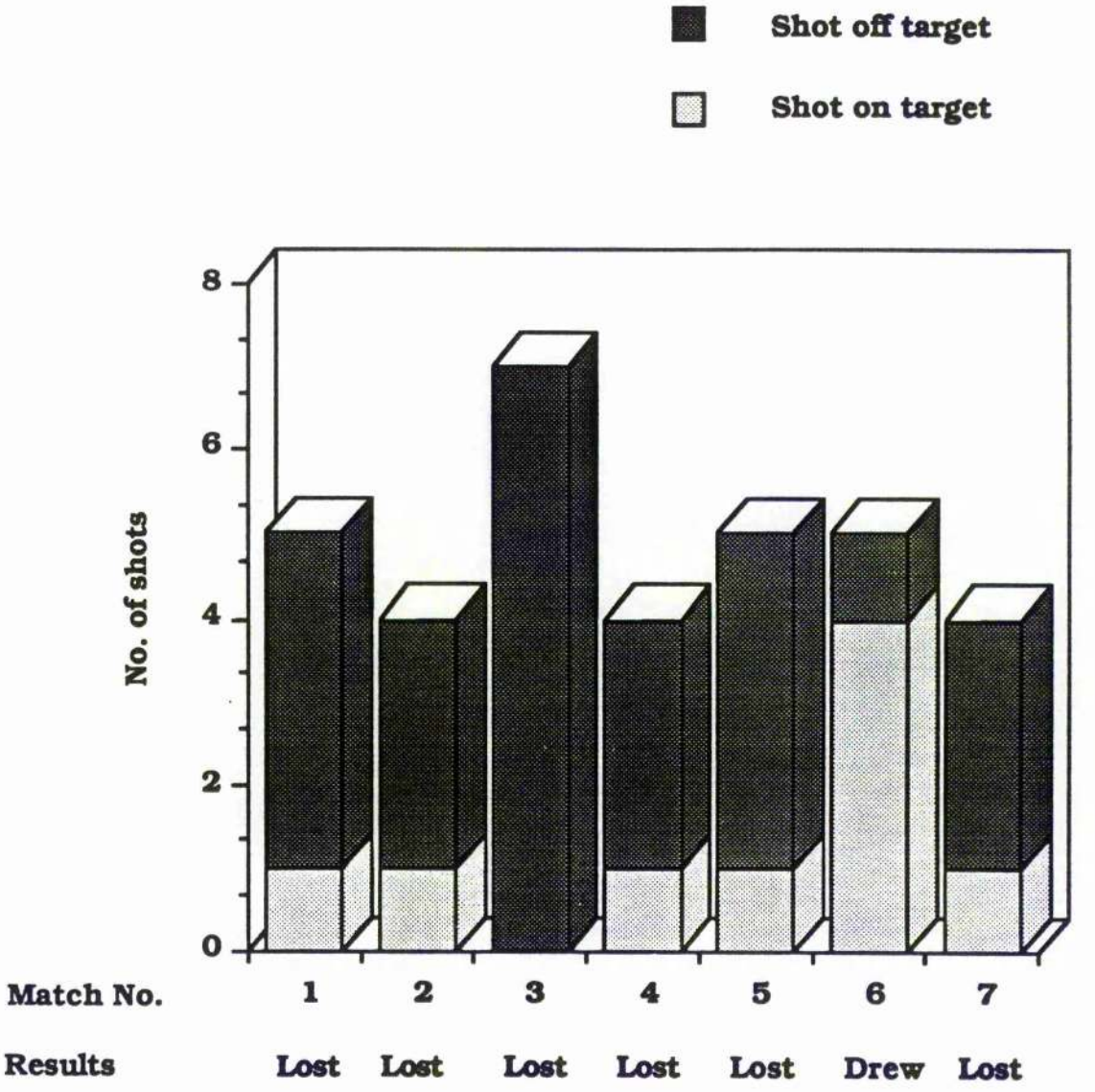


Figure 4.20

Summary of the relationships between away matches and shots on or off target for team D.



DH.4 and DH.5 were the least successful patterns of play. However, Patterns DH.1 and DH.4 concluded more often with set pieces. Nevertheless, Pattern DH.3 did produce shooting opportunities and a considerable number of corner-kicks.

The results for away matches showed that Pattern DA.4 was the most successful, and Pattern DA.1 concluded most often with corner-kicks. The successful patterns of play appeared more often in those matches which were won and drawn than in those which were lost. However, the number of attacks was not indicative of success.

The analysis of shooting showed that there was a greater total number of shots on target in those matches which were won than in those which were lost. However, those matches which were won had a greater total number of shots than those matches which were lost or drawn. It should be noted that only in away matches, were there far fewer shots off target in the match which was drawn than in those matches which were lost.

Analysis of performance during set plays :

Shooting analysis :

Although no relationship has been found between the patterns of play of offensive set pieces and the outcome of each move, it is worth examining the effectiveness of set pieces. Furthermore, it was considered desirable to assess the relationships between shots on/off target for set plays with the results of the home and away matches which were analysed. From **Figure 4.21**, which indicates the relationships between frequency of shooting in set plays and the results of the matches analysed, the following points have emerged:

(i) Those matches which were won had a greater total number of shots

Figure 4.21

Summary of the association between shots at goal from set pieces and the results of the matches for team D.

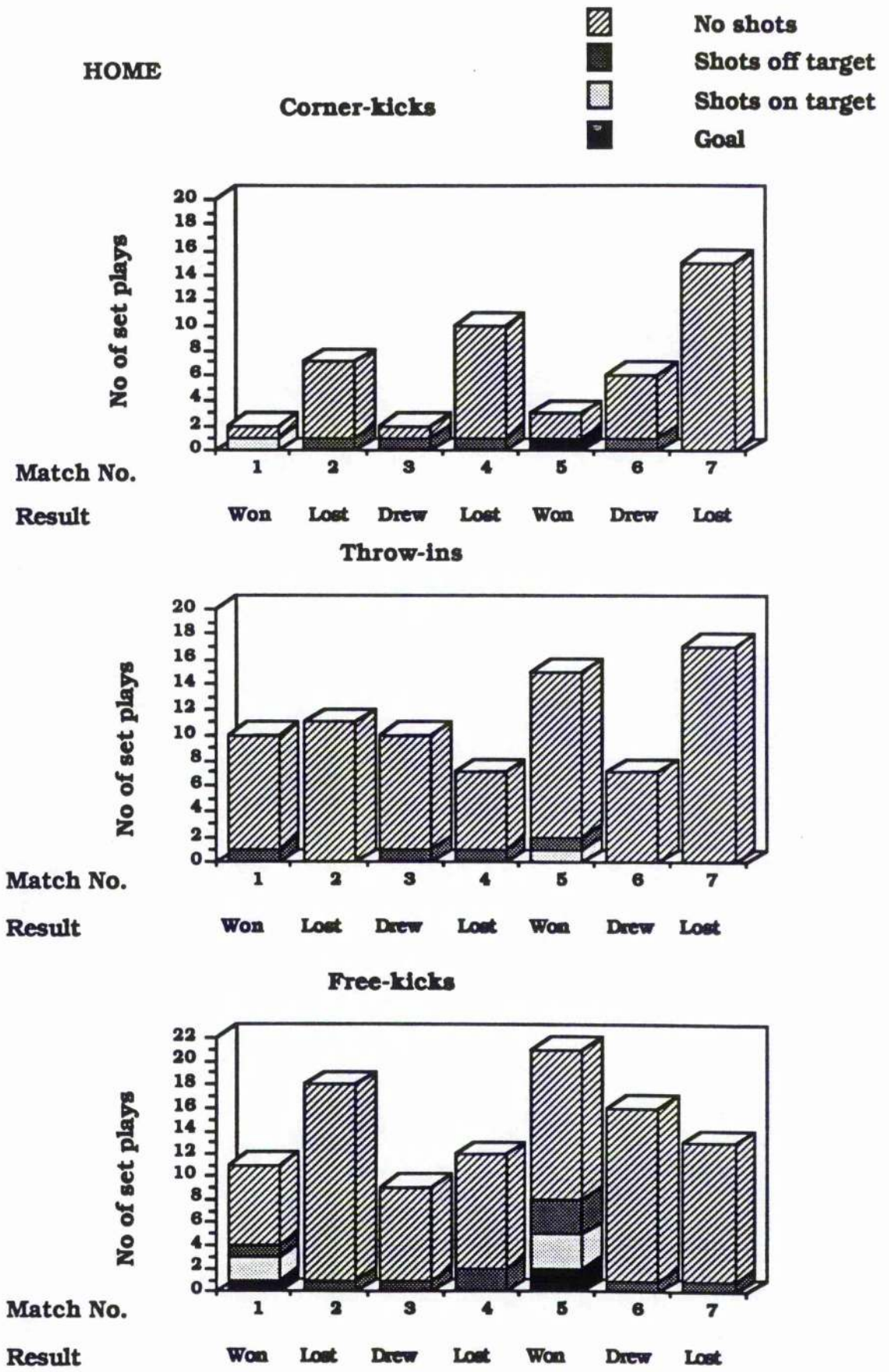
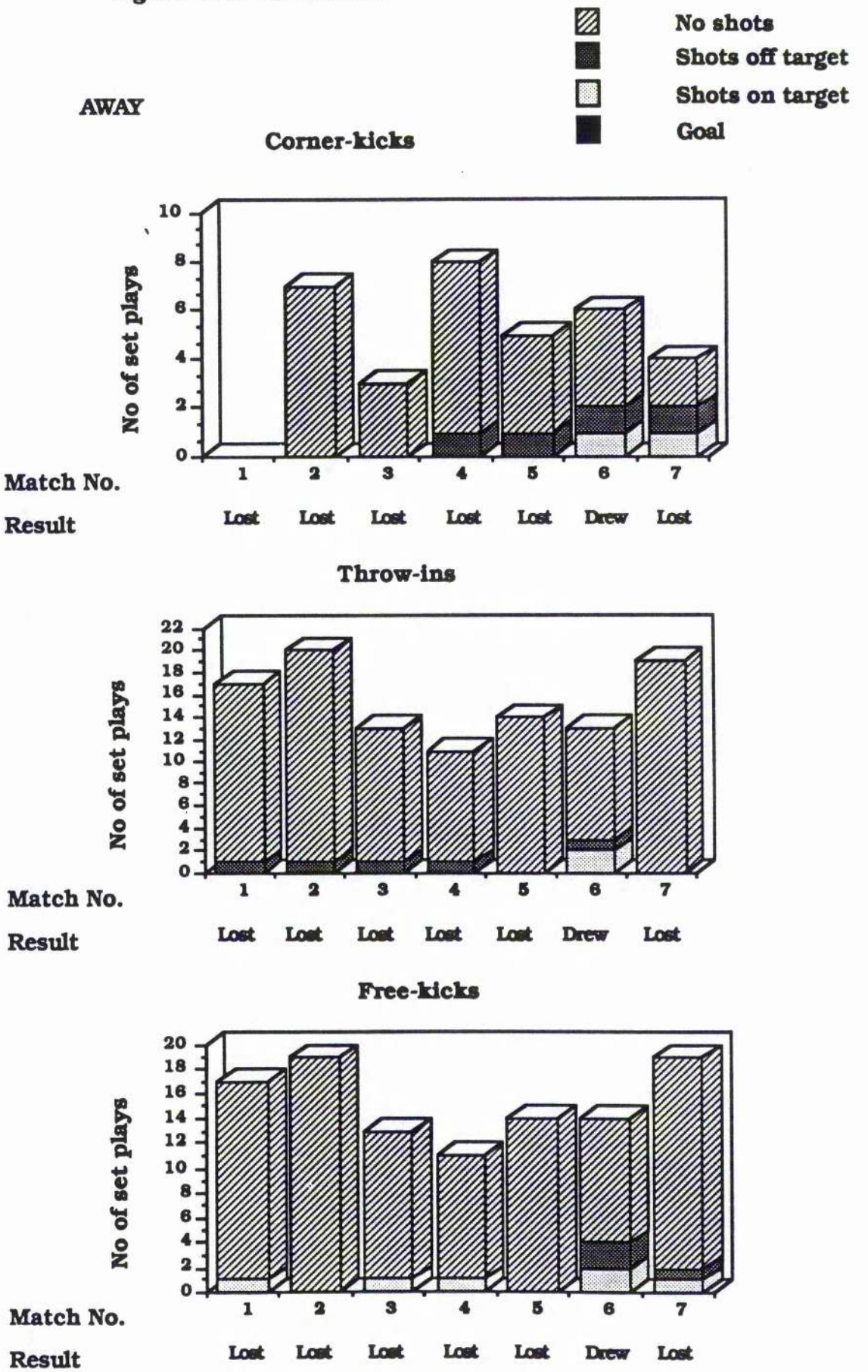


Figure 4.21 Continued.



on target from set plays than those matches which were drawn or lost, in home matches only.

(ii) The total number of set plays per se gave no indication of success.

(iii) Despite the team having more free-kicks away from home, there were more shots on target at home.

The relationships between long corner-kicks (consisting of a single cross into the opposition goal area) and short corner-kicks (consisting of a number of short passes) with shots on/off target were examined. It was found that corner-kicks which included a greater number of short passes were providing more shooting opportunities. Although the team had played a greater number of long corner-kicks (70 long corner-kicks employed) than short corner-kicks (11 short corner-kicks employed), there were more shots on target from short corner-kicks. Short corner-kicks produced 3 shots on target out of the total of 4 shots on target see **Appendix A 2:5 pp. 462.**

In addition, a useful assessment was made of the relationships between long throw-ins (throw-ins taken in the attacking third of the pitch and thrown into the oppositions penalty area for shooting) and short throw-ins (throw-ins to a colleague, which starts an ordinary attacking move) with shots on/off target. It was found that short throw-ins produced more shooting opportunities than long throw-ins. Short throw-ins produced all 3 shots on target see **Appendix A 2:5 pp. 463.** It should be noted that the team had employed a greater number of short throw-ins (169 short throw-ins employed) than long throw-ins (4 long throw-ins employed).

Furthermore, it was interesting to evaluate the relative effectiveness of free-kicks taken in front of the opposition goal by direct shots on target in relation to free-kicks taken as a lay-off to another player. It was found that the free-kicks which were taken as direct shots on goal

were more successful. Free-kicks which taken by shots on goal produced 11 shots on target out of the total of 15 shots on target see **Appendix A 2:5 pp. 464**. It should be noted that the team had employed a greater number of free-kicks which were taken as a lay-off to another player (175 free-kicks employed as a lay-off to another player) than free-kicks which taken directly by shot on goal (32 free-kicks employed as a direct shot on goal).

In summary, the analysis of set plays for the team **D** showed that there was a greater number of shots on target (a) from short corner-kicks rather than from long corner-kicks, (b) short throw-ins rather than long throw-ins and (c) from direct shots at the goal rather than from free-kicks as lay-offs to another player.

Team E :

During the soccer season 1987–1988 the team was analysed playing eight matches at home and eight matches away (see **Table 4.1**). For the purpose of analysis the team's attacking performance at home was separated from its attacking performance away and the two were analysed in the following manner:

Analysis of performance during home matches :

Patterns of play during home matches :

Out of a large number of attacking moves, there were five patterns of play in home matches. Each of these patterns of play represented a distinct attacking move as follows:

(i) Pattern EH.1 An attack initiated from the inside of the penalty area on the defensive half of the pitch, moving up the middle of the pitch

towards the penalty arc of the offensive half and terminated by a defensive player. This pattern is typical of 97 attacking moves.

(ii) Pattern EH.2 An attack initiated from the defensive half of the pitch, close to the right side of the penalty arc, moving briefly towards the right side as far as the centre line then towards the offensive penalty area and terminated by shooting. This pattern is typical of 27 attacking moves.

(iii) Pattern EH.3 An attack initiated from the defensive half of the pitch, close to the left side of the penalty arc, moving towards the left, crossing the offensive half, then moving along close to the left side line towards the left side line of the penalty area and terminated by interception by a defensive player at this position. This pattern is typical of 38 attacking moves.

(iv) Pattern EH.4 An attack initiated from the defensive half of the pitch, close to the right side of the penalty area, moving briefly towards the centre spot of the pitch then moving up the middle towards the offensive penalty area and terminated by a defensive player. This pattern is typical of 36 attacking moves.

(v) Pattern EH.5 An attack initiated from the defensive half of the pitch, close to the right side of the penalty area, moving towards the centre spot and then towards the right side line, then moving towards the right side line, towards the right side of the penalty area and terminated by a defensive player. This pattern is typical of 40 attacking moves.

Final actions with patterns of play :

From **Table 4.10**, which indicates the relationship between the final actions and the patterns of play, the undernoted observations were made:

Table 4.10

Summary of the frequency distribution of free attacks between final actions and patterns of play for all attacking moves in eight away matches for team E.

Final actions	Patterns of play					Row total
	EH.1	EH.2	EH.3	EH.4	EH.5	%
1	0	2	0	0	0	2 0.8
2	0	8	0	0	0	8 3.4
3	7	1	3	3	2	16 6.7
4	65	10	23	22	29	149 62.6
6	3	1	1	0	0	5 2.1
7	5	2	7	7	3	24 10.1
8	11	2	4	3	4	24 10.1
9	0	0	0	0	1	1 0.4
10	6	1	0	1	1	9 3.8
Total No. of attacks %	97 40.8	27 11.3	38 16.0	36 15.1	40 16.8	238 100.0

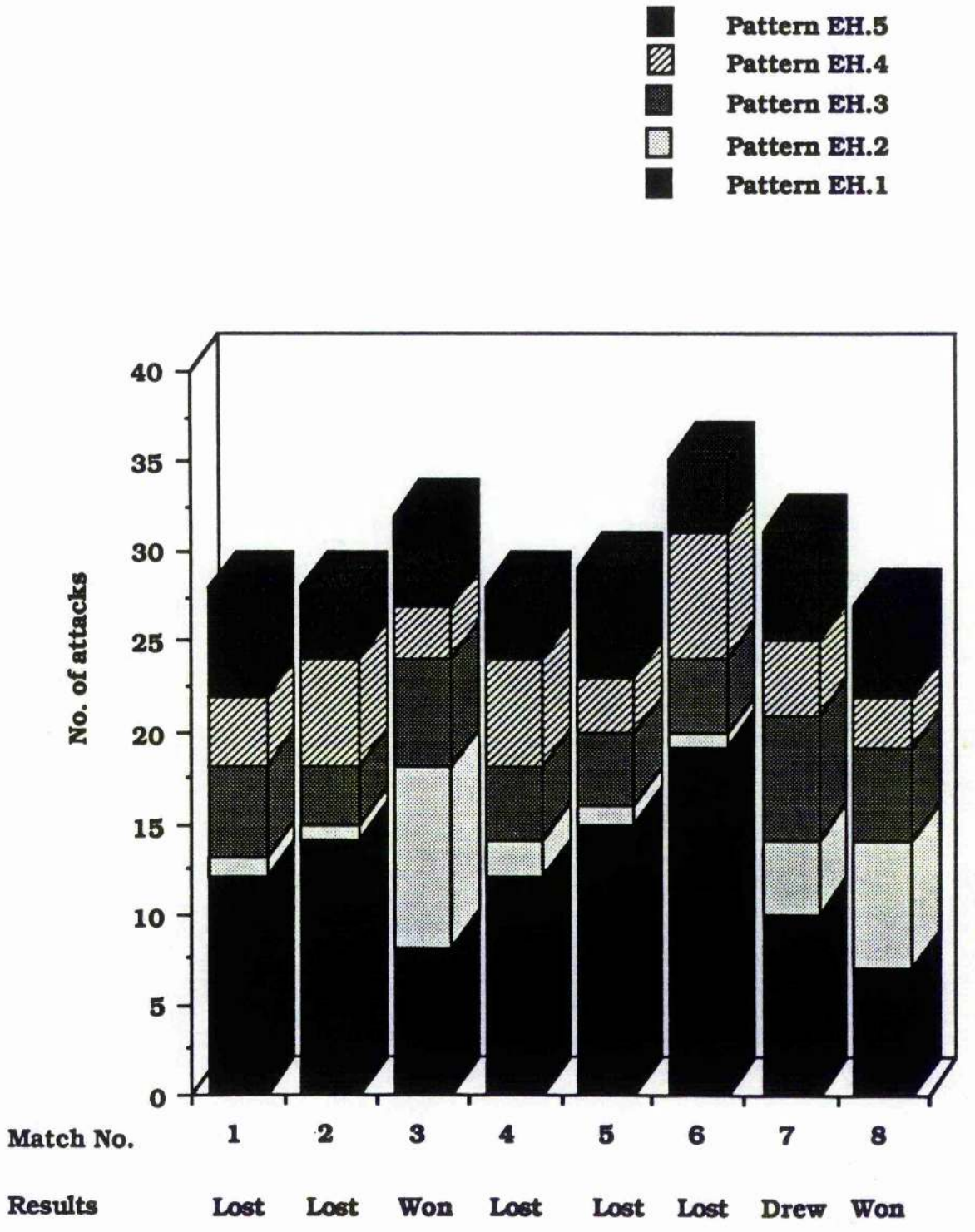
(i) Pattern EH.2 was the only pattern to produce final actions 1 and 2. (Final actions 1 and 2 are shooting at the goal). These final actions taken together were produced in 37% of all attacks using this pattern.
(ii) The most common outcome of Patterns EH.1, EH.3, EH.4 and EH.5 was final action 4. 67% of Pattern EH.1, 61% of Pattern EH.3, 61% of Pattern EH.4 and 73% of Pattern EH.5 produced final action 4. (Final action 4 represents lost of possession).
(iii) Patterns EH.3, EH.4 and EH.5 have a fairly similar distribution of final actions, with final action 4 being the most common outcome.

Clearly, the results of the above observations show that Pattern EH.2 was the most effective pattern of play since it provided most of the goals and most of the shots on target of all the patterns of play. It produced all 10 shots on target. It appears that Patterns EH.1, EH.3, EH.4 and EH.5 are pretty similar. Only Pattern EH.2 was successful.

The most and least successful attacking patterns of play for team **E** during home matches have now been identified and it is desired to assess how frequently these patterns of play appeared in each of those matches which were analysed in relation to the result of the match. This can be seen in **Figure 4.22**, which shows that Pattern EH.2 appeared more frequently in those matches which were won than in those which were lost. It is also revealed that Pattern EH.1 appeared in all of the matches played but it was repeated in a greater number in those matches which were lost than in those matches which were won. Patterns EH.3, EH.4 and EH.5 were found in a regular distribution in most of the matches which were played although it might be argued that Pattern EH.4 occurred more often in games lost than won. It should be noted that there was not a big difference between the total number of attacking moves in those matches which were won and the total number of attacking moves in those matches

Figure 4.22

Summary of the association between frequencies of patterns of play from free attacks in home matches team E.



which were lost, clearly the total number of attacks per se was not an indication of success.

Analysis of performance during away matches :

Patterns of play during away matches :

Out of a large number of attacking moves, there were four patterns of play in away matches. Each of these patterns of play represented a number of attacking move as follows:

(i) Pattern EA.1 An attack initiated from the inside of the penalty area on the defensive half of the pitch, moving directly towards the right side of the penalty area of the offensive half of the pitch and terminated by interception by a defensive player. This pattern is typical of 118 attacking moves.

(ii) Pattern EA.2 An attack initiated from the defensive half of the pitch, close to the left side of the penalty area, moving along the left side line towards the centre line and from this position to the offensive penalty area for shooting. This pattern is typical of 37 attacking moves.

(iii) Pattern EA.3 An attack initiated from the defensive half of the pitch, close to the right side of the penalty arc, moving along the right side line towards the centre line and from this position towards the offensive penalty arc but intercepted by a defensive player before it reaching the penalty arc. This pattern is typical of 79 attacking moves.

(iv) Pattern EA.4 An attack initiated from the inside of the penalty area of the defensive half of the pitch, moving along the right side line towards the right side of the offensive penalty area and terminated by interception by a defensive player. This pattern is typical of 43 attacking moves.

Final actions with patterns of play :

From **Table 4.11**, which indicates the relationship between the final actions and patterns of play, the undernoted observations were made:

(i) Pattern EA.2 produces the final actions 1 and 2 more often than the other patterns of play. (Final actions 1 and 2 are shooting at the goal). These final actions taken together were produced in 38% of all attacks using this pattern.

(ii) The most common outcome of Patterns EA.1 and EA.3 was final action 4, and this occurred more often (70% and 65% of the time respectively) than for any other patterns of play. They also produced final actions 7, 8 and 10 more frequently than other outcomes. (Final actions 4, 7, 8 and 10 are representing lost of possession, throw-in, off-side and free-kicks respectively).

(iii) Pattern EA.4 usually produced final action 4, although in 12% of attacks it produced final action 10. (Final action 10 represents a free-kick).

Clearly, the results of the above observations show that Pattern EA.2 was the most effective pattern of play since it provided most of the goals and most of the shots on target of all the patterns of play. It produced 14 shots on target out of the total of 15 shots on target from all four patterns of play. It should also be noted that Patterns EA.1 and EA.3 were the least successful since they only provided 1 shooting opportunity out of 197 attacking moves. Pattern EA.4 produced a considerable number of throw-ins and free-kicks and the effectiveness of these throw-ins and free-kicks will be examined in detail later in this chapter.

Table 4.11

Summary of the frequency distribution of free attacks between final actions and patterns of play for all attacking moves in eight away matches for team E.

Final actions	Patterns of play				Row total
	EA.1	EA.2	EA.3	EA.4	%
1	0	5	0	0	5 1.8
2	0	9	1	0	10 3.6
3	3	2	4	1	10 3.6
4	83	11	51	26	171 61.7
6	5	5	3	1	14 5.1
7	4	2	8	6	20 7.2
8	8	2	5	4	19 6.9
10	15	1	7	5	28 10.1
Total No. of attacks %	118 42.6	37 13.4	79 28.5	43 15.5	277 100.0

The most and least successful attacking patterns of play for team **E** during away matches have now been identified and it is desired to assess how frequently these patterns of play appeared in each of those matches which were analysed in relation to the result of the match. This can be seen in **Figure 4.23**, which shows that Pattern EA.2 appeared more frequently in match eight which was won than in those which were lost as well as in the drawn matches. It is also revealed that Patterns EA.1 and EA.3 appeared in all of the matches played but it was repeated in a greater number in those matches which were lost than in those matches which were drawn or won. Pattern EA.4 appeared in all of the matches played but it was repeated in greater number in those matches which were drawn or won than in those matches which were lost. It should be noted that the total number of attacking moves in those matches which were won was less than the total number of attacking moves in those matches which were lost, clearly the total number of attacks per se was not an indication of success.

Shooting analysis during home and away matches :

The relationships between shots on/off target for free attacking moves with the results of the matches were assessed. These relationships are shown in **Figures 4.24** and **4.25** from which the following points emerge:

(i) Those matches which were won had a greater total number of shots than those matches which were drawn or lost. Note the contrast with the number of attacks.

(ii) Those matches which were won had a greater total number of shots on target than those matches which were drawn or lost.

Figure 4. 23

Summary of the association between frequencies of patterns of play from free attacks in away matches for team E.

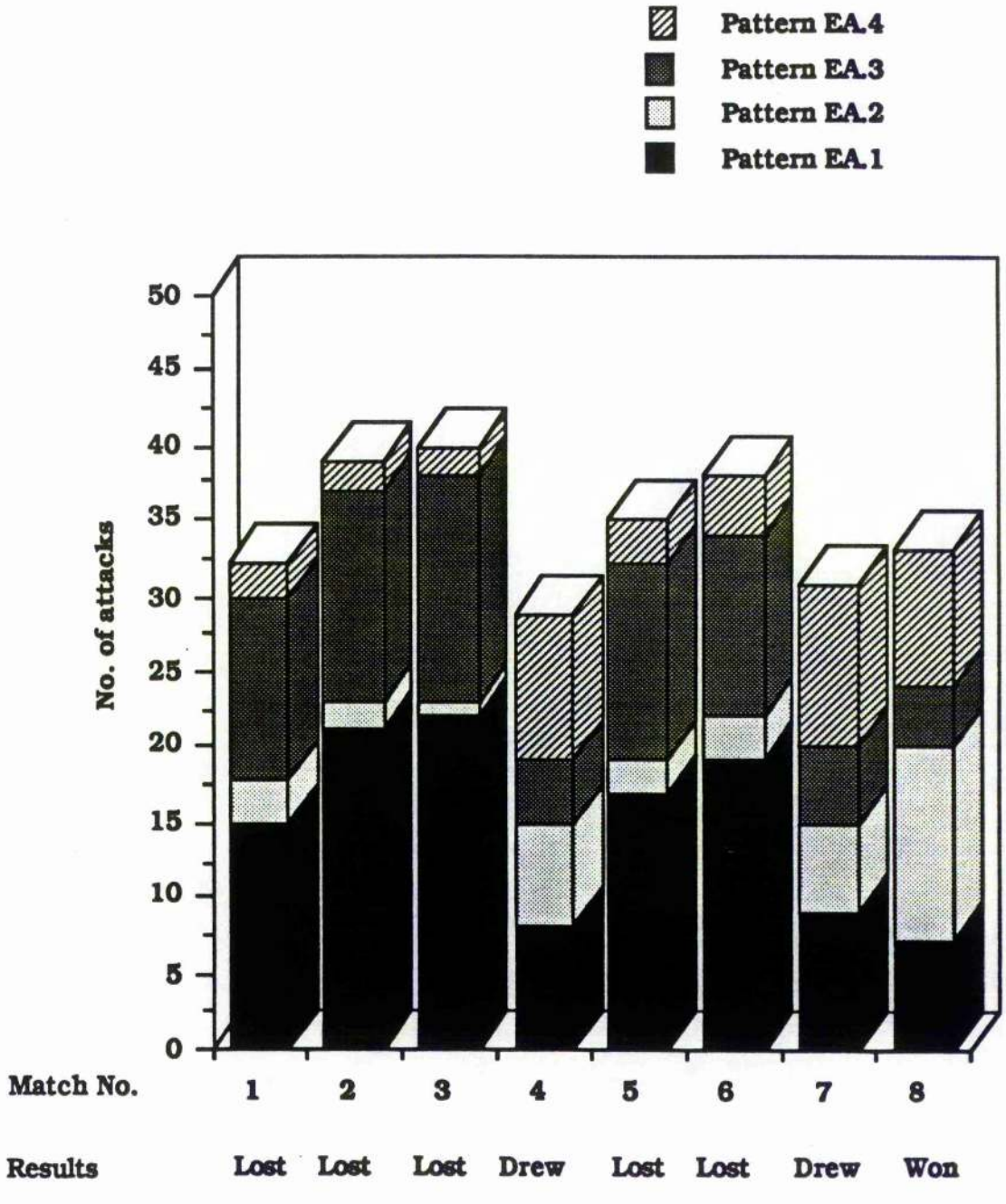


Figure 4.24

Summary of the relationships between home matches and shots on or off target for team E.

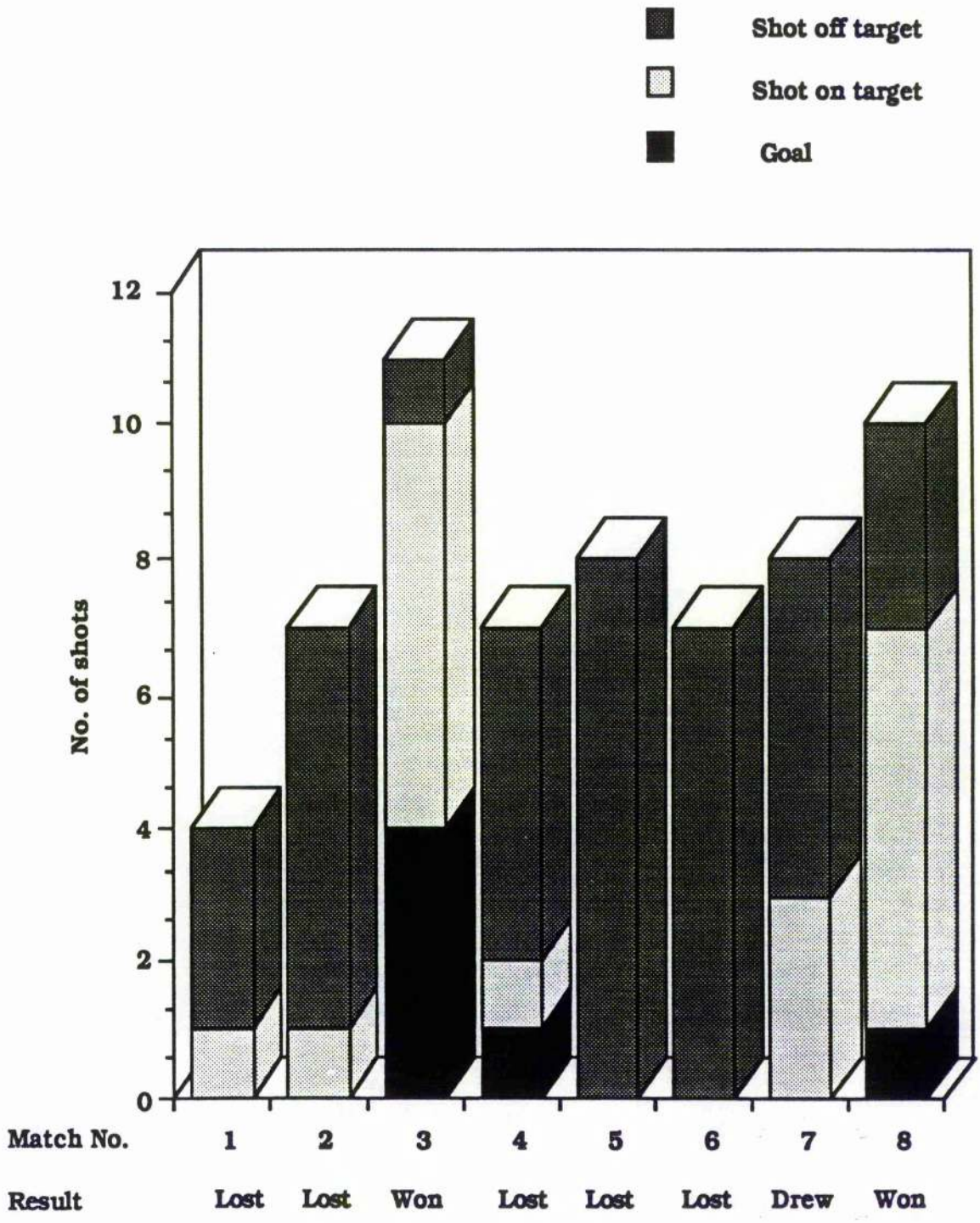
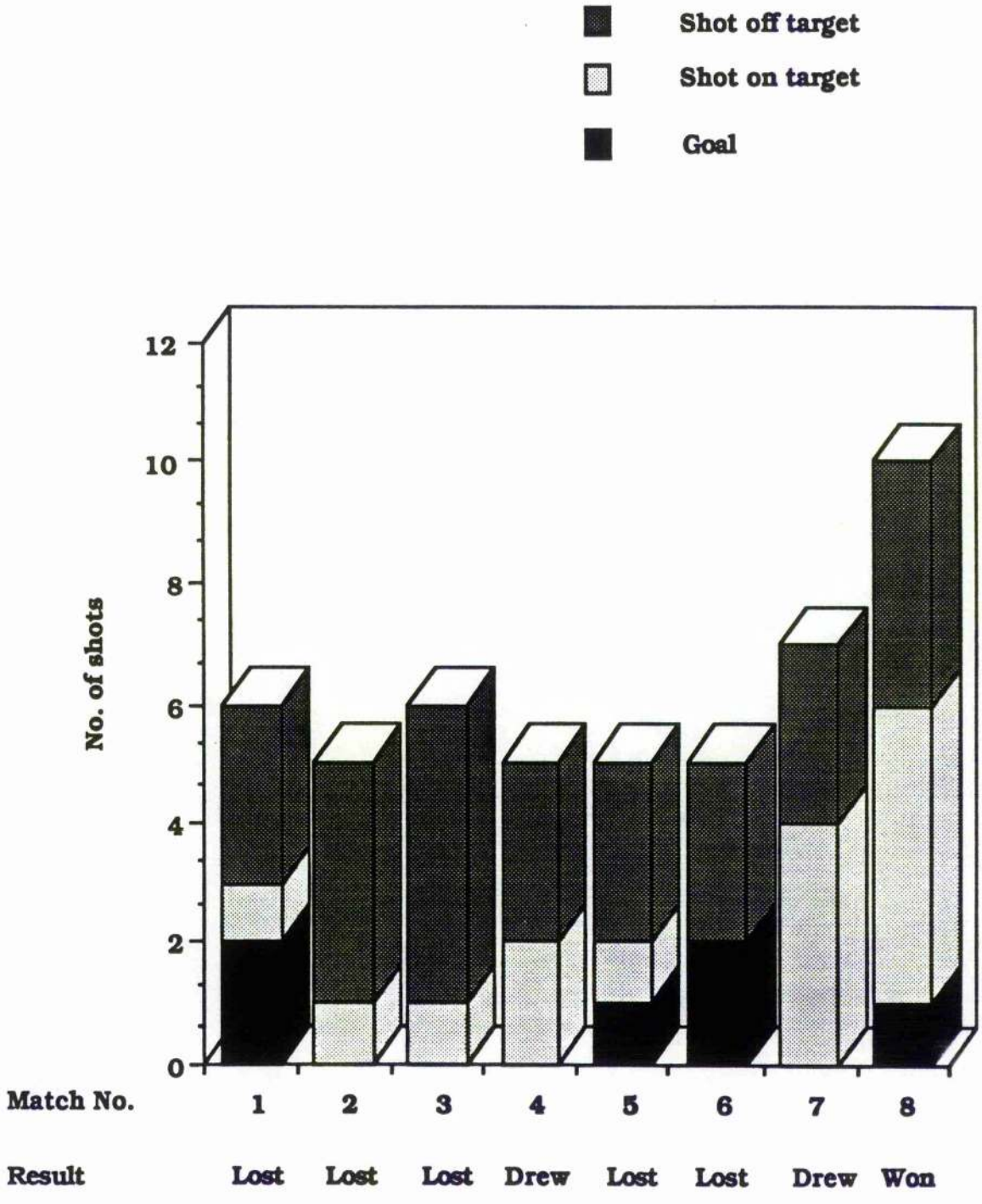


Figure 4.25

Summary of the relationships between away matches and shots on or off target for team E.



Summary of analysis of performance during home and away matches :

The analysis of patterns of play for team **E** during its home and away matches showed that there were five distinct patterns of play in the seven home matches and also there were four distinct patterns of play in the seven away matches analysed. The results showed that Pattern EH.2 was the most successful pattern of play.

The results for away matches showed that Pattern EA.2 was the most successful, and Pattern EA.4 concluded more often with throw-ins and free-kicks. The successful patterns of play appeared more often in the match which was won than those which were lost. However, the number of attacks was not indicative of success – in common with the findings for team **D**.

The analysis of shooting showed that there was a greater total number of shots on target in those matches which were won than in those which were lost or drawn. There was also a greater total number of shots in those matches which were won than in those matches which were lost or drawn.

Analysis of performance during set plays :

Shooting analysis :

Although no relationship has been found between the patterns of play of offensive set pieces and the outcome of each move, it is worth examining the effectiveness of set pieces. Furthermore, it was considered desirable to assess the relationships between shots on/off target for set plays with the results of the home and away matches which were analysed. From **Figure 4.26**, which indicates the relationships between frequency of shooting in set plays and the results of the matches analysed, the following points have emerged:

Figure 4.26

Summary of the association between shots at goal from set pieces and the results of the matches for team E.

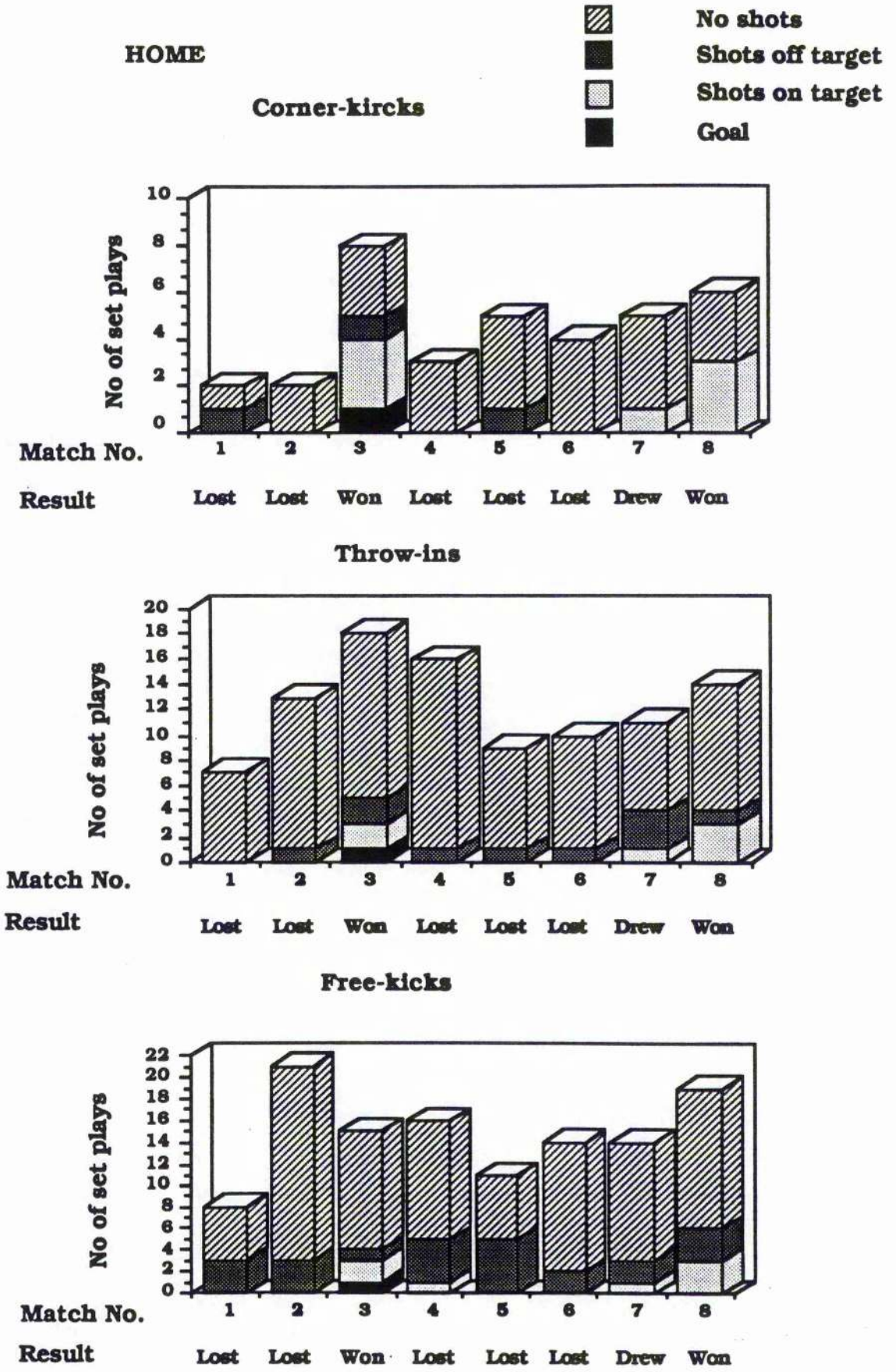
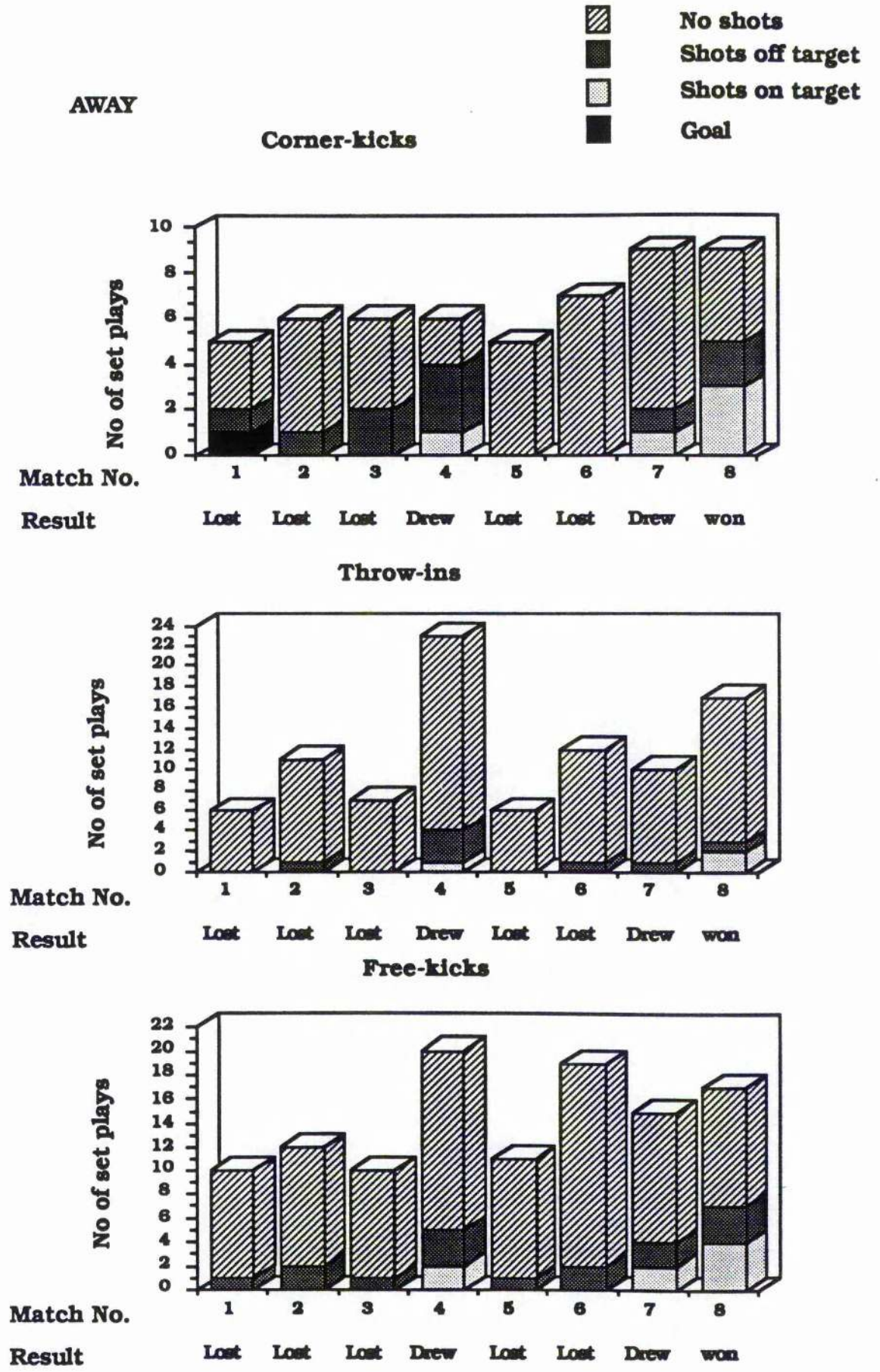


Figure 4.26 Continued.



(i) Those matches which were won had a greater total number of shots on target from set plays than those which were drawn or lost.

(ii) The total number of set plays per se gave no indication of success.

(iii) Despite the team having more corner-kicks away from home, there were more shots on target at home.

The relationships between long corner-kicks (consisting of a single cross into the opposition goal area) and short corner-kicks (consisting of a number of short passes) with shots on/off target were examined. It was found that long corner-kicks were more successful than short corner-kicks in providing more shooting opportunities **see Appendix A 2:5 pp. 465**. Long corner-kicks produced 10 shots on target out of the total of 12 shots on target **see Appendix A 2:5 pp. 465**. It should be noted that the team had employed a greater number of long corner-kicks (64 long corner-kicks employed) than short corner-kicks (6 short corner-kicks employed).

In addition, a useful assessment was made of the relationships between long throw-ins (throw-ins taken in the attacking third of the pitch and thrown into the oppositions penalty area for shooting) and short throw-ins (a throw-ins to a colleague, which starts an ordinary attacking move) with shots on/off target. It was found that short throw-ins were more successful in producing shooting opportunities than long throw-ins. Short throw-ins produced all 11 shots on target **see Appendix A 2:5 pp. 466**. It should be noted that the team had employed a greater number of short throw-ins (173 short throw-ins employed) than long throw-ins (7 long throw-ins employed).

Furthermore, it was interesting to evaluate the relative effectiveness of free-kicks taken in front of the opposing goal by direct shots on target in relation to free-kicks taken as a lay-off to another player. It was found that the free-kicks which were taken as a lay-off to another

player were more successful in producing shooting opportunities than free-kicks which were taken directly by shots on goal. Free-kicks which were taken as a lay-off to another player produced 14 shots on target out of the total of 16 shots on target **see Appendix A 2:5 pp. 467.** It should be noted that the team had employed a greater number of free-kicks which were taken as a lay-off to another player (206 free-kicks employed as a lay-off to another player) than free-kicks directly taken as shots on goal (16 free-kicks employed as direct shots on goal).

In summary, the analysis of set plays for the team **E** showed that there was a greater number of shots on target (a) from long corner-kicks rather than from short corner-kicks, (b) short throw-ins rather than long throw-ins and (c) from lay-offs to another player rather than from direct shots at the goal from free-kicks.

4.4 DISCUSSION :

The major aim of the investigation described in this chapter was to find out if there are any similar patterns of play for all teams, and if these successful patterns of play occur equally in home and away matches. A further aim was to discover how frequently the successful patterns of play are seen, in good and poor teams.

Free play analysis :

The analysis of patterns of play of each team during free play has clearly revealed a number of similarities. In each match the team had a large number of attacking moves (i.e. team **A** in 7 home matches had 210 attacks and team **E** in 8 home matches had 238 attacks). Most of these attacks were similar, and could be classified into distinct patterns of play. Surprisingly, the distinct patterns of play identified

for each team in both home and away matches were few in number (between 4 and 6 patterns for each team) and accounted for a very high percentage of all attacks. For example, the 5 patterns of play for team **A** in home matches incorporated 210 attacks (95% of all attacks). However, there were a few attacks which were excluded from the analysis because they were unique (see **Chapter 4, Section Two**). Good and poor teams had the same number of patterns of play (4–6).

One might think that good teams utilise a greater number of patterns of play, but the results clearly show that there are a similar number of patterns of play for all the teams. For example, team **A** had 5 patterns of play at home and away, and team **E** had 5 patterns of play at home and 4 patterns of play away. The possible reason for good and poor teams having the same number of patterns of play may be that most of the teams are restricted to certain strategies which are well planned by their managers and coaches. Further investigation is required to clarify this point.

Good teams **A** and **B** had the same number of successful patterns of play in home and away matches (e.g. AA.1, AA.3, AH.2 and AH.3 for team **A** : BH.2, BH.5, BA.1 and BA.4 for team **B**). The poorer teams also had the same number of successful patterns in home and away matches (e.g. DH.2 and DA.4 for team **D** : EH.2 and EA.2) but they were fewer in number. This indicates that the better teams had a greater repertoire of successful patterns of free play, and this might explain why they were better teams. There may be a number of possible reasons for top teams having more successful patterns of play, (e.g. because they have a greater number of individuals, more skilful, experienced and confidence players which enable them to create more successful attacking moves).

It should be noted that the results showed clearly that these successful patterns of play appeared more often in those matches which teams won, providing further indication that to be successful a team needs to use a variety of successful patterns of attacks, and to use them frequently.

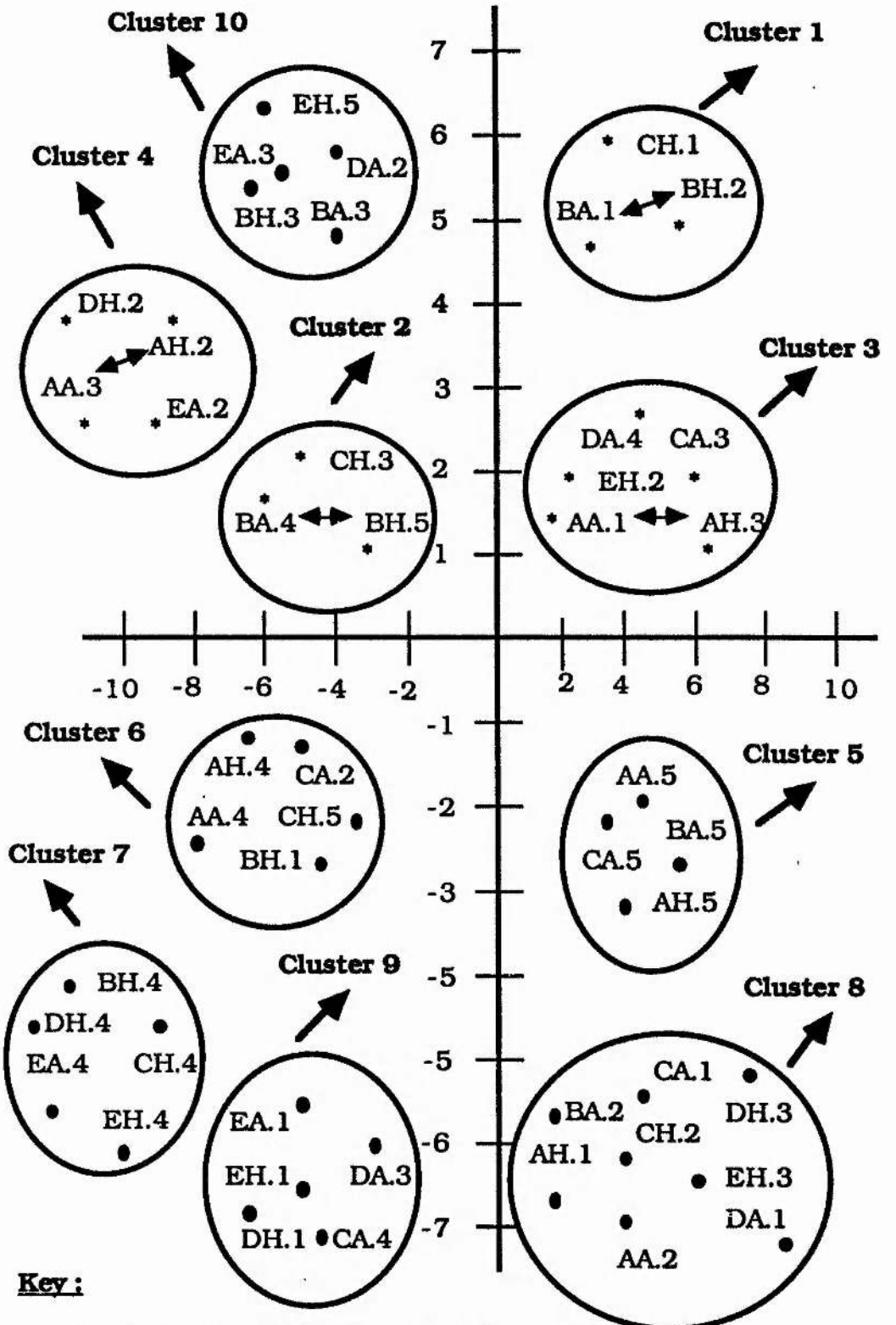
It is worthwhile exploring whether there are a limited number of patterns of play common to all teams. The forty-seven patterns of play which were identified earlier in this chapter from all five teams were further analysed to find out if they had common features, and to investigate if the successful patterns of play at home and away were the same for all the teams. The same computer program which had been used previously in Chapter Two, Section II, was run for this data. Using a similar Cluster analysis technique to that used in Chapter Two Section II, similar patterns of play were grouped with each other as shown in **Figure 4.27**. This produced 10 clusters, each cluster representing a number of patterns of play which had similarities. The method was supplemented by a visual inspection of the original patterns of play within each cluster, to try and identify these similarities.

Of the ten major clusters, all the similar successful patterns of play were grouped together into one, of four clusters (clusters 1, 2, 3 and 4 in **Figure 4.27**). For example, Cluster 1 and Cluster 2 represent three similar successful patterns of play, Cluster 3 represents five similar successful patterns of play and Cluster 4 represents four similar successful patterns of play. The following were found to be the most successful clusters in concluding successful patterns of play:

Cluster 1 consisted of patterns BA.1, BH.2 and CH.1, and all of these successful patterns had similar common features. All of these moves were initiated from the same locations and moved towards the

Figure 4.27

Example of a graph, showing patterns of play; the ten clusters represent clusters of similar patterns of play.



Key :

- **EH.4 : Pattern 4 for team E at home which was less successful.**
- **Unsuccessful pattern of play.**
- **Successful pattern of play.**
- **Similar successful patterns of play both at home and away.**

offensive half of the pitch, along the right wing, then towards the corner flag with similar number of passes and dribbling sections, and were terminated by a long cross into the penalty area for shooting, (see **Figures 4.28** and **4.29**). Clearly, all of the patterns within Cluster 1 were successful and Pattern BH.2 was the best of all.

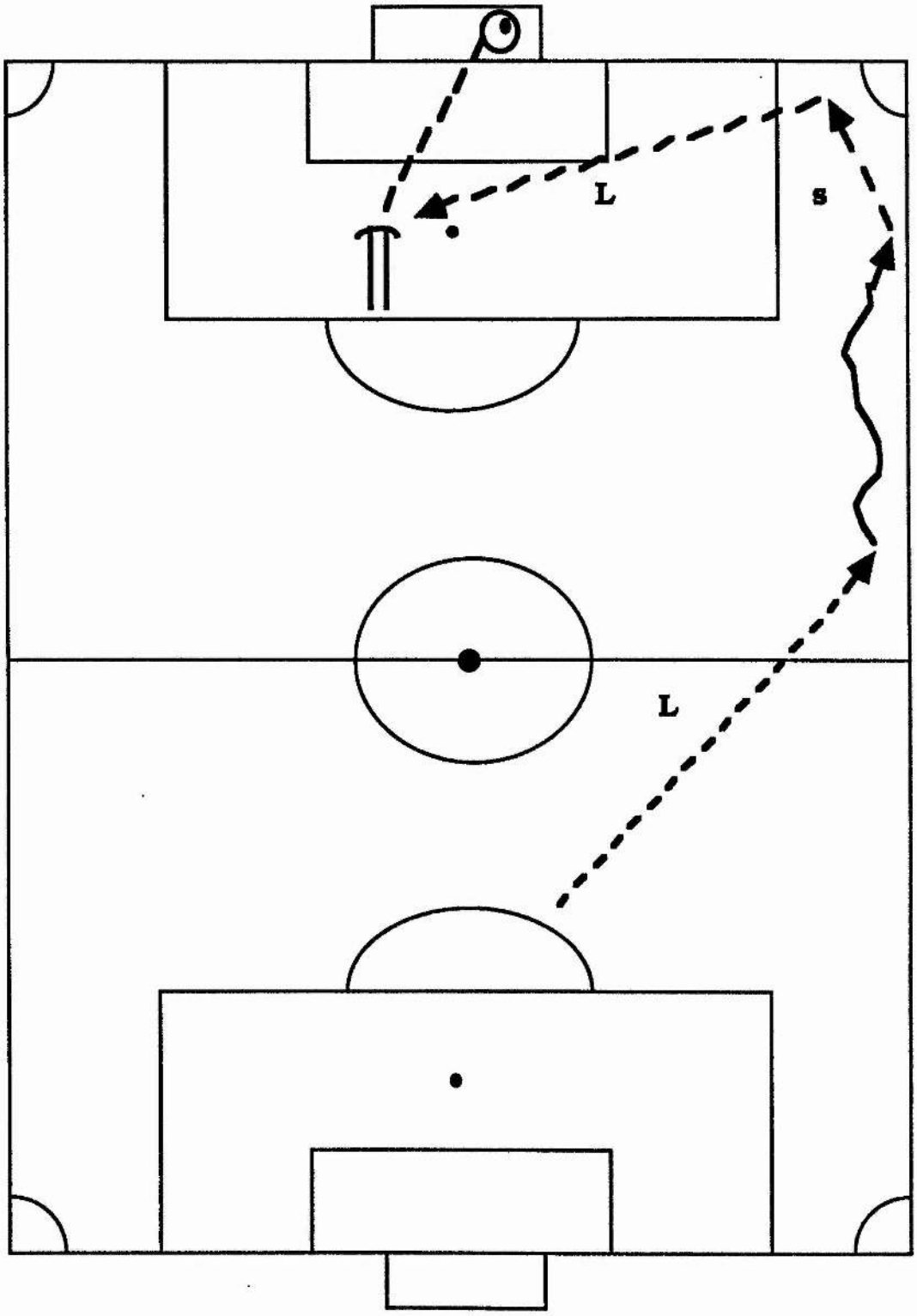
Cluster 2 consisted of patterns BA.4, BH.5 and CH.3, and all of these successful patterns had similar common features. All of these moves were initiated from the same locations and moved towards the offensive half of the pitch, along the left wing, then towards the corner flag with a similar number of passes and dribbling sections, and were terminated by a long cross into the penalty area for shooting, (see **Figures 4.30** and **4.31**). Clearly, all of the patterns within Cluster 2 were successful and Pattern BH.5 was the best of all.

Cluster 3 consisted of patterns AA.1, AH.3, CA.3, DA.4 and EH.2, and all of these successful patterns had similar common features. All of these moves were initiated from the same locations and moved towards the offensive half of the pitch, along the right wing with a similar number of passes and dribbling sections, and were terminated by a long cross into the penalty area for shooting, (see **Figures 4.32** and **4.33**). Clearly, all of the patterns within Cluster 3 are successful and Patterns AA.1 and AH.3 were the best of all.

Cluster 4 consisted of patterns AA.3, AH.2, DH.2 and EA.2, and all of these successful patterns had similar common features. All of these moves were initiated from the same locations and moved towards the offensive half of the pitch, along the left wing with a similar number of passes and dribbling sections, and were terminated by a long cross into the penalty area for shooting, (see **Figures 4.34** and **4.35**). Clearly, all of the patterns within Cluster 4 were successful and Patterns AH.2 and AA.3 were the best of all.

Figure 4.28

An attack typifying pattern BA.1.



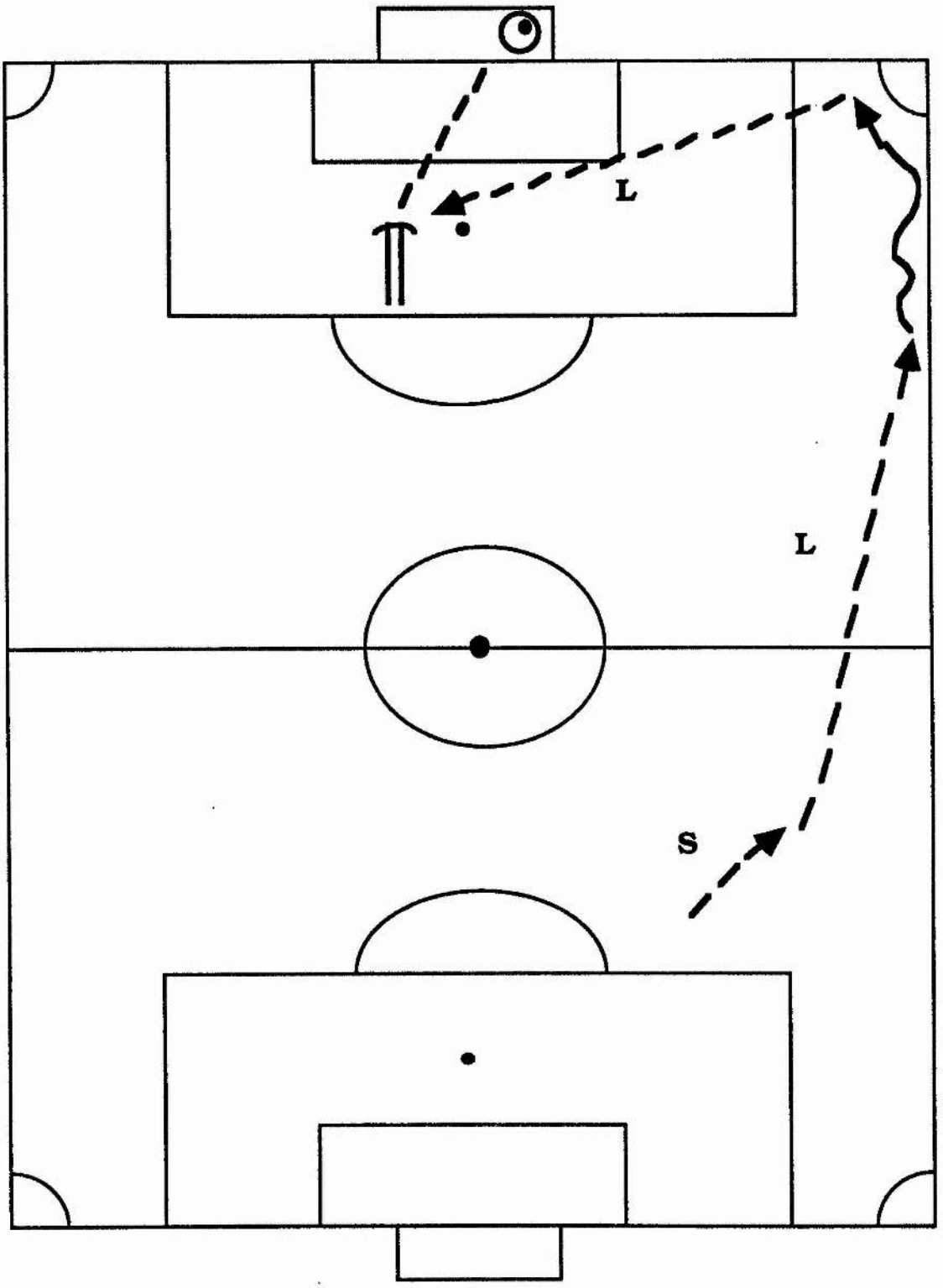
Path of ball

Route of player with ball

Shot on target

Figure 4.29

An attack typifying Pattern BH.2.



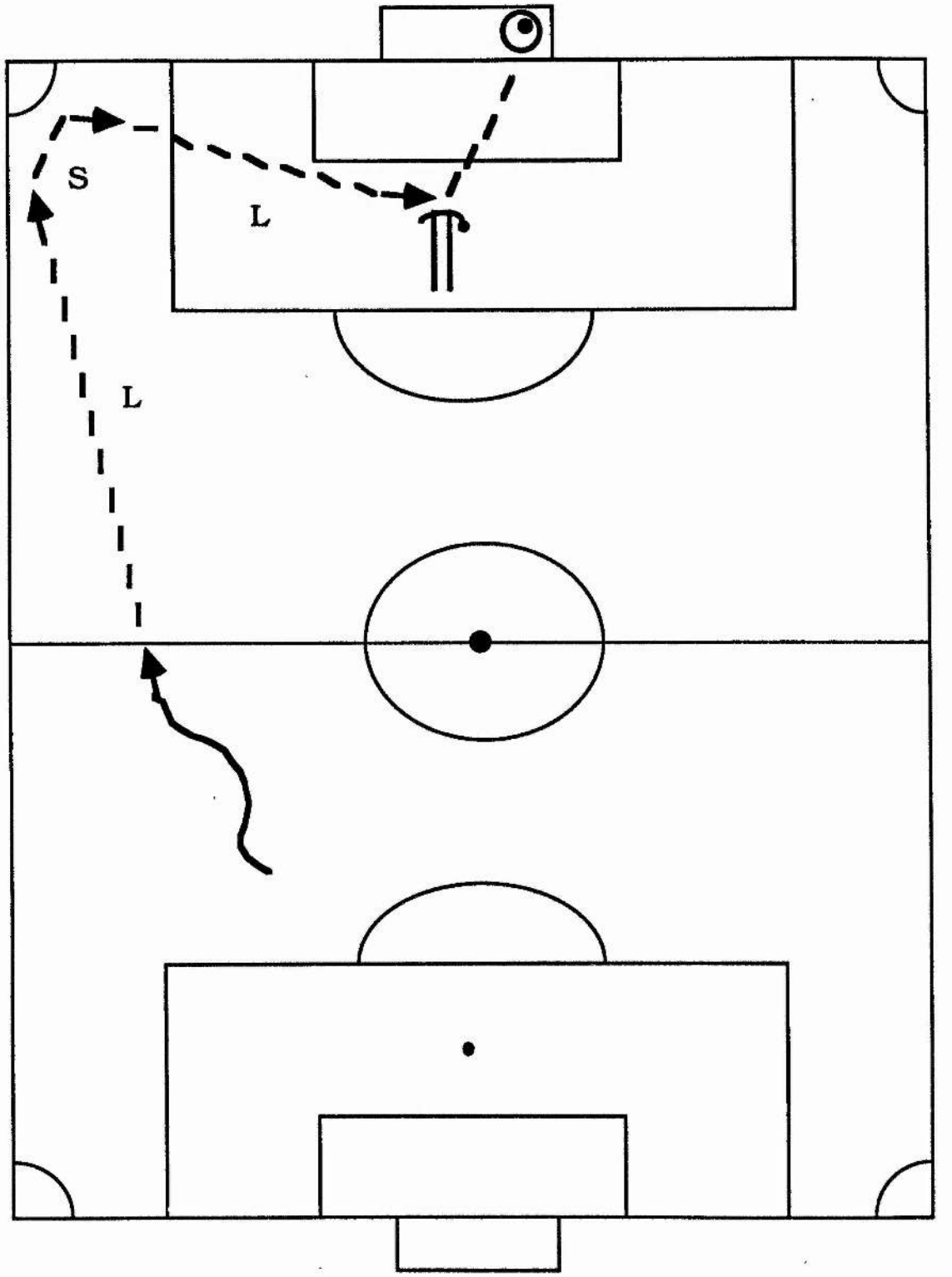
Path of ball

Route of player with ball

Shot on target

Figure 4.30

An attack typifying Pattern BA.4.



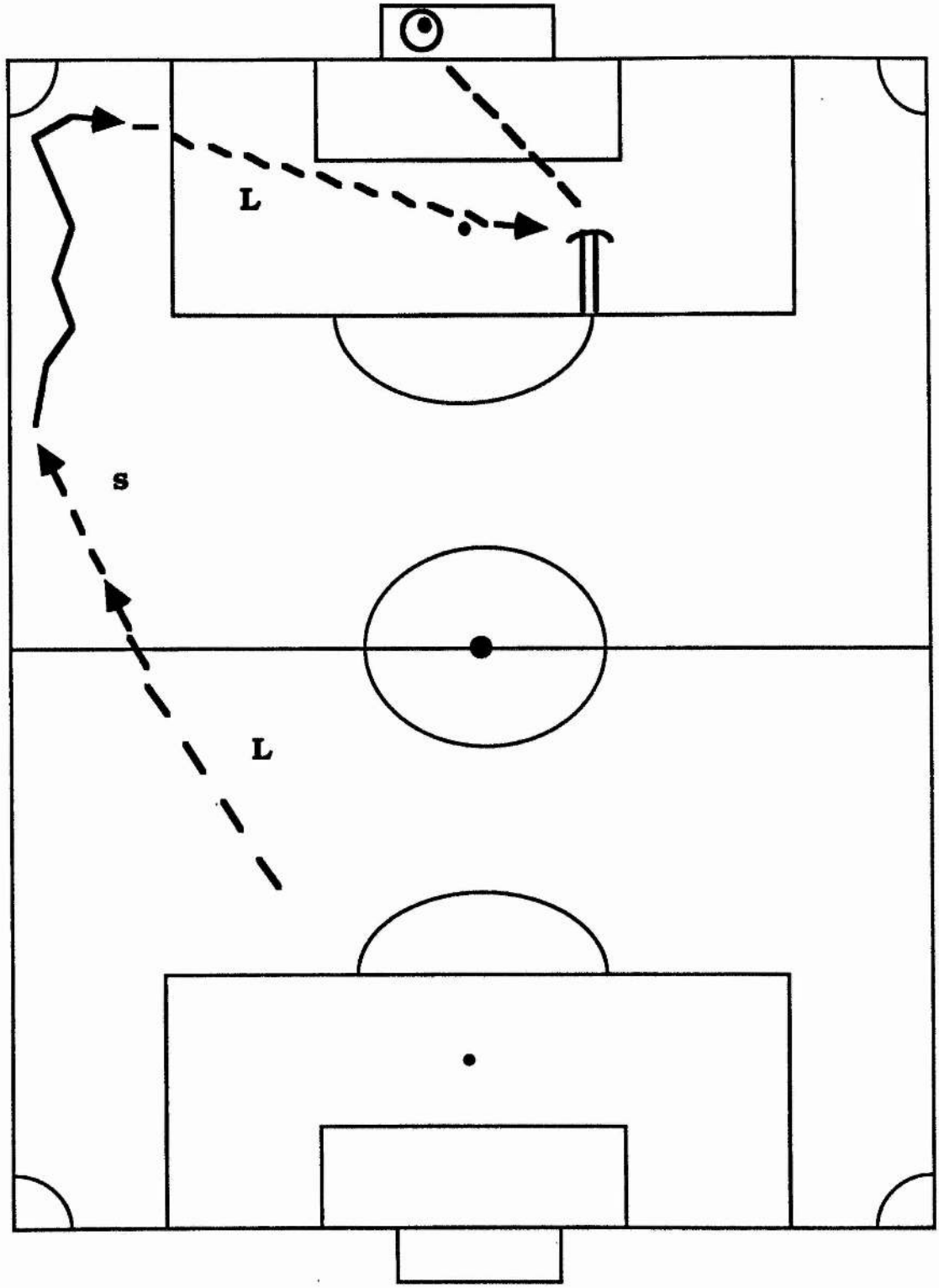
Path of ball

Route of player with ball

Shot on target

Figure 4.31

An attack typifying pattern BH.5.



Path of ball

Route of player with ball

Shot on target

Figure 4.32

An attack typifying pattern AA.1.

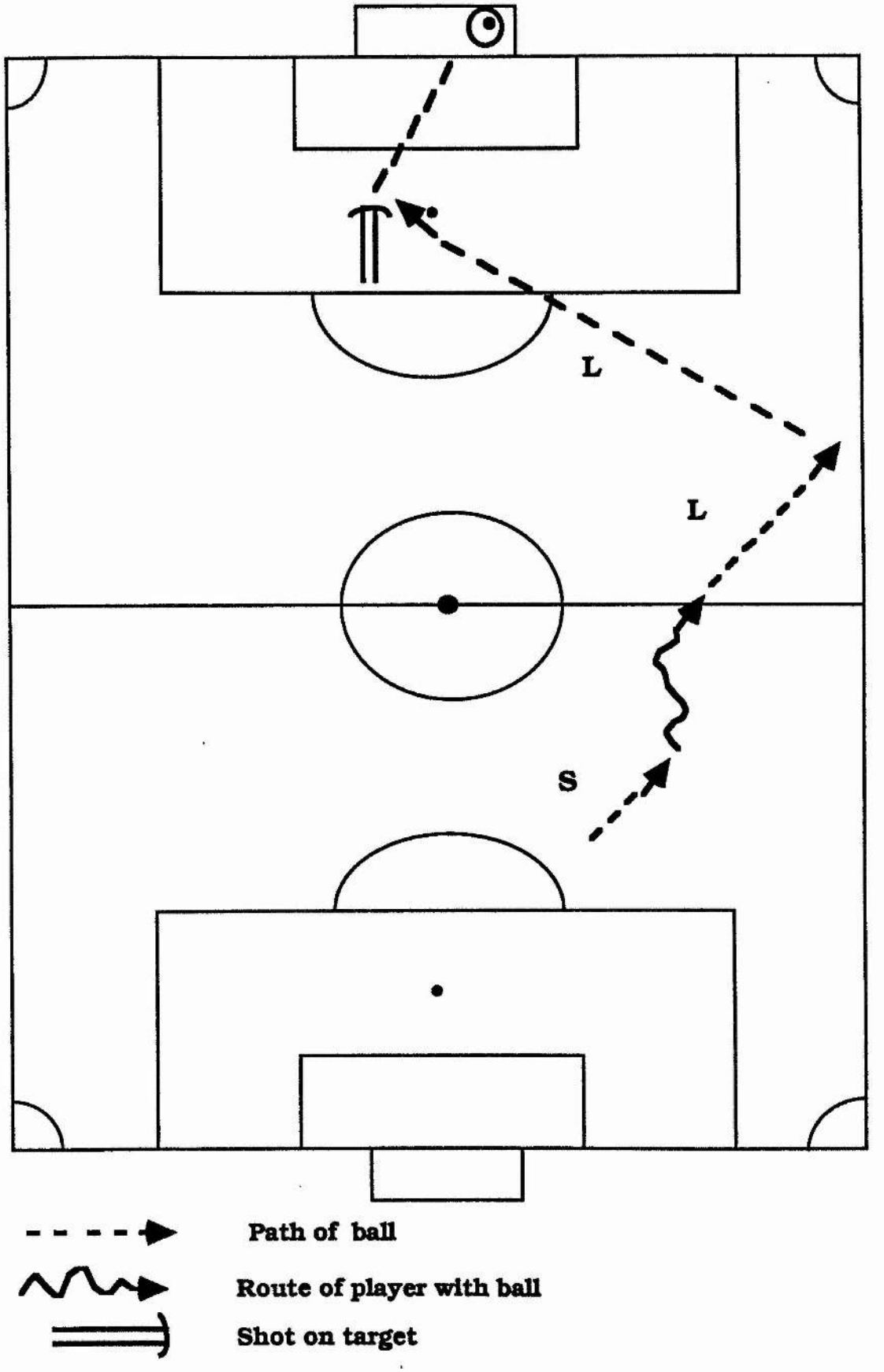
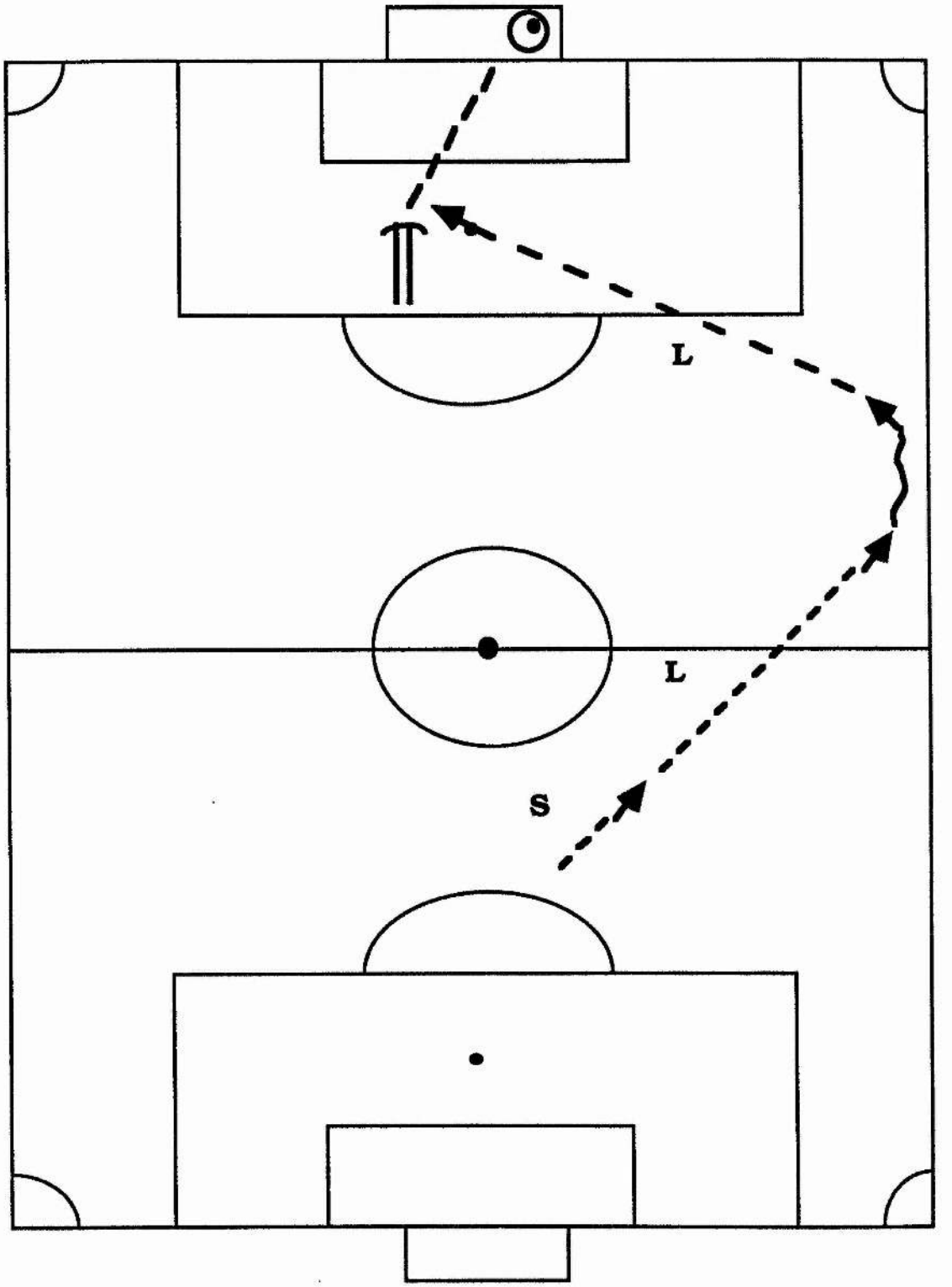


Figure 4.33

An attack typifying pattern AH.3.



Path of ball

Route of player with ball

Shot on target

Figure 4.34

An attack typifying pattern AA.3.

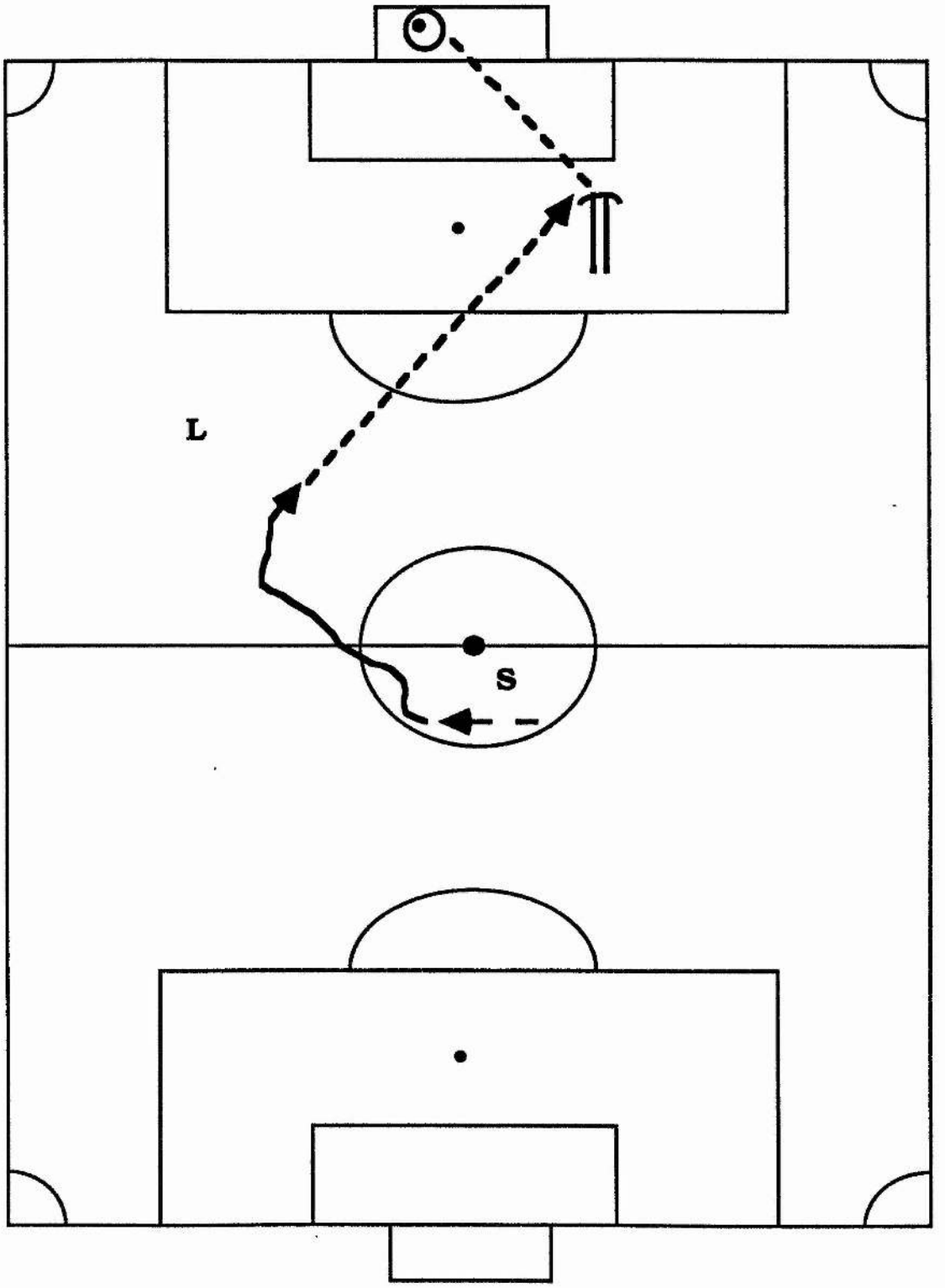
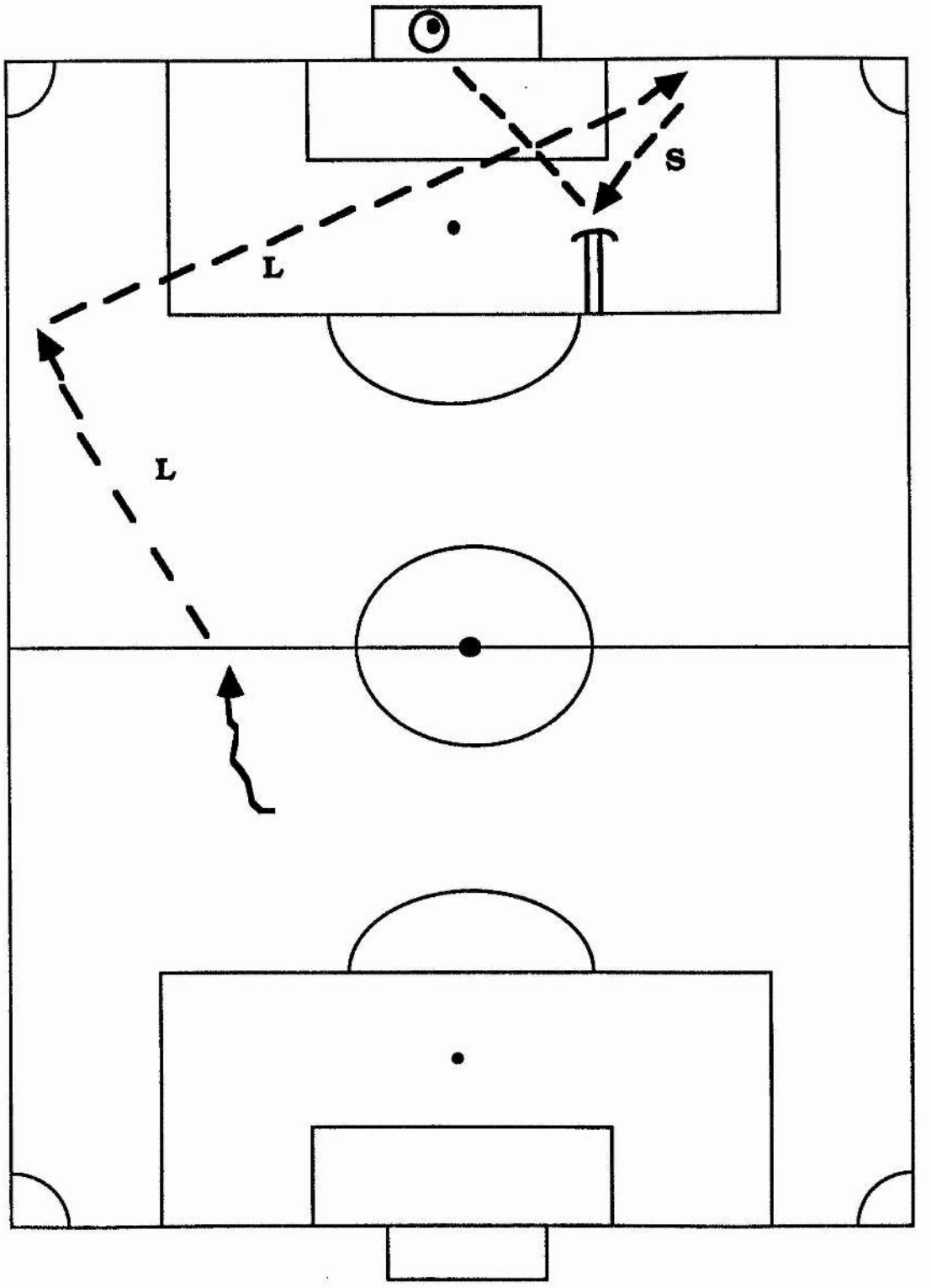


Figure 4.35

An attack typifying pattern AH.2.



Path of ball

Route of player with ball

Shot on target

The results of this study agree with the findings of **Ali (1985)** who found that, for one team from a number of attacking patterns of play, those patterns which proceed along the length of either wing were more successful than the others.

The least successful patterns of play were also grouped together into six separate clusters (clusters 5, 6, 7, 8, 9 and 10). It would appear, therefore, that successful patterns of play used by each team, have common elements with other teams, and the 15 separate patterns identified for the 5 teams can be further classified into 4 categories (i.e. clusters 1, 2, 3 and 4). Similarly, the 32 unsuccessful patterns of play can be classified into 6 categories (i.e. clusters 5–10 in **Figure 4.27**). It is worth attempting to determine what these common elements are which are shared by patterns of play falling within the same cluster.

Figure 4.27, has indicated similarities in patterns of play for all the teams. Although there are observable similarities among successful patterns of play for all the teams, it was found that there is one particular cluster which indicates successful patterns of play for all teams except team **B** (Cluster 3). Pattern AA.1 has been shown to be the most successful of all of these successful patterns in Cluster 3. This is an attack initiated from the inside of the defensive half of the pitch, moving towards the right side of the centre line, then moving along the right wing of the offensive half, then towards the penalty area and terminated by shooting (see **Figure 4.32**). However, it may be possible that that particular pattern of play would also benefit team **B**, if it were to use it.

Cluster 8 indicates patterns of play for all teams which were unsuccessful, and is characterised by moves initiated from the inside of the defensive half and moves toward the centre line close to the left

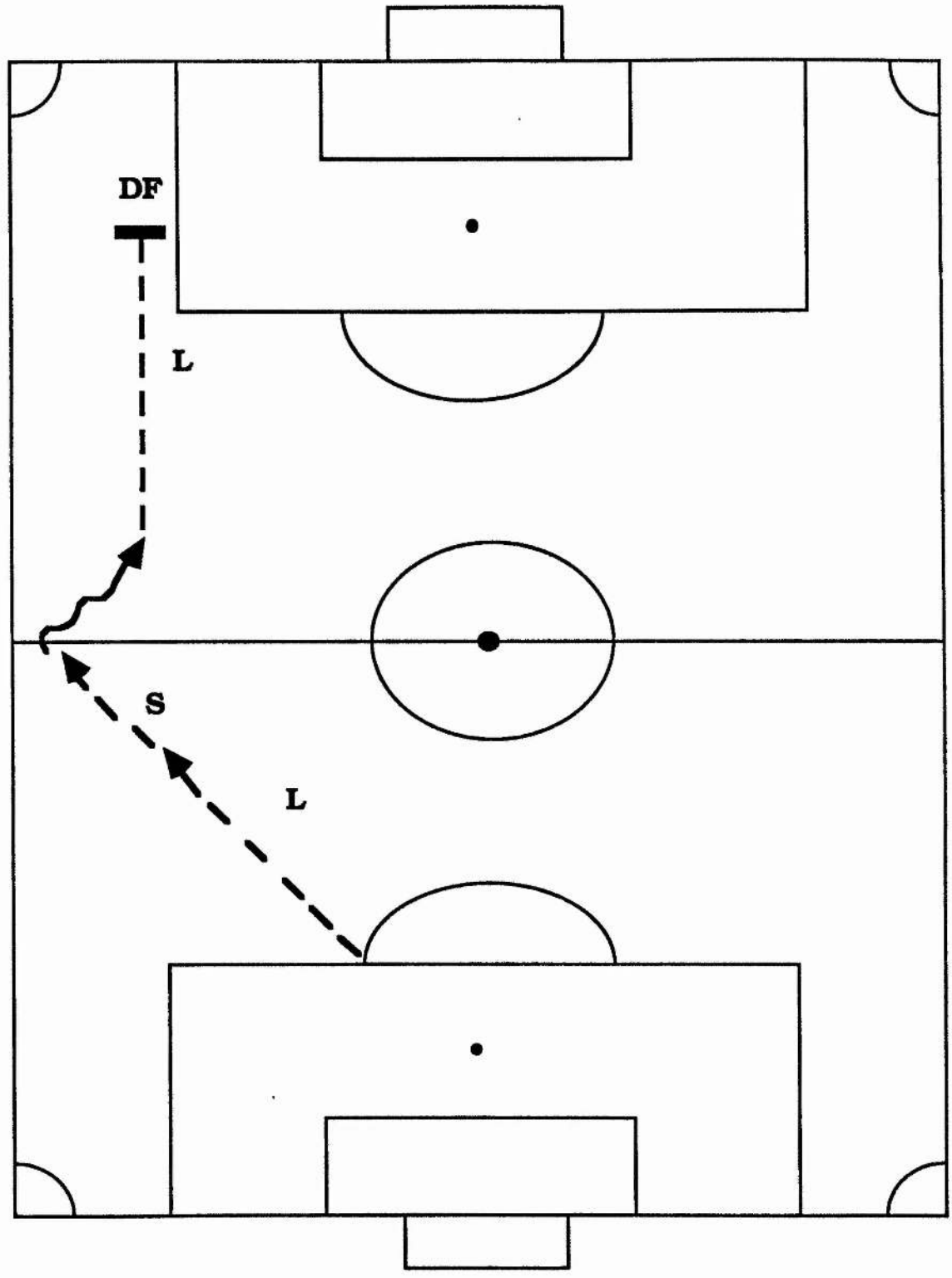
side line, then from this position sending a long ball towards the offensive penalty area, which always ended in loss of possession by defensive players. For example, Pattern EH.3 is a good example of a pattern of play characteristic of Cluster 8. This is an attack initiated from the defensive half of the pitch, close to the left side of the penalty arc, moving towards the left, crossing the offensive half, then moving along close to the left side line towards the left side line of the penalty area and terminated by interception by a defensive player at this position (see **Figure 4.36**). However, all the patterns within the cluster were unsuccessful and Pattern EH.3 was the least successful of all).

Cluster 7 indicates patterns of play which were unsuccessful for all the teams which used it (team **A** did not use it). It is possible that this particular pattern of play, may have been unsuccessful if team **A** were to have used it. It is characterised by sending a long ball from the inside of defensive penalty area towards the offensive penalty area and always these moves ended in lost of possession to a defensive players. For example, Pattern DH.4 is a good example of a pattern of play characteristic of Cluster 7. This is an attack initiated from the defensive half of the pitch, close to the left side of the penalty arc, moving towards the left, crossing the offensive half, then moving along close to the left side line towards the left side line of the penalty area and terminated by interception by a defensive player at this position. All the patterns within the cluster were unsuccessful and Pattern DH.4 was the least successful of all.

Cluster 9 indicates patterns of play for poor and average teams which were unsuccessful. It is possible that this particular pattern of play, may also have been unsuccessful if the teams **A** and **B** were to have used it. It is characterised by sending a long ball from the inside

Figure 4.36

An attack typifying pattern EH.3.



Path of ball

Route of player with ball

DF Ball intercepted by defender

of defensive penalty area towards the offensive penalty area and always these moves ended in lost of possession to a defensive players. For example, Pattern EH.1 is a good example of a pattern of play characteristic of Cluster 9. This is an attack initiated from the inside of the penalty area on the defensive half of the pitch, moving up the middle of the pitch towards the penalty arc of the offensive half and terminated by a defensive player. All the patterns within the cluster were unsuccessful and Pattern EH.1 was the least successful of all.

Comparisons analysis for free play :

It is worth considering whether teams use the same successful patterns of play in home and in away matches. **Figure 4.27** has indicated that top teams **A** and **B** had distinct successful patterns of play at home and away matches (e.g. as can be seen from **Figures 4.32, 4.33, 4.34** and **4.35**) team **A** had successful patterns of play at home which were markedly similar to their successful patterns of play in away matches (see **Patterns AA.1/AH.3** and **AA.3/AH.2**). These patterns of play had shared common features, for example, in Patterns AA.1 and AH.3 both moves were initiated in the same location of the pitch and have similar number of passes and concluded with long cross into penalty area and terminated by shooting (see **Figures 4.32** and **4.33**). Also **Figures 4.28, 4.29, 4.30** and **4.31** showed that team **B** had successful patterns of play at home which were markedly similar to their successful patterns of play in away matches (see **Patterns BA.1/BH.2** and **BA.4/BH.5).** These patterns of play have shared common features, for example, in Patterns BA.1 and BH.2 both moves were initiated in the same location of the pitch and have a similar number of passes and were concluded by a long cross into penalty area and terminated by shooting (see **Figures 4.28** and **4.29**). The above

discussion clearly showed that top teams **A** and **B** apply the same strategies when they are playing at home and away.

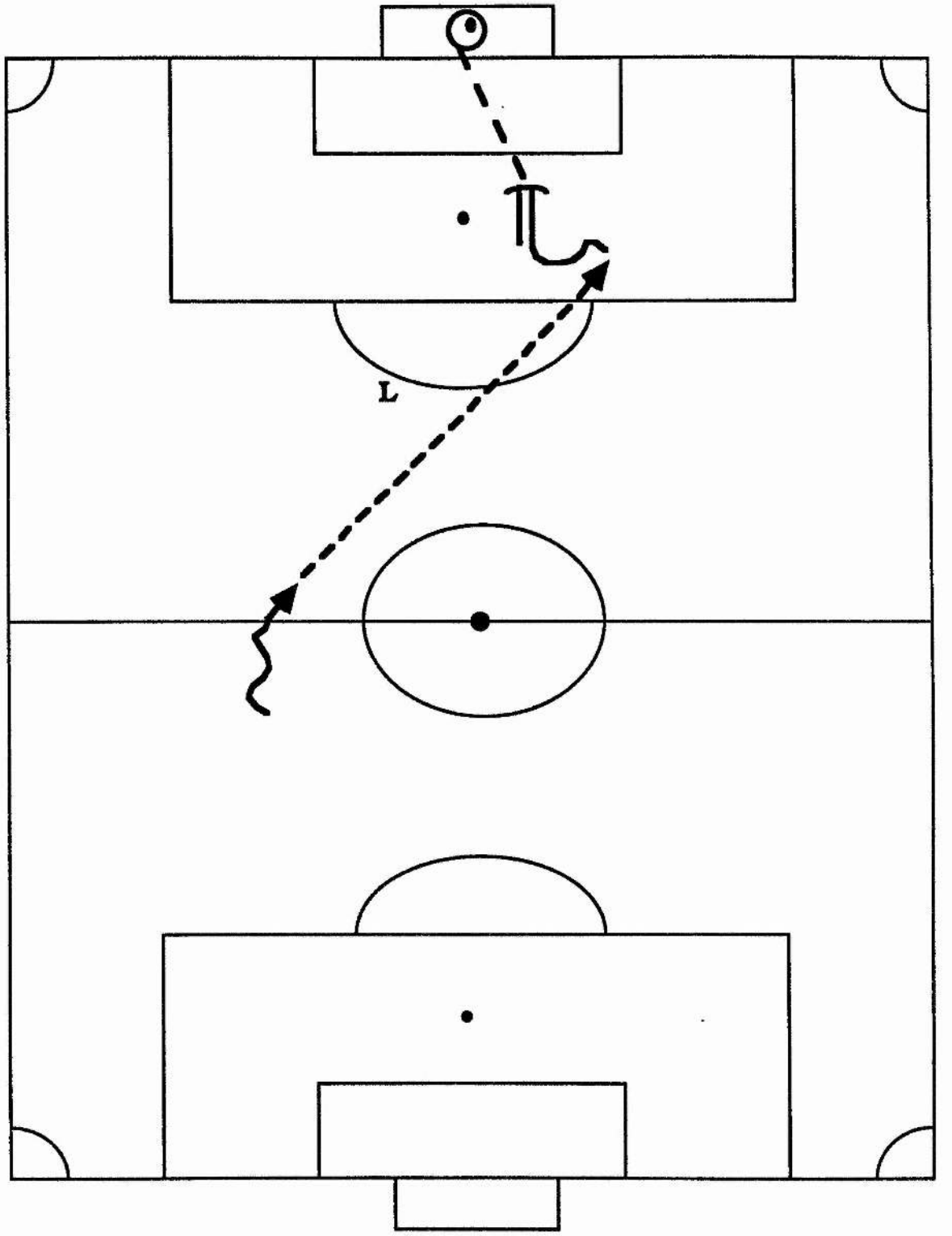
For the poorer teams, most of their successful patterns of play in home matches were different than in those successful patterns of play in away matches (e.g. team **D's** successful pattern of play in home matches, initiated from the left centre circle on the pitch, where as the successful pattern of play in away matches, initiated from the right side line of the pitch and moving along the right wing, and also they do not share common features as shown in **Figures 4.37** and **4.38**. One possible explanation is that the poorer teams are composed of a smaller pool of players, and they have very few good substitutes. When the team has a player injured, the substitute player does not fit into the team's strategies. This may be because of lack of experience or tactical knowledge. The top teams have a greater number of good substitutes, and they are able to replace the injured player without any effect on the team's style of play.

The four successful patterns of play for the top teams are distinctly different from one to another (e.g. see those successful patterns of play for team **A** in **Figures 4.32**, **4.33**, **4.34** and **4.35**, and those successful patterns of play for team **B** in **Figures 4. 28**, **4.29**, **4.30** and **4.31**; they are quite different in terms of their initiation and structure of patterns for team **A** compared to team **B**). This means that each top team has utilised a quite distinct successful patterns of play. There are a number of possible reasons for this:

(i) The strategy of the team: since each team has its own coaches and managers, they base team strategy and tactics on their own opinions. It is possible that the team has repeated particular types of pattern in practice more often than others, (managers and coaches believing that these patterns fit better the particular style of play that the team

Figure 4.37

An attack typifying pattern DH.2.



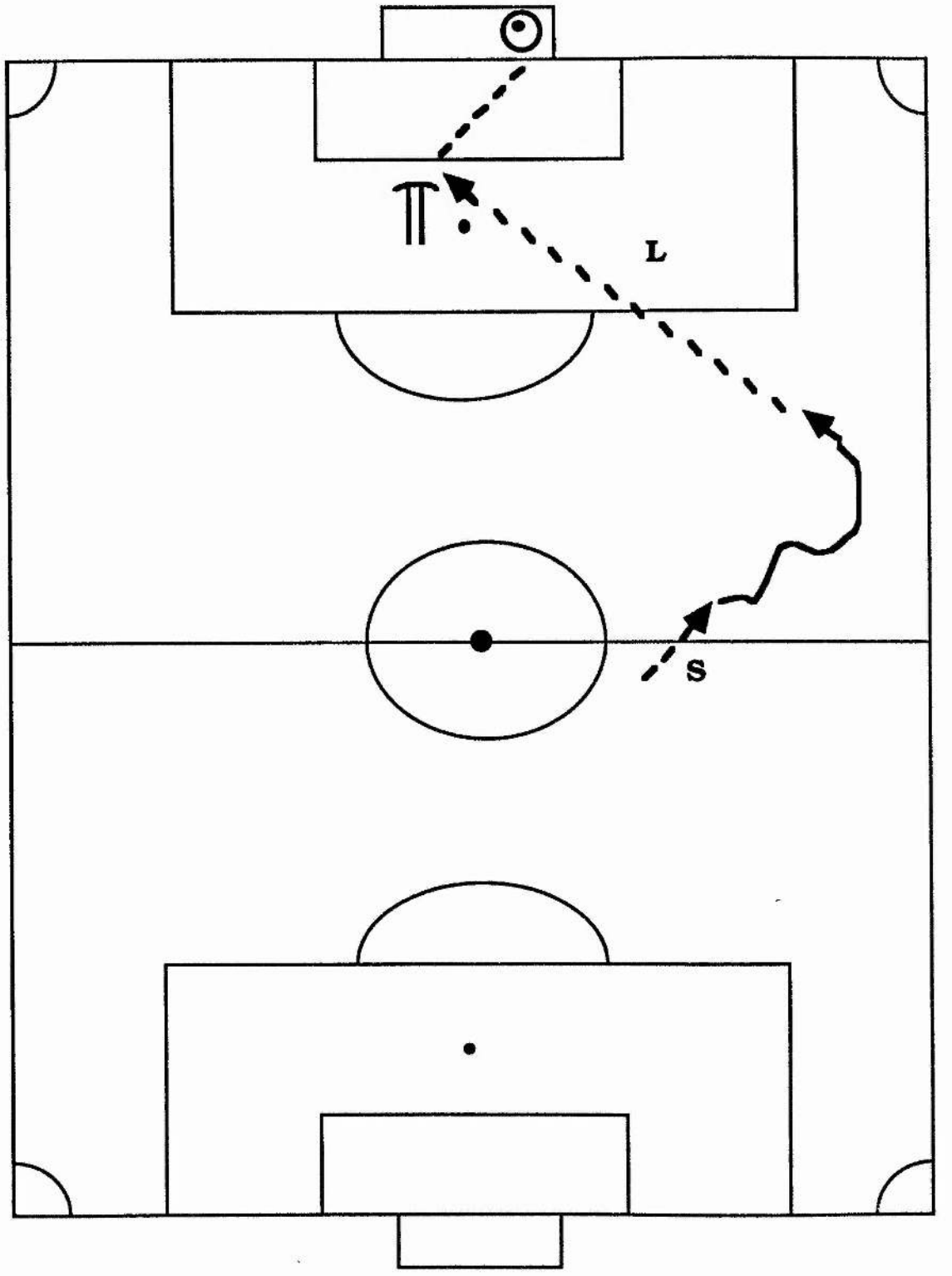
Path of ball

Route of player with ball

Shot on target

Figure 4.38

An attack typifying Pattern DA.4.



Path of ball

Route of player with ball

Shot on target

employs).

(ii) Individual players: each team has possibly utilised its best players in creating these patterns, since such players would have enough skill to perform them successfully.

(iii) Style of long pass and short pass: the purpose of a particular combination of long and short passes within these patterns may have been such that it helped towards keeping possession of the ball, and combinations were observed to vary from team to team.

These above findings are in agreement with the finding of **Pollard et al. (1988)**, who conducted a study on the English League Division teams and aimed to demonstrate how the careful recording of numerical data can lead to a better understanding and comparison of differing playing styles at soccer. They concluded that there were considerable variations between the teams on the playing style variables, for example, some teams had high similarity measures, while others' styles differed to a great extent.

Shooting analysis :

It is surprising to find that the number of attacking moves in a match did not give any indication of success. However, in those matches which were won, the teams had a greater total number of shots than in those matches which were lost and there was a greater ratio of shots/attacks. For example, team **A** in match number 3 (which was won at home) had 26% of shots/attacks, whereas in match number 1 (which was lost at home) had only 11% of shots/attacks (see **Figures 4.2** and **4.3**).

It is clear from the above discussion that as many attacks as possible should end up with a shot, and this is further supported by examining the accuracy of shooting. The team had a greater total number of shots

on target in those matches which were won than in those matches which were lost.

Set plays analysis :

The results show that the top and average teams had used similar set pieces but no relationship has been found between the patterns of play at offensive set pieces, and the outcome of each move. It should be noted that the number of attacking set pieces in a match did not give any indication of success for any of the teams, a similar finding to free attacks. It is clear from the results of set plays that as many set plays as possible should end up with a shot, and this is further supported by examining the effectiveness of set plays. Teams had a greater total number of shots on target from set pieces in those matches which were won than in those matches which were lost.

Set plays were found to be a little more successful for top teams than for poor teams (e.g. team **A** concluded 57 shots on target from set plays during seven home matches, whereas team **D** concluded only 11 shots on target from set plays during the same number of home matches).

There are a number of possible reasons for this:

(i) Individual players: obviously top teams have far more better individual players than poor teams and also top teams have probably utilised their best players in employing these set plays, since such players would have enough skill to perform them successfully.

(ii) Organised: perhaps top teams are better organised and also more aware of tactical planning in employing set plays than the poor teams and also may be better prepared to cope with these situations.

Summary :

In summary, analysis of patterns of play for all the teams showed that there were similarities and dissimilarities between the top and poorer teams. These can be summarised as follows:

(i) The distinct patterns of play identified for each team in both home and away matches were few in number (between 4 and 6 patterns for each team) and accounted for a very high percentage of all attacks.

(ii) Top teams, **A** and **B**, had the same number of successful patterns of play in home and away matches (see **Clusters 1, 2, 3** and **4**).

(iii) The poorer teams, **D** and **E**, also had the same number of successful patterns in home and away matches (see **Clusters 3** and **4**) but they were fewer in number.

(iv) Successful patterns of play appeared more often in those matches which teams won, providing further indication that to be successful a team needs to use a variety of successful patterns of attacks, and to use them frequently.

(v) Top teams, **A** and **B**, had similar successful patterns of play in home and away matches (seen **Figures 4.32, 4.33, 4.34** and **4.35**, for team **A** and **Figures 4.28, 4.29, 4.30** and **4.31** for team **B**). The above discussion clearly showed that top teams, **A** and **B**, apply the same strategies when they are playing at home and away (see **Patterns AA.1/AH.3, AA.3/AH.2, BA.1/BH.2** and **BA.4/BH.5** in **Figure 4.27**).

(vi) The number of attacking moves in a match did not give any indication of success for any of the teams. However, in those matches which were won, the teams had a greater total number of shots than in those matches which were lost and there was a greater ratio of shots/attacks (see **Figures 4.2** and **4.3**).

(vii) The number of attacking set pieces in a match did not give any indication of success for any of the teams, a similar finding to free attacks. It is clear from the results of set plays that as many set plays as possible should end up with a shot, and this is further supported by examining the effectiveness of set plays. Teams had a greater total number of shots on target from set pieces in those matches which were won than in those matches which were lost.

(viii) For poorer teams, **D** and **E**, their successful patterns of play differed in home and away matches (see **Clusters 3** and **4 in Figures 4.27**). This means that poorer teams, **D** and **E**, apply different strategies when they are playing at home and away (see **Figure 4.37 and 4.38**).

(ix) The 4 successful patterns of play for the top teams are distinctly different from one another (eg., see those successful patterns of play for team **A** in **Figures 4.32**, **4.33**, **4.34** and **4.35**, and those successful patterns of play for team **B** in **Figures 4. 28**, **4.29**, **4.30** and **4.31**, they are quite different in terms of their initiation and structure of their patterns). This means that each top team has utilised quite distinct successful patterns of play.

CHAPTER FIVE

TEAM VARIATIONS OF INTERNATIONAL PATTERNS OF PLAY

5.1 INTRODUCTION :

5.2 METHODS :

Source of data :

Statistical analysis :

5.3 RESULTS :

Analysis of performance for the home team :

Shooting analysis :

Set plays analysis :

Summary :

5.4 DISCUSSION :

Free play analysis :

Shooting analysis :

Set plays analysis :

Summary :

5.1 INTRODUCTION :

There are several unique problems for an international team that league teams do not have; for example, an international team's manager has a task which is very different from that of a league team's manager. The manager of a league team puts a team together for long-term success and can concentrate on certain aspects of his side, relying on the day to day contact of the players to sustain the dovetailed understanding any side needs. The international manager, however, only has his players under his instruction occasionally, and then briefly. These players, coming from different teams, rarely train or play together; this produces an acute lack of familiarity amongst them. Thus, the international manager has to find players whose individual talents and personalities will hold the team together.

The above discussion shows that there are observable differences between the international team and the league teams. In Chapter Four, the least and the most successful attacking patterns of play were successfully identified for the league teams, and it is desirable to find out whether the aforementioned differences have any effects on the international team – whether it has different successful and unsuccessful patterns of play from those which were found in the Chapter Four for the league teams. It would be expected that the successful and unsuccessful patterns of play of the international team will be different from those which were found for the league teams.

The aim of this chapter is then to investigate whether there are any identifiable attacking patterns of play for an international team and to assess their success. A further aim is to find out whether the successful patterns of play that occur for the international team are the same as those successful patterns of play which were found in

Chapter Four for the league teams. The main questions are:

(i) Are there specific patterns of play which can be identified for the international team?

(ii) Do different patterns of play produce different results?

(ii) Are successful patterns of play for the international team similar to those successful patterns of play found for the league teams?

5.2 METHODS :

The notational method and the field work for this study were explained in detail in Chapter Two, Section II.

Source of data :

During the soccer season 1987—1988, data were collected for an international team. The team's attacking moves were analysed at home against five international teams (see **Table 5.1**).

Statistical analysis :

All the attacking moves were subjected to visual cluster analysis according to the technique outlined in Chapter Two, Section II, thereby identifying similar patterns of attack as shown in **Appendix A 3:1 pp. 469**. The attacking patterns of play for the team during home matches were obtained. The analysis was carried out in the same way as in Chapter 4.

Table 5.1

Matches and results of an international team (I) in which its attacking moves were analysed.

Match	Opponents	Results	Score	Date
1	B	Drew	0 - 0	23.5.1987
2	C	Lost	0 - 2	26.5.1987
3	D	Won	2 - 0	9.9.1987
4	E	Won	2 - 0	14.10.1987
5	F	Drew	0 - 0	17.5.1988

Symbols key :

I : Represents an international team which is used as a subject for the study.

B, C, D, E & F : Are representing the other five international teams.

5.3 RESULTS :

The results of this study were analysed as follows:

Patterns of play during home matches :

Out of a large number of attacking moves, there were five distinct patterns of play in home matches (diagrams are given in **Appendix A 3:2 pp. 470–474**). Each of these patterns of play represented a distinct attacking move as follows:

(i) Pattern IH.1 An attack initiated from the inside of the penalty area of the defensive half of the pitch, moving up the middle of the pitch towards the penalty arc of the offensive half and terminated by a defensive player. This pattern was typical of 43 attacking moves.

(ii) Pattern IH.2 An attack initiated from the defensive half of the pitch close to the right side line, moving along the right wing in the offensive half of the pitch towards the corner flag on the right side and terminated by crossing from this position to the penalty area for shooting. This pattern is typical of 45 attacking moves.

(iii) Pattern IH.3 An attack initiated from the inside of the penalty area of the defensive half of the pitch, moving towards the left and then towards the penalty arc of the offensive half of the pitch where it was terminated by interception by a defensive player. This pattern was typical of 42 attacking moves.

(iv) Pattern IH.4 An attack initiated from the inside of the penalty area of the defensive half of the pitch, close to the right side line, moving along the right side line, then moving along the right wing, approaching the right side line of the penalty area of the offensive half of the pitch and terminated by a defensive player. This pattern was typical of 41 attacking moves.

(v) Pattern IH.5 An attack initiated from the inside of the defensive half of the pitch, close to the left side of the penalty arc, moving towards the left side, then towards the centre line, then close to the penalty area of the offensive half where it was terminated by interception by a defensive player. This pattern was typical of 47 attacking moves.

Final actions with patterns of play :

An analysis of the relationship between the types of pattern and final actions, after frequency analysis and tabulation, was carried out using the chi-squared test. This indicated a significant relationship ($\chi^2 = 72.6$; $P < 0.001$).

From **Table 5.2**, which indicates the relationship between the final actions (as described in Chapter Two, Section II) and patterns of play, the undernoted observations were made:

(i) Pattern IH.2 produced the final actions 1 and 2 more often than the other patterns of play. (Final actions 1 and 2 were shooting at the goal). These final actions taken together were produced in 40% of all attacks using this pattern.

(ii) The most common outcome of Patterns IH.1, IH.4 and IH.5 was final action 4 (final action 4 representing loss of possession), and this occurred more often than for any other pattern of play. 49% of Pattern IH.1, 56% of Pattern IH.4 and 51% of Pattern IH.5 produced final action 4. They also produced few shots on goal.

(iii) Pattern IH.3 mainly produced final action 4, although in 14% of attacks it produced final action 6. (Final action 6 represented a corner-kick).

Table 5.2

Summary of the frequency distribution of free attacks between final actions and patterns of play for all attacking moves in five home matches for the international team.

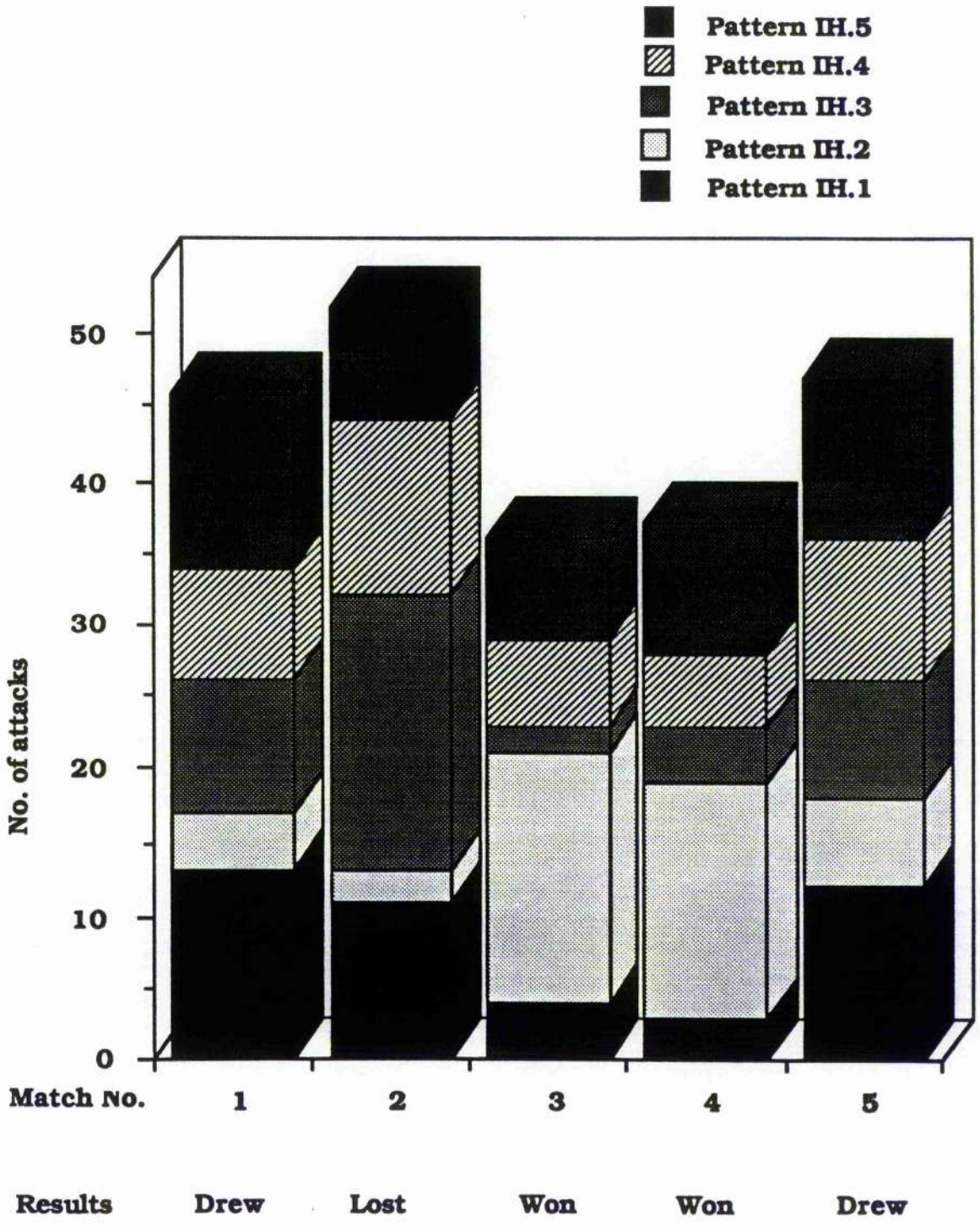
Final actions	Patterns of play					Row total
	IH.1	IH.2	IH.3	IH.4	IH.5	%
1	0	4	0	0	0	4 1.8
2	2	14	1	1	1	19 8.7
3	6	10	4	6	7	33 15.1
4	21	9	19	23	24	96 44.0
6	1	2	6	3	3	15 6.9
7	8	3	7	5	10	33 15.1
8	2	1	1	0	0	4 1.8
10	3	2	4	3	2	14 6.4
Total No. of attacks %	43 19.7	45 20.6	42 19.3	41 18.8	47 21.6	218 100.0

Clearly, the results of the above observations show that Pattern IH.2 was by far the most effective pattern of play since it produced 18 shots on target out of the total of 23 shots on target from all five patterns of play and did so from only 45 attacks. It should also be noted that Patterns IH.1, IH.4 and IH.5 were the least successful since most of their attacking moves ended in lost possession (i.e. 68 moves ended in loss of possession out of a total of 131 moves for all three patterns of play). However, Pattern IH.3 did produce one shot on target out of 42 attacking moves, but it also produced a considerable number of set pieces and the effectiveness of these set pieces will be examined later in this chapter. It should not be assumed that an attack is fruitless if the end result is not a shot on goal. It may produce, for example a corner-kick which could lead to a scoring opportunity.

The most and least successful attacking patterns of play during home matches have now been identified and it was desirable to assess how frequently these patterns of play appeared in each of the matches analysed in relation to the result of the match. This can be seen in **Figure 5.1** which shows that Pattern IH.2 appeared more frequently in the matches which were won than in those which were drawn or lost. It is also revealed that Patterns IH.1, IH.3 and IH.4 appeared in all of the matches played but were repeated in a greater number in those matches which were drawn or lost than in those matches which were won. Pattern IH.5 was found in a regular distribution in most of the matches which were played although it might be argued that Pattern IH.5 occurred more often in games drawn than in those games which were won or lost. The distribution of Patterns IH.1 and IH.3 were found to differ in the five matches analysed (e.g. Pattern IH.3 was repeated in a greater number in the match which was lost than those

Figure 5.1

Summary of the association between frequencies of patterns of play from free attacks in home matches and the number of attacks for the international team.



matches which were drawn, whilst Pattern IH.1 was repeated in a greater number in those matches which were lost or drawn than those matches which were won see **Figure 5.1**). It should be noted that the total number of attacking moves in those matches which were won was less than the total number of attacking moves in those matches which were drawn or lost. Clearly the total number of attacks per se was not indicative of success.

Shooting analysis :

It was considered desirable to assess the relationships between shots on/off target for free attacking moves with the results of the matches. These relationships are shown in **Figure 5.2** from which the following points emerge:

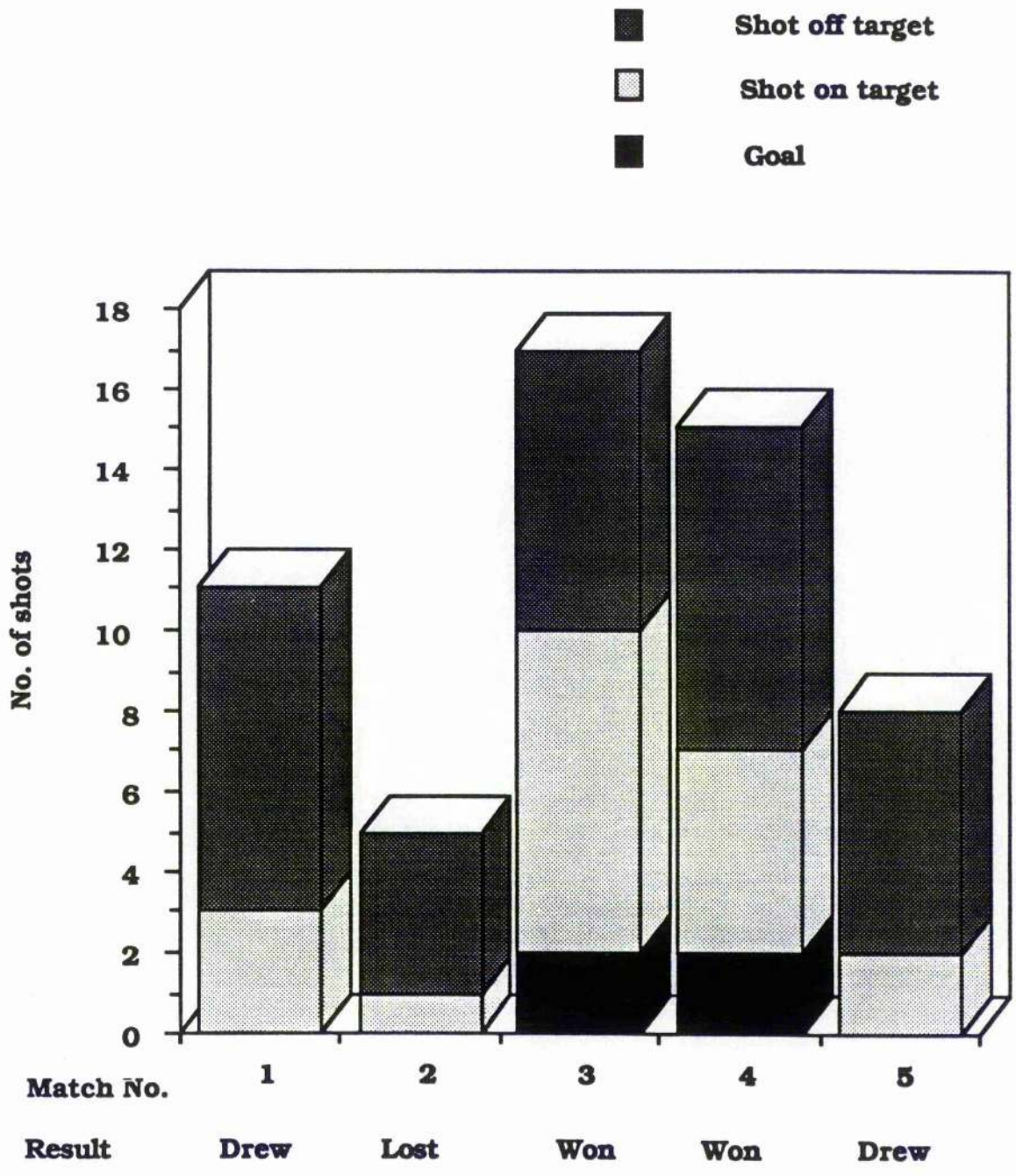
(i) Those matches which were won had a greater total number of shots than those matches which were drawn or lost. This indicated that in successful games the team produced more shots from free attacks (e.g. in the match number 3 which was won, the team produced the greatest number of shots, see **Figure 5.2**).

(ii) Those matches which were won had a greater total number of shots on target than those matches which were drawn or lost.

(iii) The ratio of shots on target to attacks was greater in those matches which were won than those matches which were drawn or lost. For example, the international team in match number 3 which was won produced a shot on target from 24% of attacks, whereas in match number 2 which was lost a shot on target resulted from only 2% of attacks (see **Figures 5.1** and **5.2**).

Figure 5.2

Summary of the relationships between matches and shots on or off target for the international team.



Summary of analysis of performance during home matches :

In summary, the analysis of patterns of play during home matches showed that there were five distinct patterns of play in the five matches analysed. The results showed that Pattern IH.2 was the most successful pattern of play while Patterns IH.1, IH.4 and IH.5 were the least successful patterns of play. However, Pattern IH.3 concluded in a considerable number of set pieces. The successful pattern of play appeared more often in those matches which were won than in those which were drawn or lost. The number of attacks was not indicative of success there being fewer, but more successful attacks in the games won.

The analysis of shooting showed that there was a greater total number of shots on target in those matches which were won than in those which were drawn or lost. Those matches which were won had a greater total number of shots than those matches which were drawn or lost.

Analysis of performance during set plays :

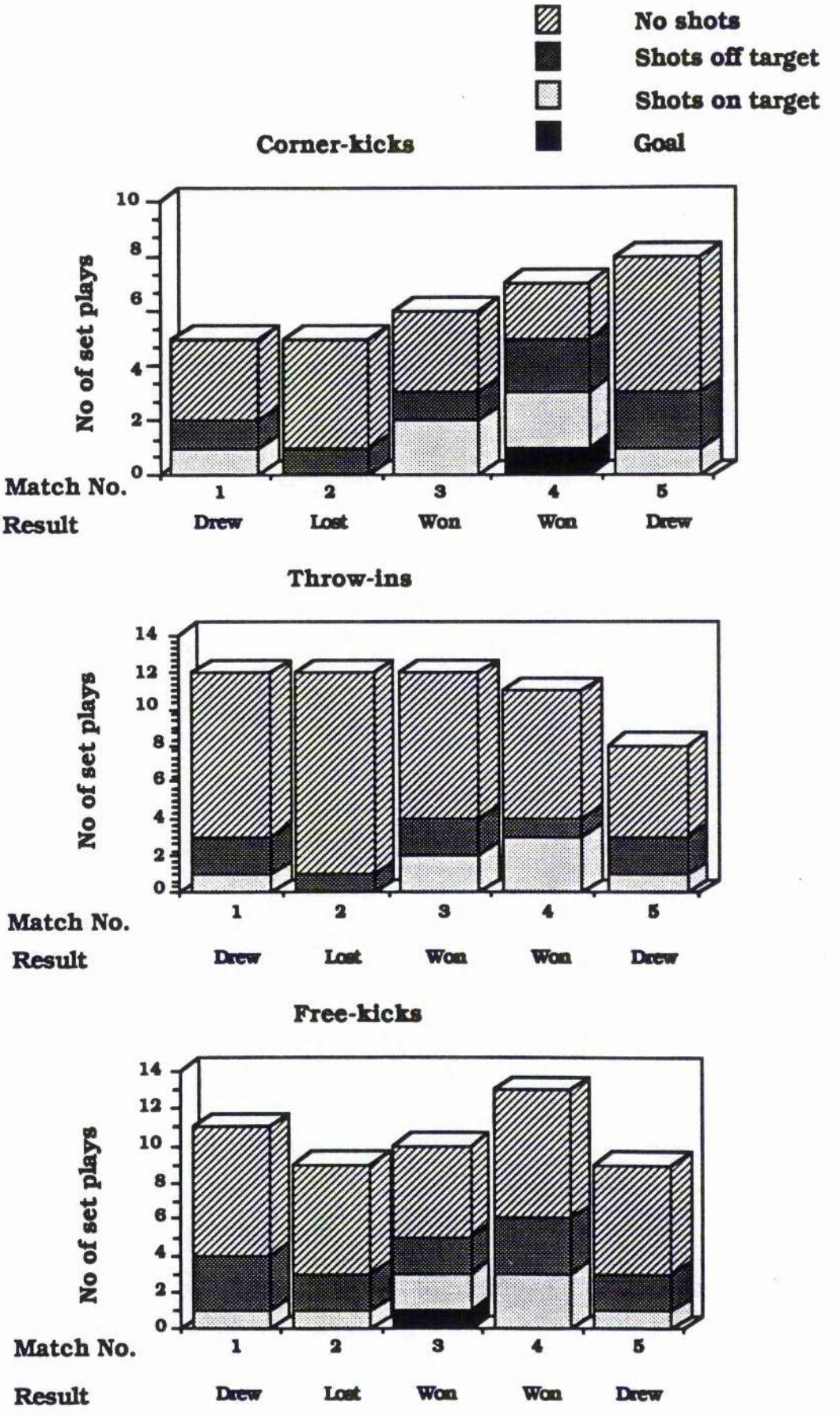
The analysis of set plays was carried out in the same way as in Chapter Four.

Shooting analysis :

Although no relationship has been found between the patterns of play of offensive set pieces and the outcome of each move, it was worth examining further the effectiveness of set pieces. Furthermore, it was considered desirable to assess the relationships between shots on/off target for set plays with the results of the matches which were analysed. From **Figure 5.3**, which indicates the relationships between

Figure 5.3

Summary of the association between shots at goal from set pieces and the results of the matches for the international team.



the frequency of shooting in set plays and the results of matches, the following points have emerged:

(i) Those matches which were won had a greater total number of shots on target from set plays than those which were drawn or lost.

(ii) The total number of set plays per se gave no indication of success.

Since analysis of set plays for team **I** showed that there were no significant differences between corner-kicks taken from either side of the pitch and between throw-ins taken from either side of the pitch, it was considered desirable to examine short corner-kicks, long throw-ins and direct free-kicks which were taken by direct shots on target. In general, there were very few short corner-kicks, long throw-ins, and direct free-kicks. Because of the lack of data it was not possible to carry out the proper statistical analysis, (for example there were only 9 long throw-ins out of the total of 55 throw-ins **see Appendix A 3:3 pp. 476**). However, the data were analysed by visual inspection, as described below.

The relationships between long corner-kicks and short corner-kicks with shots on or off target were examined. It was found that corner-kicks which included a greater number of short passes were providing more shooting opportunities. Although the team had played a greater number of long corner-kicks (20 long corner-kicks employed) than short corner-kicks (11 short corner-kicks employed), there were more shots on target from short corner-kicks. Short corner-kicks produced 5 shots on target out of the total of 7 shots on target **see Appendix A 3:3 pp. 475.**

In addition, a useful assessment was made of the relationships between long throw-ins and short throw-ins with shots on or off target. It was found that there were no differences between short

throw-ins and long throw-ins (e.g. 10% of short throw-ins and long throw-ins produced shot on target, **see Appendix A 3:3 pp. 476**). However, the results of the throw-ins should be treated with caution because there were only 9 long throw-ins employed out of the total of 55 throw-ins **(see Appendix A 3:3 pp. 476)**. One possible explanation for finding no differences between long throw-ins and short throw-ins is probably because the team will employ long throw-ins occasionally and always when it will gain an advantage in the attacking third of the pitch. Obviously, the defending team will be aware of this and be better prepared to cope with these situations.

Furthermore, it was interesting to evaluate the relative effectiveness of free-kicks taken in front of the opposition goal by direct shots on target in relation to free-kicks taken as a lay-off to another player. It was found that the free-kicks which were taken as direct shots on goal did produce more shots on target, 5 shots on target out of a total of 8 shots on target, **see Appendix A 3:3 pp. 477**. It should be noted that the team had employed a greater number of free-kicks which were taken as a lay-off to another player (39 free-kicks employed as a lay-off to another player) than free-kicks which taken directly by shot on goal (13 free-kicks employed as a direct shot on goal).

In summary, the analysis of set plays for the team **I** showed that there was a greater number of shots on target (a) from short corner-kicks rather than from long corner-kicks, (b) from direct shots at the goal from free-kicks rather than from lay-offs to another player. However, there were no differences between long throw-ins and short throw-ins.

5.4 DISCUSSION :

The major aim of the investigation described in this chapter was to find out if there were any similar patterns of play for an international team. A further aim was to find out whether the successful patterns of play that occurred for the international team were the same as those successful patterns of play which were found in Chapter Four for the league teams.

Free play analysis :

The analysis of patterns of play of the international team during free play has clearly revealed a number of similarities with the free patterns of play of the league teams. In each match the team had a large number of attacking moves (in 5 home matches there were 218 attacks). Most of these attacks were similar, and could be classified into distinct patterns of play. There were five distinct patterns of play identified for the team in home matches which accounted for a very high percentage of all attacks, which is similar in number to the league teams (4-6).

One possible reason for all the teams having the same number of patterns of play may be that most of the teams are restricted to certain strategies which are well planned by their managers and coaches. Further investigation is required to clarify this point.

The international team and the poorer league teams **D** and **E** had the same number of successful patterns of play in home matches (e.g. the international team had one successful pattern of play, IH.2, and the poorer league teams, **D** and **E**, also had one successful pattern of play, DH.2 and EH.2 respectively). The better teams had a greater repertoire of successful patterns of free play, and this might explain

why they were better teams. One possible explanation for the international team having a lesser number of successful patterns of play is that the international team is composed of players from different teams, who rarely train together or play many matches together unlike the club teams.

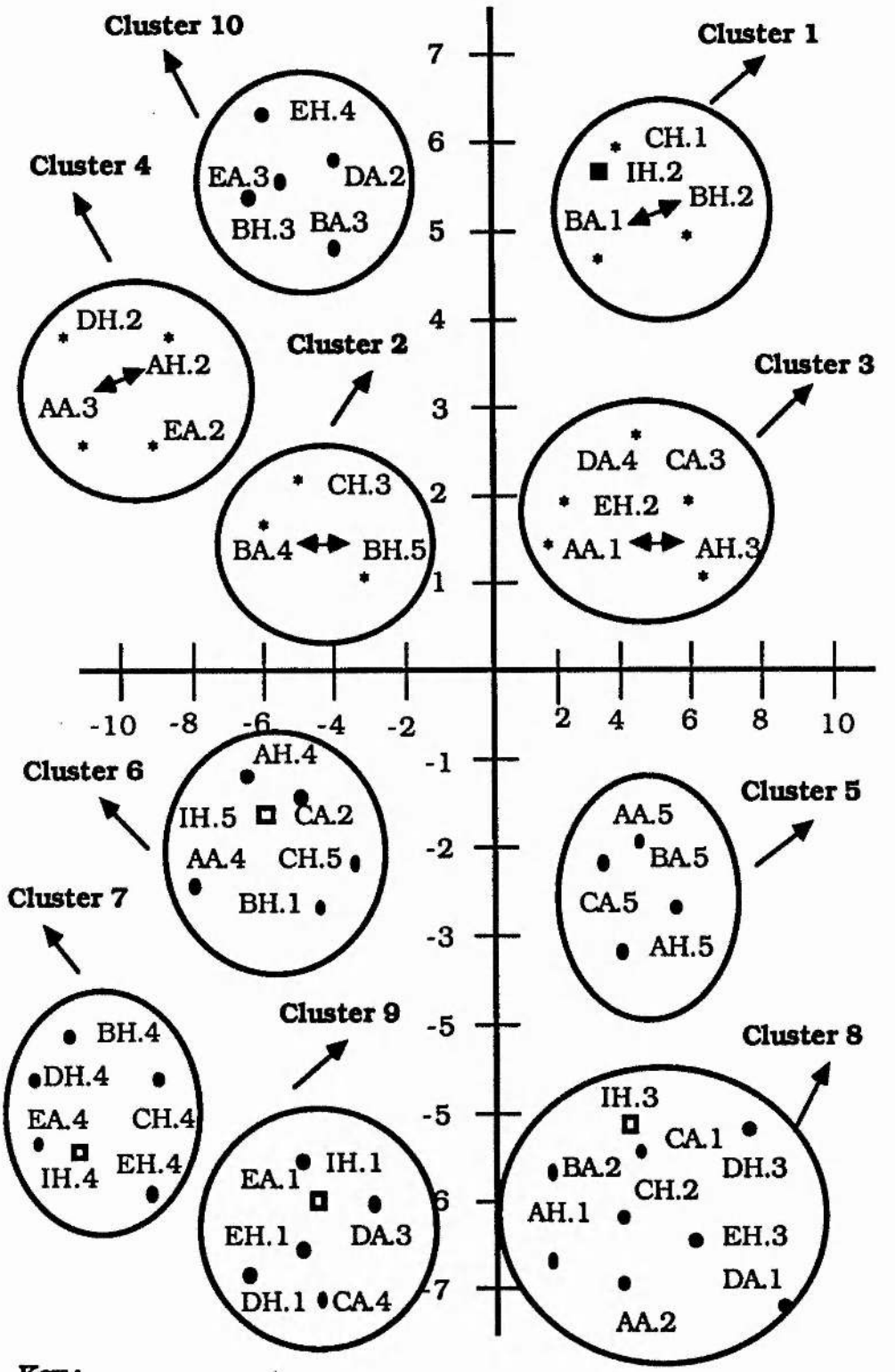
It should be noted that the results showed clearly that the successful pattern of play appeared more often in those matches which teams won, providing a further indication that to be successful a team needs to use a successful pattern of attack, and to use it frequently; a similar finding was found for the league teams.

It is worthwhile exploring whether there were a limited number of patterns of play common to all teams (the international and league teams). The forty-seven patterns of play which were identified earlier in Chapter Four from all five league teams and the five patterns of play identified for the international team were further analysed to find out if they had common features and to investigate if the successful patterns of play were the same for all the teams. The same procedure as described in Chapter Four was used, when similar patterns of play were grouped with each other. This again produced 10 clusters, each cluster representing a number of patterns of play which had similarities (see **Figure 5.4**). The method was supplemented by a visual inspection of the original patterns of play within each cluster, to try and identify these similarities.

The successful pattern of play for the international team belonged to cluster 1 (which is one of the four successful clusters of patterns of play found earlier in Chapter four for the five league teams as shown in **Figure 5.4**). For example, Cluster 1 consisted of patterns BA.1, BH.2 and CH.1 for league teams and IH.2 for the international team, and all

Figure 5.4

Example of a graph, showing patterns of play; the ten clusters represent clusters of similar patterns of play for the international and league teams.



Key :

- ▫ **Unsuccessful pattern of play for the international team.**
- • **Unsuccessful pattern of play for the league teams.**
- ■ **Successful patterns of play for the international team.**
- * **Successful patterns of play for the league teams.**

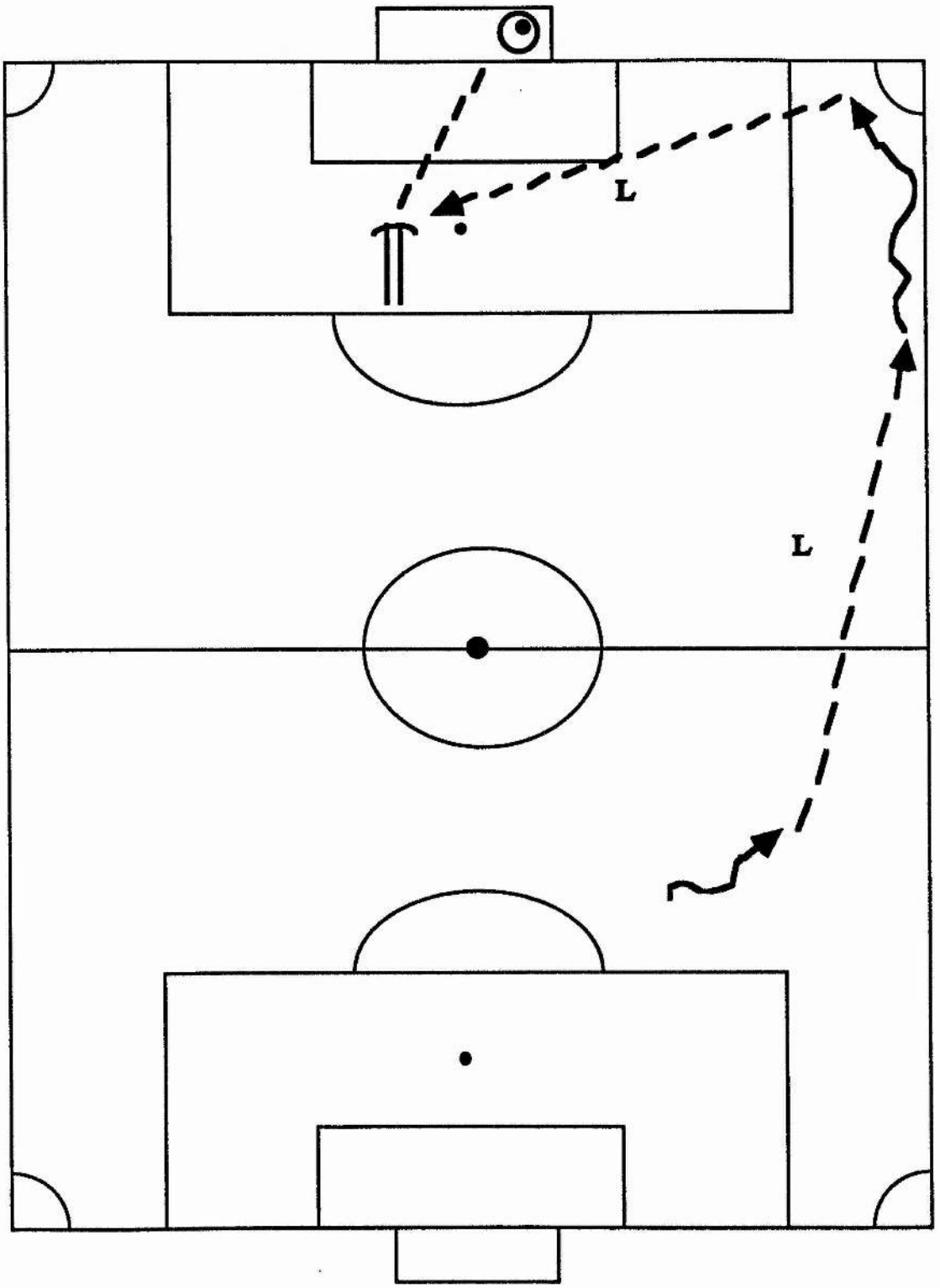
of these successful patterns had similar common features. All of these moves were initiated from the same locations and moved towards the offensive half of the pitch, along the right wing, then towards the corner flag with a similar number of passes and dribbling sections, and were terminated by a long cross into the penalty area for shooting, (see **Figures 4.28** and **5.5**). The least successful patterns of play for the international team were also grouped together with the unsuccessful patterns of play for the league teams into six separate clusters (clusters 5, 6, 7, 8, 9 and 10 in **Figure 5.4**).

It would appear, therefore, that successful patterns of play used by each team have common elements with other teams, and the successful patterns of play identified for the 5 league teams and the international team can be further classified into 4 categories (i.e. clusters 1, 2, 3 and 4). Similarly, the unsuccessful patterns of play can be classified into 6 categories (i.e. clusters 5–10 in **Figure 5.4**). It is worth attempting to determine what common elements are shared by patterns of play falling within the same cluster.

The four unsuccessful patterns of play for the international team were found to fall into four separate clusters with unsuccessful patterns of play for the league teams and so share common elements with them Patterns IH.1, IH.3, IH.4 and IH.5 of international team fell into clusters 9, 8, 7 and 6 respectively, (see **Figure 5.4**). One might expect to see the unsuccessful patterns of play for the international team differing from those unsuccessful patterns of play for the league teams, but the results clearly show that there were no differences. This indicates that regardless of whether the team is playing at league or at international level, it will not achieve success by using these patterns of play.

Figure 5.5

An attack typifying Pattern IH.2, the most successful pattern.



Path of ball

Route of player with ball

Shot on target

It was found that there was one particular unsuccessful pattern of play for the international team, Pattern IH.4, which has been shown to be the least successful of all of the unsuccessful patterns of play. This pattern of play was an attack initiated from the inside of the penalty area of the defensive half of the pitch, close to the right side line, moving along the right side line, then moving along the right wing, approaching the right side line of the penalty area of the offensive half of the pitch and terminated by a defensive player (see **Figure 5.6).** However, all the other three patterns of play for the international team were unsuccessful and Pattern IH.4 was the least successful of all for the international team.

Figure 5.4 indicates similarities in both successful and unsuccessful patterns of play for all the teams (international and league teams). There are a number of possible reasons for the international and league teams having the same successful and unsuccessful patterns of play, these are as follows:

(i) The same players who play for the league teams also play for the international team.

(ii) Often players are playing in the same positions regardless of whether they are playing for the international or the league teams.

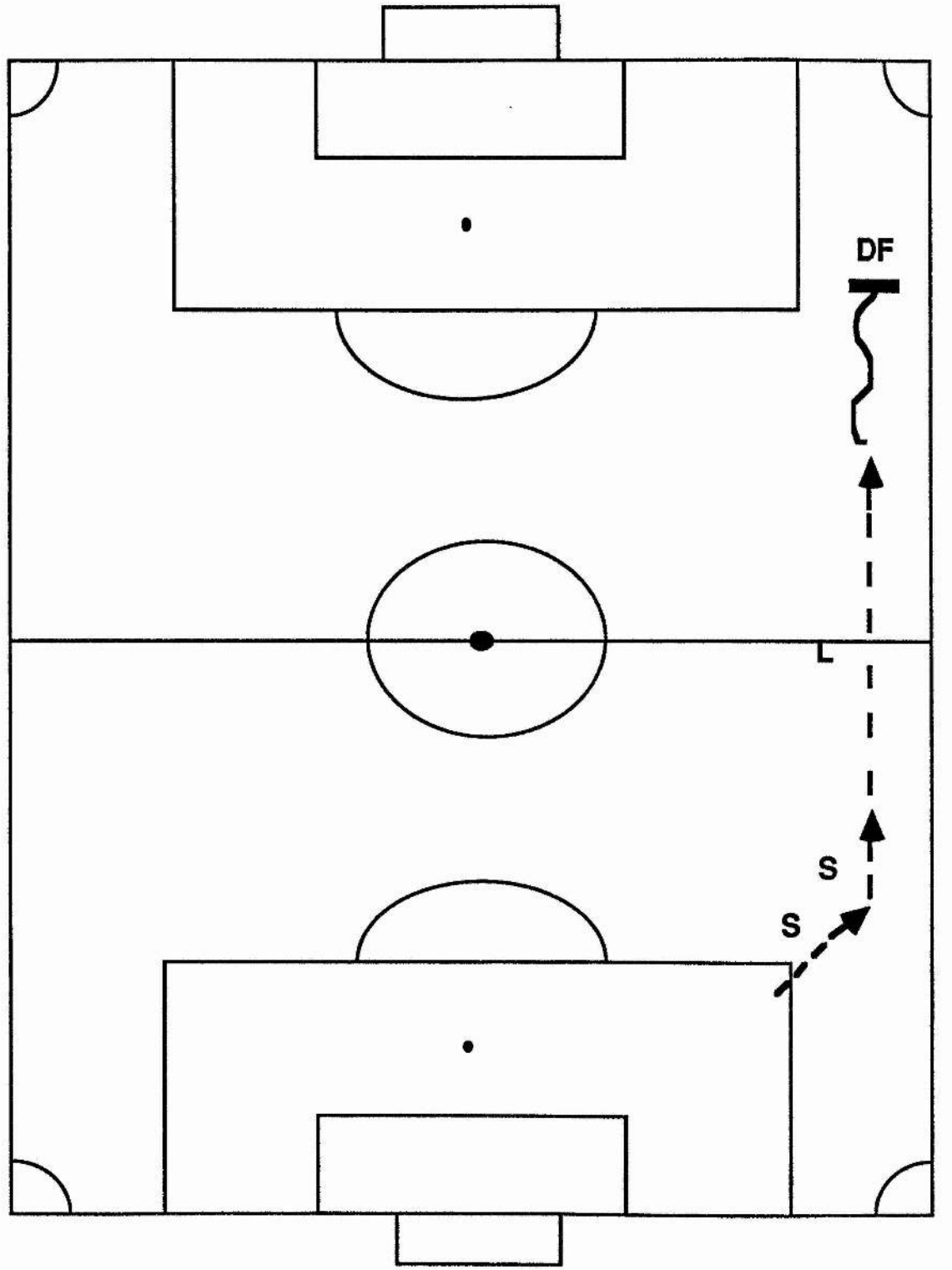
(iii) An international team will meet together only occasionally and briefly, so the manager does not have sufficient time to build new strategies and he often asks the players to play their successful club strategies.

Shooting analysis :

It is surprising to find that the number of attacking moves in a match did not give any indication of success – a similar finding to that

Figure 5.6

An attack typifying pattern IH.4, the least successful pattern.



Path of ball

Route of player with ball

DF Ball intercepted by defender

for the league teams. However, in those matches which were won, the teams had a greater total number of shots than in those matches which were lost and there was a greater proportion of attacks producing shots. For example, for the international team in match number 3 which was won produced a shot on target 24% of its attacks, whereas in match number 2 which was lost a shot on target resulted from only 2% of its attacks (see **Figures 5.1** and **5.2**).

It is clear from the above discussion that as many attacks as possible should end up with a shot, and this is further supported by examining the accuracy of shooting. In common with the league teams, the team had a greater total number of shots on target in those matches which were won than in those matches which were lost. This indicated that teams will win matches when they have a large number of shots on target and a greater proportion of attacks producing shots on target regardless of whether the team is playing at league or international level.

Set plays analysis :

The results show that the international team had used similar set pieces as for those used by the league teams and also that there was no relationship between the patterns of play for offensive set pieces and the outcome of each move for the international team and the league teams. It should be noted that the number of attacking set pieces in a match did not give any indication of success for the team – a similar finding to free attacks for international and league teams. It is clear from the results for set plays that as many set plays as possible should end up with a shot, and this is further supported by examining the effectiveness of set plays. A team had a greater total number of shots

on target from set pieces in those matches which were won than in those matches which were lost. Again this indicated that teams will win matches when they have a greater number of shots on target and a greater proportion of attacks producing shots regardless of whether the team is playing at league or international level.

Summary :

In summary, analysis of patterns of play for all the teams showed that there were similarities and dissimilarities between the international and league teams. These can be summarised as follows:

(i) The distinct patterns of play identified for international and league teams were few in number (between 4 and 6 patterns for each team) and accounted for a very high percentage of all attacks.

(ii) The international team and the poorer league teams, **D** and **E**, had the same number of successful patterns of play in home matches (see Patterns IH.2 for international team and DH.2 and EH.2 for the poorer teams **D** and **E** respectively) but they were fewer in number than those successful patterns of play for the top league teams **A** and **B**.

(iii) Successful patterns of play appeared more often for the international and league teams in those matches which were won, providing further evidence that to be successful a team needs to use the of successful patterns of attacks frequently.

(iv) The international team and league teams **B** and **C**, had the same successful patterns of play (see **Figures 5.5** for international team and **Figures 4.28 and 4.29** for team **B**) and applied the same strategies (see Patterns IH.2 for the international team, BH.2 and BA.1 for the league team **B** and CH.1 for the league team **C**).

(v) The number of attacking moves in a match did not give any indication of success for any of the teams (international and league teams). However, in those matches which were won, the teams had a greater total number of shots than in those matches which were lost and there was a greater proportion of attacks producing shots on target (see **Figures 5.1** and **5.2** for the international team and **Figures 4.2** and **4.3** for the league team **A**).

(vi) The number of attacking set pieces in a match did not give any indication of success for any of the teams – a similar finding to free attacks. It is clear from the results of set plays that as many set plays as possible should end up with a shot, and this is further supported by examining the effectiveness of set plays. Teams had a greater total number of shots on target from set pieces in those matches which were won than in those matches which were lost.

(vii) A team wins when it has a greater number of shots on target and a greater proportion of attacks producing shots regardless of whether the team is playing at league or international level.

CHAPTER SIX

TEAM VARIATIONS IN DEFENSIVE STRATEGIES OF PLAY

6.1 INTRODUCTION :

6.2 METHODS :

Source of data :

Statistical analysis :

6.3 RESULTS :

Part One - the top teams :

Teams A and B

Part Two - the average team :

Team C :

Part Three - poorer teams :

Teams D and E

6.4 DISCUSSION :

Defensive performance analysis :

Comparison analysis :

Summary :

6.1 INTRODUCTION :

Obviously, a team will not meet with success if it attacks all the time. At some time during a match even the best teams may be compelled to play a defensive game. For example, in all three European tournaments, UEFA Cup, Cup Winners Cup and Champions Cup, matches are played over two legs. In away matches, most of the teams have been more concerned not to lose and have been satisfied with a draw. As soon as the team loses possession it immediately works to manoeuvre all its players back into a deep position, challenging its opponent to try to break down its defence. This type of team is well prepared for away matches, using a purely defensive strategy to make life very frustrating for its opponents. Often managers and coaches select defensive playing systems such as 4–4–2, 5–3–2 or 5–4–1 formations for away matches, aiming at strengthening the defence so that the team can regularly defend its goal with 8 or 9 players. A thick defensive wall is formed in front of its goal making it extremely difficult for the attacking team to penetrate into its penalty area.

Even attack-minded teams usually withdraw players to form a defensive wall in away matches. This bolsters their defence and by using different defensive styles they can use their skill to nullify the opponent team's attack. Generally, the game has become more defence-minded to provide more security for the players and the coaches, bringing continuity of success. Managers and coaches often select those midfield and forward players who have a defensive attitude of play to participate in away matches. These players have mobility, are hard-working and have energetic qualities which enable them to closely mark opponents and participate in defence when their

team loses possession of the ball, neutralising the opposing team. In such games, all the players, including midfielders and forwards, are required to help in defence. This indicates how important it is for all the team members to be capable of defending and to be aware of defensive tactics. For example, it is often seen that many teams who are winning in the first half of a match will try to adopt defensive strategies in the second half to hold on to that lead. Therefore all of the team members will defend and the manager may substitute those midfield and forward players who have a more defensive style in preference to those with a more attacking style.

In Chapter Four the successful attacking strategies for five league teams were studied. It is also desirable to examine defensive strategies for these teams. It should be noted that in this chapter only defence against the successful attacking patterns of play of the five league teams described earlier have been included. It was of particular interest to examine how each of the five league teams attempted to defend against these successful attacking patterns of play. It may be useful, however, to examine all their opponents' attacking patterns of play but obviously this task would require more time which at present is not available. Differences between defensive strategies for the top and the poorer teams would be expected and also the teams' defensive strategies at home may differ from those when playing away.

The aim of this chapter is, then, to identify strategies for defending against the 4 clusters (clusters 1, 2, 3 and 4 in **Figure 4.28**) of successful attacking patterns of play as identified in Chapter Four for the five league teams. The main questions are:

(i) Are there differences between the defensive strategies of good and poor teams?

(ii) Are similar defensive strategies used in home and away matches ?

6.2 METHODS :

The notational method and the field work for this study were explained in detail in Chapter Two Section II. It should be noted that the interpretation of defensive symbols is different from that of attacking symbols (see **Table 2.5** and **Figure 2.6**).

Source of data :

Data were collected on the five Scottish premier soccer league teams whose offensive play has been analysed in Chapter Four (see **Table 4.1**). The defensive moves of the same matches were analysed and the tables of match results for each team are presented in **Appendix A 2:1 pp. 385–390.**

Statistical analysis :

Using the live match analysis technique which was outlined in Chapter Two Section II, data were obtained from thirty-seven matches of the Scottish Premier League during 1987-1988. All the defending moves at home and away matches were separated for each team.

The way the teams defended against the successful attacking patterns of play identified in Chapter Four in both home and away matches needs to be examined. This was achieved by using the following procedure:

(i) All the teams played each other at least once at home and at least once away. Thus, for example, in order to examine team **A**'s defensive

strategy when playing at home, the way team **A** defended against the successful patterns of play for teams **B**, **C**, **D** and **E** playing away has to be examined. Similarly, to examine team **A**'s defensive strategy when playing away, the way team **A** defended against the successful patterns of play for teams **B**, **C**, **D** and **E** playing at home has to be examined.

(ii) For the purpose of the analysis, the four clusters of successful attacking patterns of play (i.e. 1, 2, 3 and 4, see **Figure 4.27**) were reproduced (see **Figure 6.1**). Obviously, each of the four clusters consists of a number of similar successful attacking patterns of play in home and away matches. For example, in order to examine the defensive strategy of team **A** at home against the successful attacking patterns of play of the other teams, cluster 1 represents the successful attacking patterns of play, BA.1; cluster 2 represents BA.4; cluster 3 represents CA.3 and DA.4, and cluster 4 represents EA.2 (see **Figure 6.1**).

This procedure was used to examine the defensive strategies of all the teams when playing both at home and away matches. It should be noted that each successful attacking pattern of play represents a number of successful attacking moves and each attacking move has a defending response against it and each defending response consists of a number of defensive elements.

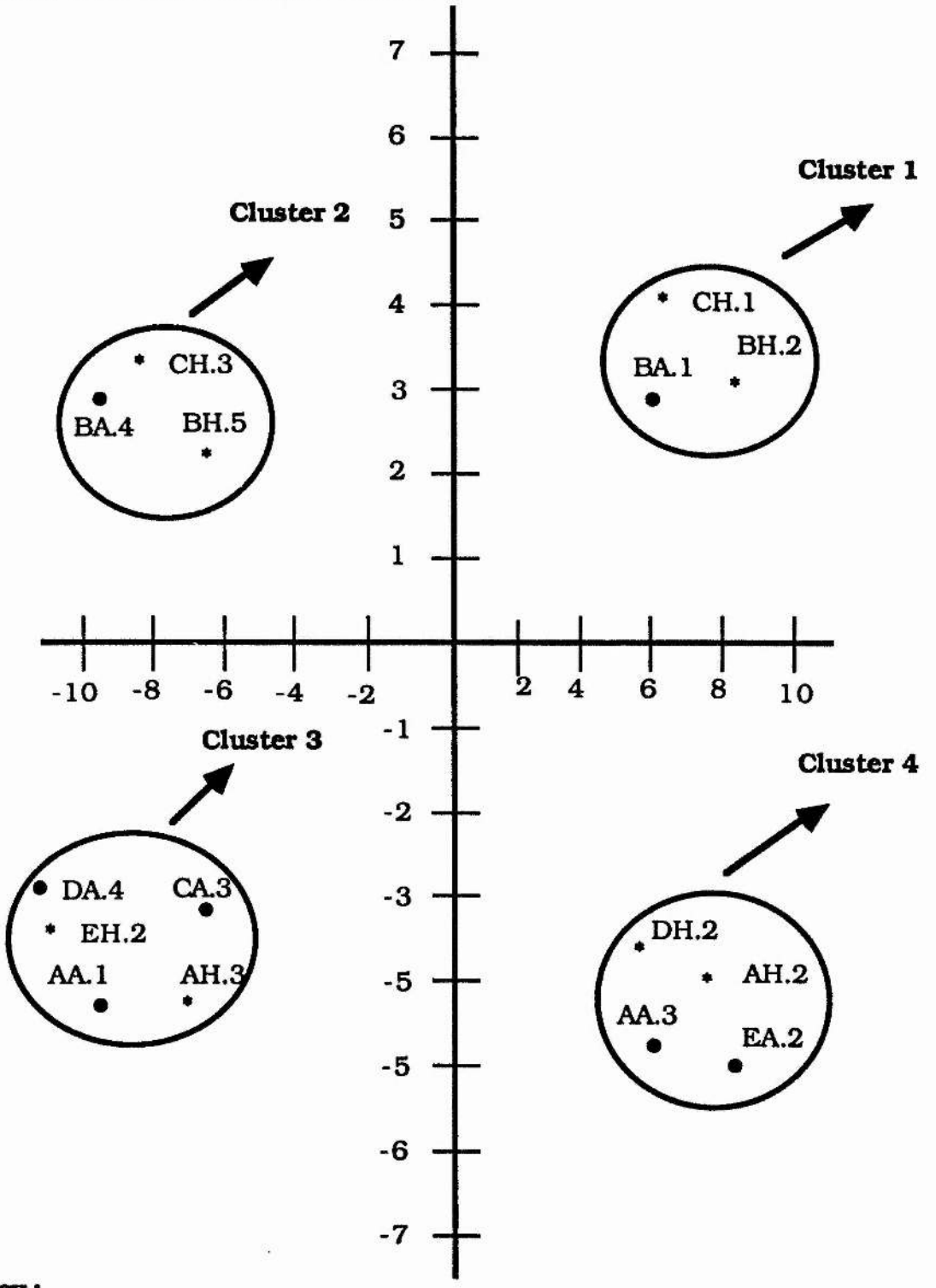
6.3 RESULTS :

The results of the teams were analysed as follows:

Part One - the top teams :

Figure 6.1

Example of a graph, showing attacking patterns of play; the four clusters represent groups of similar successful attacking patterns of play from the five league teams.



Key :

- ● **Successful pattern of play during away matches.**
- * **Successful pattern of play during home matches.**

Teams A and B :

The teams were analysed playing at home and away matches (see **Table 4.1**). For the purpose of the analysis, the teams' defensive performances at home were separated from their defensive performances away and these were analysed in the following manner:

Analysis of defensive performance during home matches :

Table 6.1 shows that clusters 1, 2, 3 and 4 consisted of 8, 11, 7 and 5 successful attacking moves respectively. Each defensive response to each attacking move also consisted of a number of defensive elements (close marking, no marking, interception and tackle) which are collated and tabulated in **Table 6.2**. This two–way table of counts consists of a number of cells. Each cell contains the observed frequency of given particular defensive elements against particular successful attacking patterns of play. The row totals show the total frequency of particular defensive elements against all the successful attacking patterns of play, and the column totals show the total frequency of all defensive elements for each particular successful attacking pattern of play. For example, from Pattern 1 arose 14 occurrences of close marking,...., 7 occurrences of tackle, out of a total of 32 defensive elements which was 26% of all defensive elements against all successful attacking patterns of play (i.e. Patterns 1–4). Statistical analysis using the chi-squared test was carried out to see if any significant relationships occurred. The relationship between the defensive elements and the successful attacking patterns of play for teams **A** and **B** at home was shown not to be significant (χ^2 = 9.1 and 1.7 respectively ; and $P > 0.05$ in each case).

Table 6.1

This table is an example of the analysis of defensive elements for team A against the opponents successful attacking moves.

No. of Attacks	Clusters	Close Marking	No Marking	Attempted Interception	Attempted Tackle
1	1	2	1	1	0
2	1	0	2	2	0
3	1	2	0	0	2
4	1	3	0	0	2
5	1	2	1	2	0
6	1	0	1	1	0
7	1	2	0	0	2
8	1	3	0	0	1
1	2	2	0	1	1
2	2	1	0	2	1
3	2	2	0	1	2
4	2	2	0	1	2
5	2	1	1	0	0
6	2	0	1	1	2
7	2	2	0	1	1
8	2	0	1	1	2
9	2	3	0	1	1
10	2	2	0	0	2
11	2	2	0	0	1
1	3	3	0	0	2
2	3	1	1	1	0
3	3	0	2	2	1
4	3	2	0	0	1
5	3	3	0	0	1
6	3	2	0	0	2
7	3	3	0	0	1
1	4	1	2	0	0
2	4	2	1	2	2
3	4	0	2	1	1
4	4	1	1	0	1
5	4	2	0	0	1

Table 6.2

Summary of the frequency distribution of defensive elements for team A in home matches against the successful attacking patterns of play of opponent teams. (Value of chi-squared statistic = 9.1 ; P = N. S.).

Defensive elements	Successful attacking patterns of play				Row total %
	P.1	P.2	P.3	P.4	
Close Marking	14	17	14	6	51 41%
No Marking	5	3	3	6	17 14%
Interception	6	9	3	3	21 17%
Tackle	7	15	8	5	35 28%
Total %	32 26%	44 36%	28 23%	20 16%	124 100%

From **Tables 6.2** and **6.3**, which indicate the relationship between the defensive elements and successful attacking patterns of play in home matches, the following observations were made:

(i) Close marking was employed most frequently of all the defensive elements used against the successful attacking patterns of play (i.e. 41% and 37% of all defensive elements were close marking for teams **A** and **B** respectively).

(ii) Tackle was the second most frequent defensive element to be used against the successful attacking patterns of play (i.e. 28% and 30% of all the defensive elements included a tackle for teams **A** and **B** respectively).

(iii) No marking was observed least frequently of all the defensive elements against the successful attacking patterns of play (i.e. 14% and 15% of all the defensive elements were no marking for teams **A** and **B** respectively).

Clearly the above observations indicate that the defensive strategies of teams **A** and **B** at home consisted mainly of close marking and tackling. Rarely were the opponent players left unmarked.

Furthermore, it was considered desirable to assess both the numbers and percentages of goals and shots on/off target conceded by teams **A** and **B** during defensive in home matches against the successful away attacking patterns of play of opponent teams. From **Figures 6.2** and **6.3**, which indicate the number of goals and shots on/off target conceded by teams **A** and **B**, the following points have emerged:

(i) The average number of shots conceded per home match was surprisingly low (i.e. (4 goals + 6 shots on target + 15 shots off target)/7 = 3.6 shots per match for team **A** and similarly 28/7 = 4

Table 6.3

Summary of the frequency distribution of defensive elements for team B in home matches against the successful attacking patterns of play of opponent teams. (Value of chi-squared statistic = 1.7 ; P = N.S.).

Defensive elements	Successful attacking patterns of play		Row total %
	P.3	P.4	
Close Marking	24	20	44 37%
No Marking	13	5	18 15%
Interception	12	9	21 18%
Tackle	21	15	36 30%
Total %	70 59%	49 41%	119 100%

Figure 6.2

Numbers and percentages of goals, shots on target and shots off target conceded by team A during its defensive strategies in home matches against the successful attacking patterns of play of opponent teams.

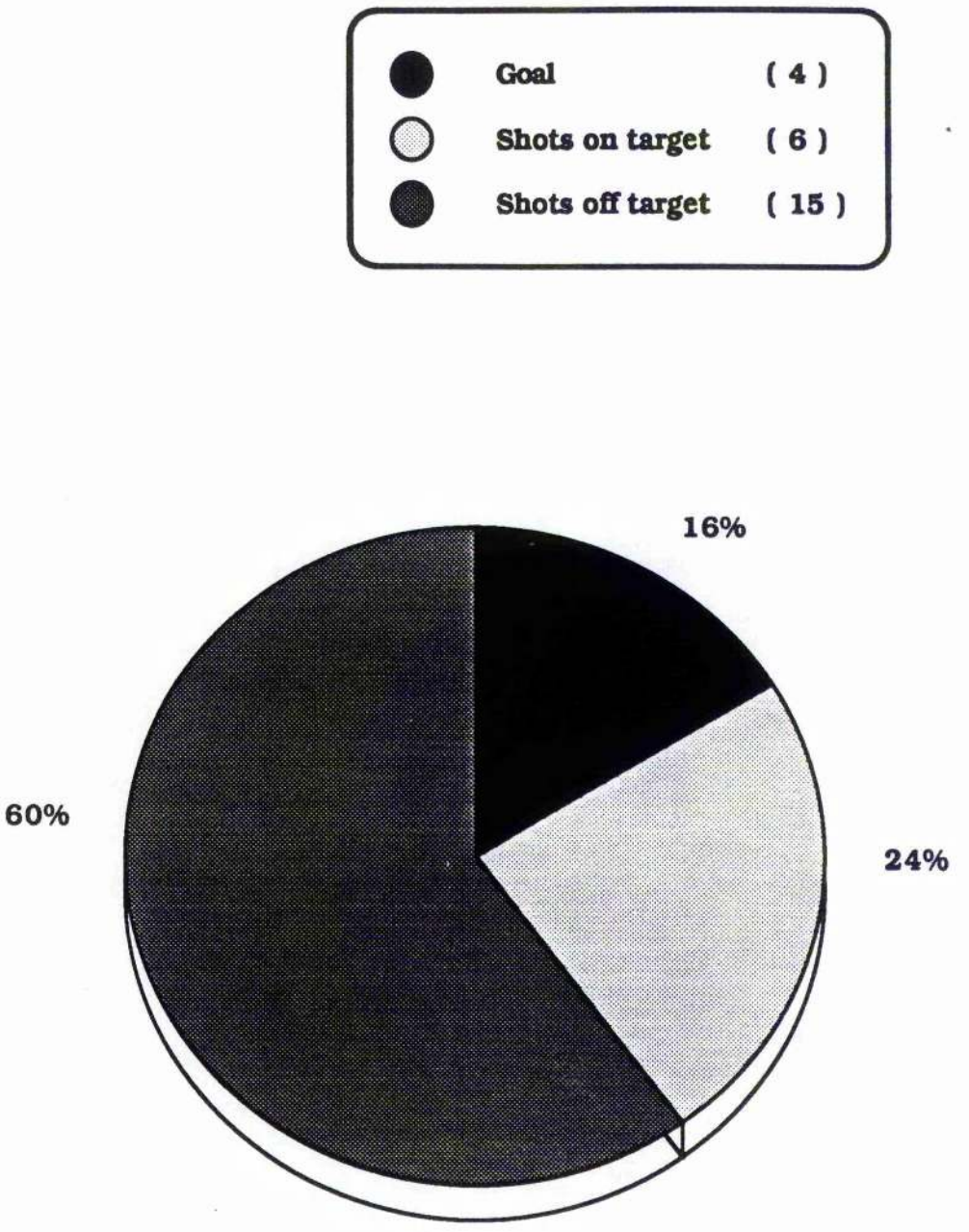
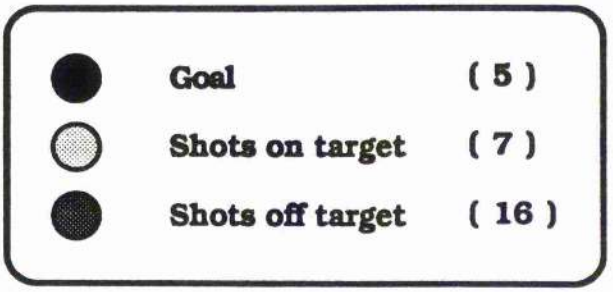
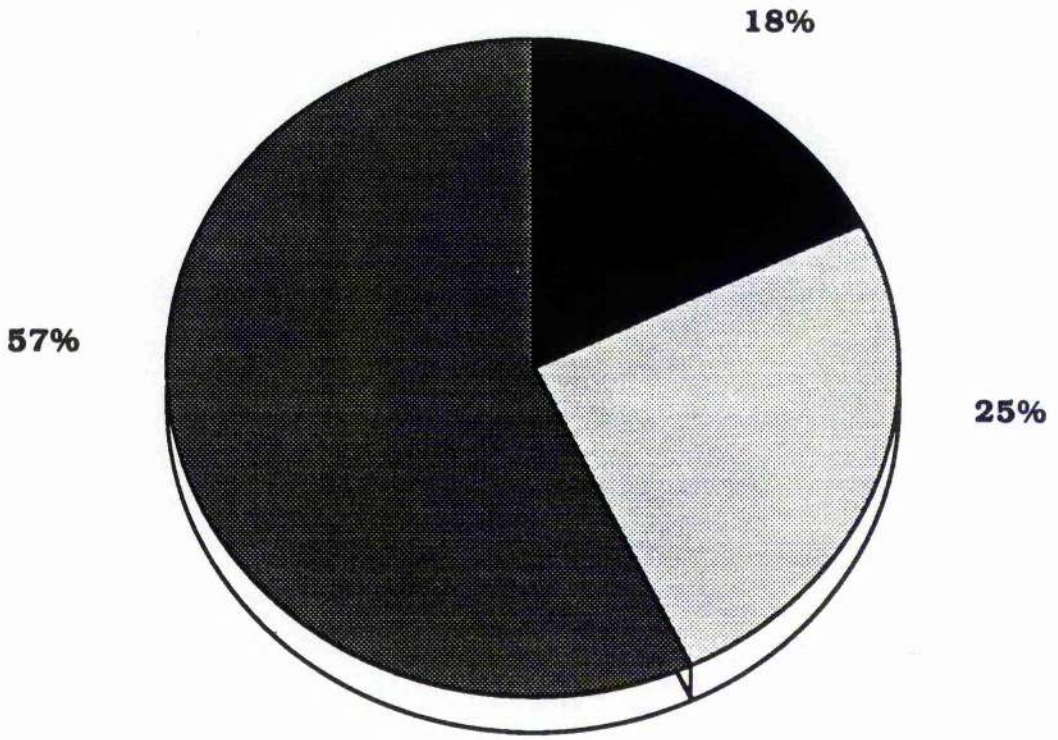


Figure 6.3

Numbers and percentages of goals, shots on target and shots off target conceded by team B during its defensive strategies in home matches against the successful attacking patterns of play of opponent teams.





shots per match for team **B**)).

(ii) More than 56% of all shots conceded were off target for both teams **A** and **B**.

Analysis of defensive performance during away matches :

From **Tables 6.4** and **6.5**, which indicate the relationship between the defensive elements and successful attacking patterns of play in away matches, the following observations were made:

(i) Close marking was employed most frequently of all the defensive elements used against the successful attacking patterns of play (i.e. 41% and 36% of all defensive elements were close marking for teams **A** and **B** respectively).

(ii) Tackle was the second most frequent defensive elements to be used against the successful attacking patterns of play (i.e. 32% and 29% of all the defensive elements included a tackle for teams **A** and **B** respectively).

(iii) No marking was observed least frequently of all the defensive elements against the successful attacking patterns of play (i.e. 13% and 17% of all the defensive elements were no marking for teams **A** and **B** respectively).

Clearly the above observations indicate that the defensive strategies of teams **A** and **B** in away matches consisted mainly of close marking and tackling. Rarely were the opponent players left unmarked, a similar observation to performance in home matches.

From **Figures 6.4** and **6.5**, which indicate the number of goals and shots on/off target conceded by teams **A** and **B**, the following points have emerged:

Table 6.4

Summary of the frequency distribution of defensive elements for team A in away matches against the successful attacking patterns of play of opponent teams. (Value of chi-squared statistic = 5.7 ; P = N.S.).

Defensive elements	Successful attacking patterns of play				Row total %
	P.1	P.2	P.3	P.4	
Close Marking	11	16	4	18	49 41%
No Marking	6	3	2	4	15 13%
Interception	7	6	0	5	18 15%
Tackle	12	11	2	13	38 32%
Total %	36 30%	36 30%	8 7%	40 33%	120 100%

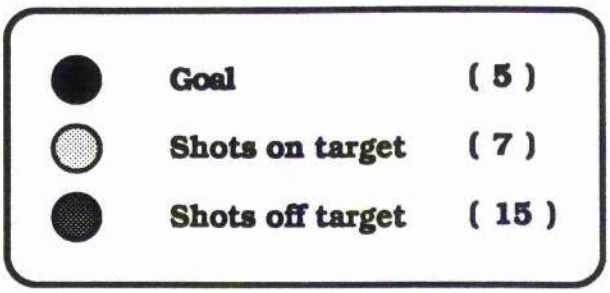
Table 6.5

Summary of the frequency distribution of defensive elements for team B in away matches against the successful attacking patterns of play of opponent teams. (Value of chi-squared statistic = 4.5 ; P = N.S.).

Defensive elements	Successful attacking patterns of play				Row total %
	P.1	P.2	P.3	P.4	
Close Marking	7	9	18	7	41 36%
No Marking	5	4	6	4	19 17%
Interception	4	5	11	2	22 19%
Tackle	4	5	18	6	33 29%
Total %	20 17%	23 20%	53 46%	19 17%	115 100%

Figure 6.4

Numbers and percentages of goals, shots on target and shots off target conceded by team A during its defensive strategies in away matches against the successful attacking patterns of play of opponent teams.



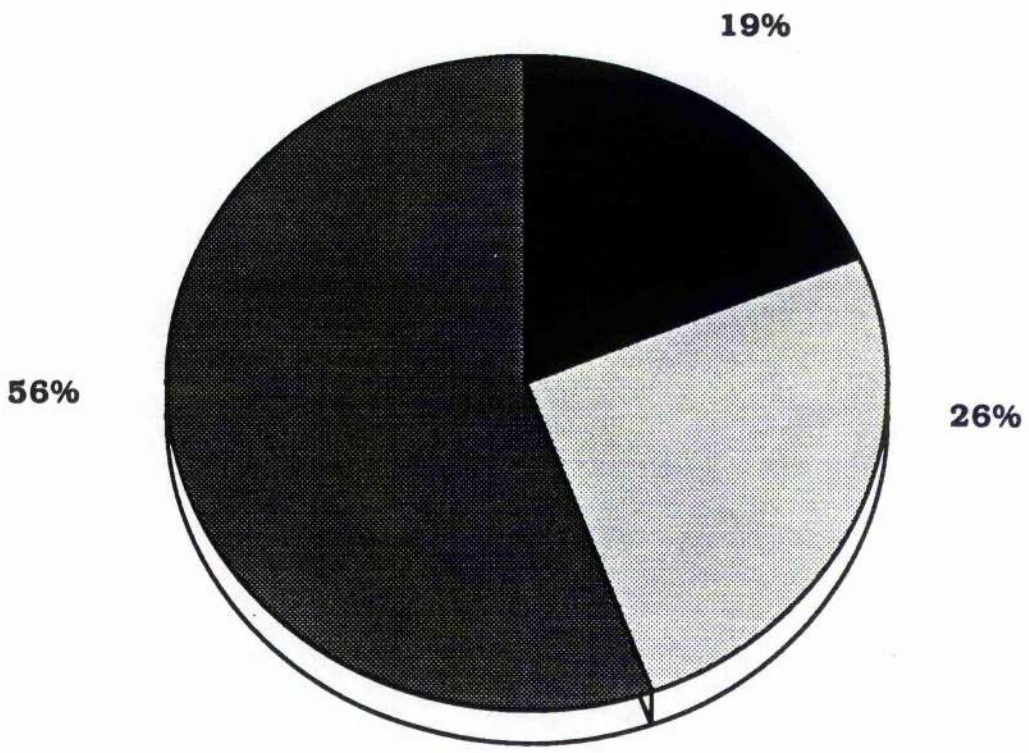
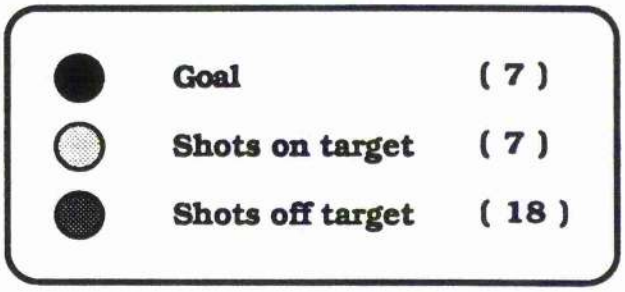
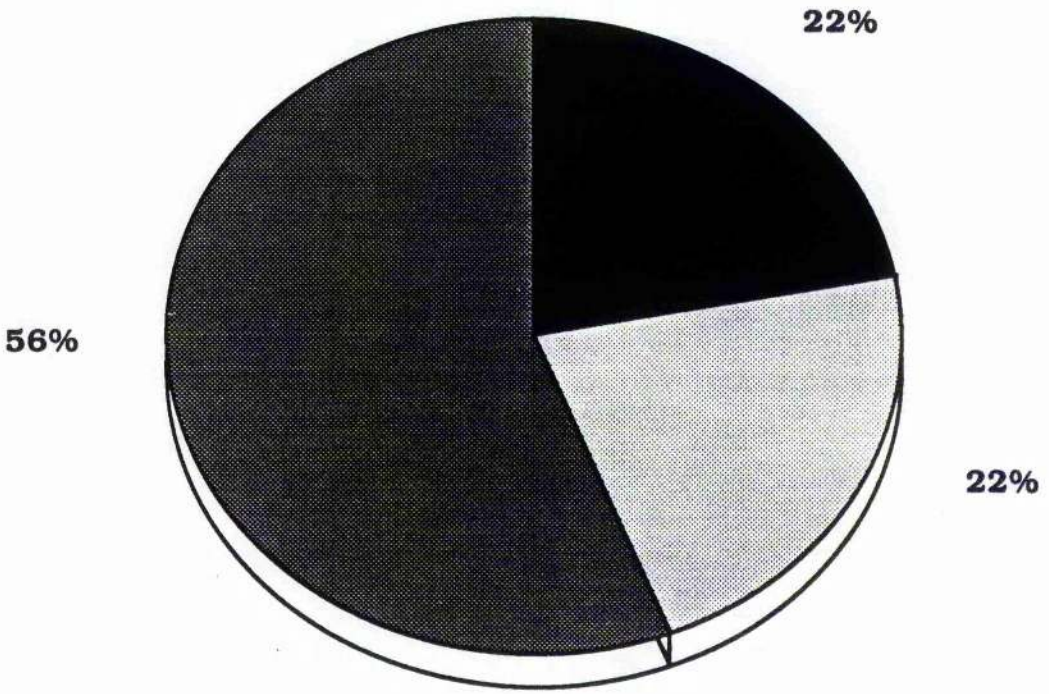


Figure 6.5

Numbers and percentages of goals, shots on target and shots off target conceded by team B during its defensive strategies in away matches against the successful attacking patterns of play of opponent teams.





(i) The average number of shots conceded per home match was surprisingly low (i.e. (5 goals + 7 shots on target + 15 shots off target)/8 = 3.4 shots per match for team **A** and similarly 32/7 = 4.6 shots per match)).

(ii) 55% of all shots conceded were off target for both teams **A** and **B**.

Summary of analysis of performance for top teams :

In summary, the analysis of the defensive strategies of the top teams **A** and **B** against the successful attacking patterns of play during their home and away matches showed a particular distributions in the defensive elements used. Close marking was used as a defensive element most often followed by tackling and, to a much lesser extent, interception. Rarely were the opponent players left unmarked.

The analysis of number of goals and shots on or off target conceded by the teams showed that the average number of shots conceded per home and away match was surprisingly low. More than 54% of all shots conceded were off target. This indicated how the defence of top teams in home and away matches was effective in nullifying successful attacking patterns of play, and shows that the defensive strategies described above was successful. The reasons for their success (for example, well rehearsed moves, outstanding players) have yet to be determined.

There were surprising similarities in the defensive strategies employed by top teams in both home and away matches. There may be several reasons for similarities in the successful defensive strategies used by the teams both at home and away matches. These could be as follows:

(i) The teams are well organised and prepared in defensive strategies in both home and away matches.

(ii) The teams have a greater number of skilful individual players who are capable of successfully employing the such defensive elements as close marking and tackling.

(iii) The success of their defensive strategies encourages their use.

Part Two - the average team :

Team C :

The team was analysed playing eight matches at home and seven matches away (see **Table 4.1**). For the purpose of analysis the team's defensive performance at home was separated from its defensive performance away and the two were analysed in the following manner:

Analysis of defensive performance during home matches :

From **Table 6.6**, which indicates the relationship between the defensive elements and successful attacking patterns of play for 54 attacks in the eight home matches, the following observations were made:

(i) Close marking and tackle were employed most frequently out of all defensive elements used against the successful attacking patterns of play (i.e. 30% and 29% of all defensive elements were close marking and tackle respectively).

(ii) No marking was observed as the third most frequent of the defensive elements to be used against the successful attacking patterns of play (i.e. 23% of all the defensive elements were no marking).

Table 6.6

Summary of the frequency distribution of defensive elements for team C in home matches against the successful attacking patterns of play of opponent teams. (Value of chi-squared statistic = 32.3 ; P < 0.001).

Defensive elements	Successful attacking patterns of play				Row total %
	P.1	P.2	P.3	P.4	
Close Marking	13	22	15	7	57 30%
No Marking	7	6	9	21	43 23%
Interception	5	1	12	17	35 18%
Tackle	9	13	19	14	55 29%
Total %	34 18%	42 22%	55 29%	59 31%	190 100%

(iii) Interception was observed least frequently of all the defensive elements against the successful attacking patterns of play (i.e. 18% of all the defensive elements were interception).

Clearly the above observations indicate that the defensive strategy of team **C** at home consisted mainly of close marking and tackling. In a considerable number of instances the opponents players were left unmarked.

From **Figure 6.6**, which indicates the number of goals and shots on/off target conceded by team **C**, the following points have emerged:

(i) The average number of shots conceded per home match was surprisingly low (i.e. (9 goals + 18 shots on target + 16 shots off target)/8 = 5.4 shots per match)).

(ii) More than 50% of all shots conceded were on target.

Analysis of defensive performance during away matches :

From **Table 6.7**, which indicates the relationship between the defensive elements and successful attacking patterns of play for 50 attacks in the seven away matches, the following observations were made:

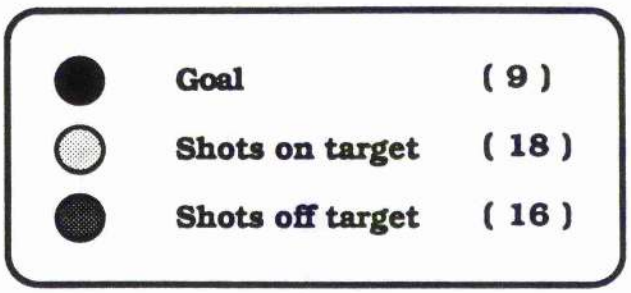
(i) Close marking and tackle were employed most frequently out of all defensive elements used against the successful attacking patterns of play (i.e. 34% and 29% of all defensive elements were close marking and tackle respectively).

(ii) No marking was observed as the third most frequent defensive element to be used against the successful attacking patterns of play (i.e. 25% of all the defensive elements were no marking).

(iii) Interception was observed least frequently of all the defensive elements against the successful attacking patterns of play (i.e. 13% of

Figure 6.6

Numbers and percentages of goals, shots on target and shots off target conceded by team C during its defensive strategies in home matches against the successful attacking patterns of play of opponent teams.



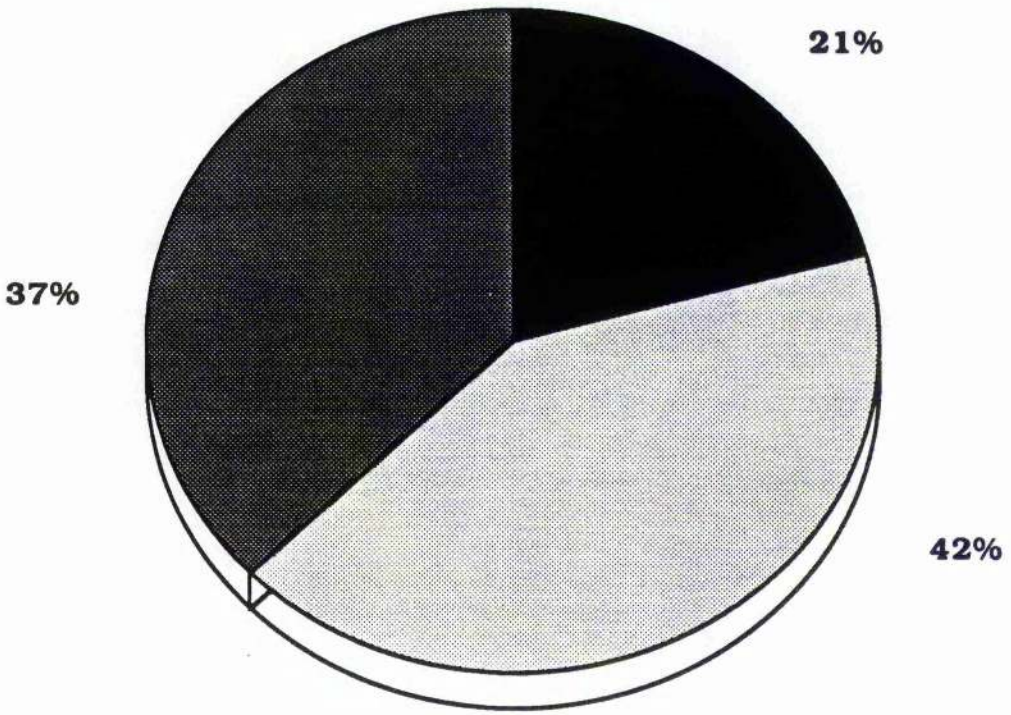


Table 6.7

Summary of the frequency distribution of defensive elements for team C in away matches against the successful attacking patterns of play of opponent teams. (Value of chi-squared statistic = 7.9 ; P = N.S.).

Defensive elements	Successful attacking patterns of play				Row total %
	P.1	P.2	P.3	P.4	
Close Marking	13	19	11	24	67 34%
No Marking	11	7	10	22	50 25%
Interception	2	4	5	14	25 13%
Tackle	8	12	12	26	58 29%
Total %	34 17%	42 21%	38 19%	86 43%	200 100%

all the defensive elements were interception).

Clearly the above observations indicate that the defensive strategy of team **C** in away matches consisted mainly of close marking and tackling. In a considerable number of instances the opponent players were left unmarked.

From **Figure 6.7**, which indicates the number of goals and shots on/off target conceded by team **C**, the following points have emerged:

(i) The average number of shots conceded per away match was high compared to that of the top teams (i.e. (11 goals + 19 shots on target + 15 shots off target)/7 = 6.4 shots per match)).

(ii) More than 50% of all shots conceded were on target.

Summary of analysis of performance during home and away matches :

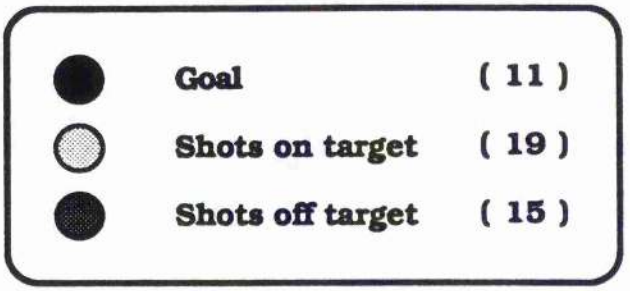
The analysis of team the defensive strategy of team **C** against the successful attacking patterns of play during its home and away matches showed a particular distribution in the defensive elements used. Close marking and tackling were used as a defensive elements most frequently. In a considerable number of instances, the opponent players were left unmarked.

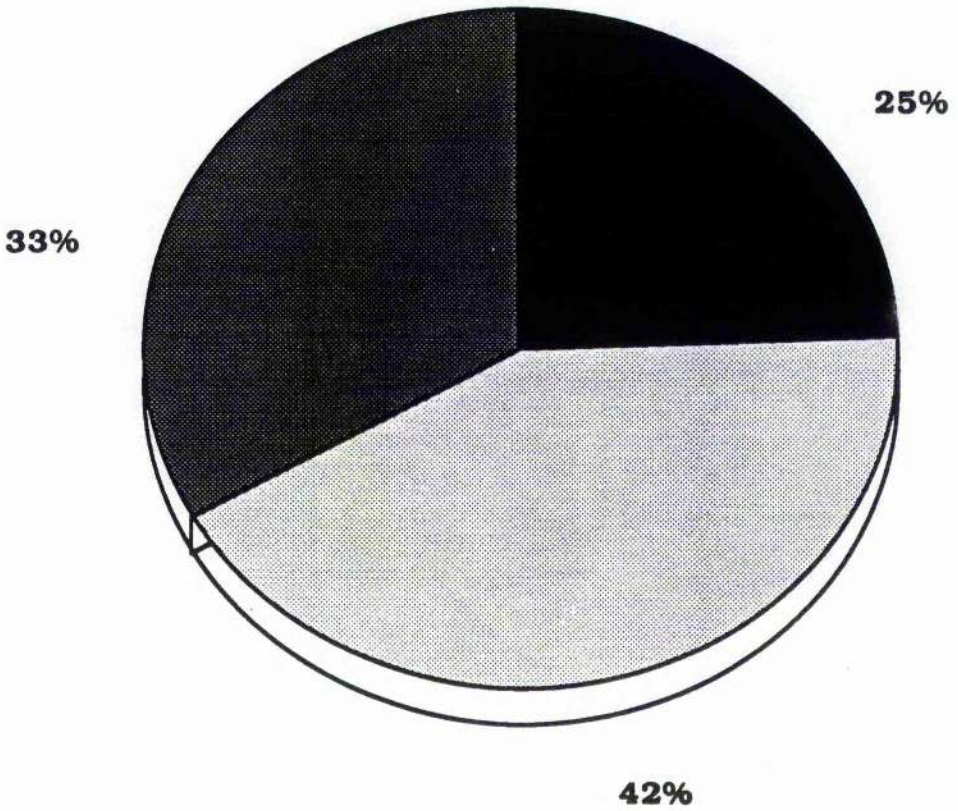
The analysis of number of goals and shots on or off target conceded by team **C** showed that the average number of shots conceded per home and away match was high compared to that for the top teams. More than 50% of all shots conceded were on target. This indicated how the defence of team **C** in away matches was not very effective in nullifying successful attacking patterns of play, since it conceded a considerable number of goals and shots on target.

The defensive strategies of team **C** at home and away had mediocre results. They were less effective than those of teams **A** and **B** but not as

Figure 6.7

Numbers and percentages of goals, shots on target and shots off target conceded by team C during its defensive strategies in away matches against the successful attacking patterns of play of opponent teams.





ineffective as those of teams **D** and **E**.

Part three - the poorer teams :

Teams D and E :

The teams were analysed playing in home and away matches (see **Table 4.1**). For the purpose of analysis the teams' defensive performances at home was separated from their defensive performances away and these were analysed in the following manner:

Analysis of defensive performance during home matches :

From **Tables 6.8** and **6.9** which indicate the relationship between the defensive elements and successful attacking patterns of play in home matches, the following observations were made:

(i) No marking was by far the most frequently observed defensive element used against the successful attacking patterns of play (i.e. 34% and 48% of all the defensive elements were no marking for teams **D** and **E** respectively).

(ii) Tackle and interception were the second most frequent defensive elements to be used against the successful attacking patterns of play (i.e. 24% and 18% of all the defensive elements included a tackle for teams **D** and **E** respectively; 24% and 21% of all the defensive elements were interception for teams **D** and **E** respectively).

(iii) Close marking was used least frequently of all the defensive elements against the successful attacking patterns of play (i.e. 18% and 13% of all the defensive elements were close marking for teams **D** and **E** respectively).

Clearly the above observations indicate that teams **D** and **E** failed primarily to mark their opponent players as opposed to the top teams

Table 6.8

Summary of the frequency distribution of defensive elements for team D in home matches against the successful attacking patterns of play of opponent teams. (Value of chi-squared statistic = 8.4 ; P = N.S.).

Defensive elements	Successful attacking patterns of play				Row total %
	P.1	P.2	P.3	P.4	
Close Marking	2	1	17	14	34 18%
No Marking	1	3	28	34	66 34%
Interception	1	0	29	16	46 24%
Tackle	2	2	25	17	46 24%
Total %	6 3%	6 3%	99 52%	81 42%	192 100%

Table 6.9

Summary of the frequency distribution of defensive elements for team E in home matches against the successful attacking patterns of play of opponent teams. (Value of chi-squared statistic = 16.4 ; $P < 0.05$).

Defensive elements	Successful attacking patterns of play				Row total %
	P.1	P.2	P.3	P.4	
Close Marking	2	3	15	16	36 13%
No Marking	20	17	61	30	128 48%
Interception	6	9	25	7	47 18%
Tackle	4	7	35	11	57 21%
Total %	32 12%	36 13%	136 51%	64 24%	268 100%

who rarely left their opponent players unmarked. Also, the close marking and tackling elements made up lower percentages of the defensive elements of teams **D** and **E** than the corresponding percentages of the better teams (i.e. team **D** had 18% of close marking and 24% of tackling of all the defensive elements as compared to team **A's** 41% of close marking and 28% of tackling of all the defensive elements in home matches).

From **Figures 6.8** and **6.9**, which indicate the number of goals and shots on/off target conceded by teams **D** and **E**, the following points have emerged:

(i) The average number of shots conceded per home match was high compared to that of the top teams (i.e. (8 goals + 23 shots on target + 17 shots off target)/7 = 6.9 shots per match for team **D** and similarly 66/8 = 8.3 shots per match for team **E**)).

(ii) 65% and 70% of all shots conceded were on target, of these one in four shots resulted in a goal against teams **D** and **E** respectively.

Analysis of defensive performance during away matches :

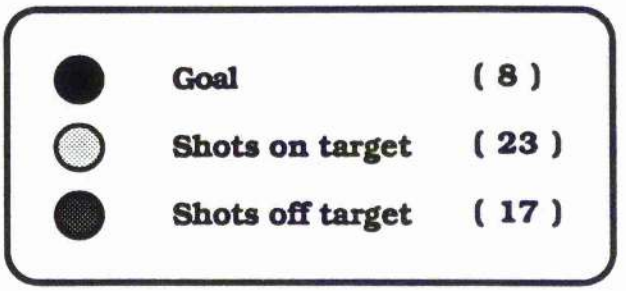
From **Tables 6.10** and **6.11**, which indicate the relationship between the defensive elements and successful attacking patterns of play in away matches, the following observations were made:

(i) No marking was observed most frequently out of all defensive elements used against the successful attacking patterns of play (i.e. 41% and 51% of all the defensive elements were no marking for teams **D** and **E** respectively).

(ii) Tackle was the second most frequent defensive element to be used against the successful attacking patterns of play (i.e. 24% and 22% of all the defensive elements were a tackle and close marking for teams

Figure 6.8

Numbers and percentages of goals, shots on target and shots off target conceded by team D during its defensive strategies in home matches against the successful attacking patterns of play of opponent teams.



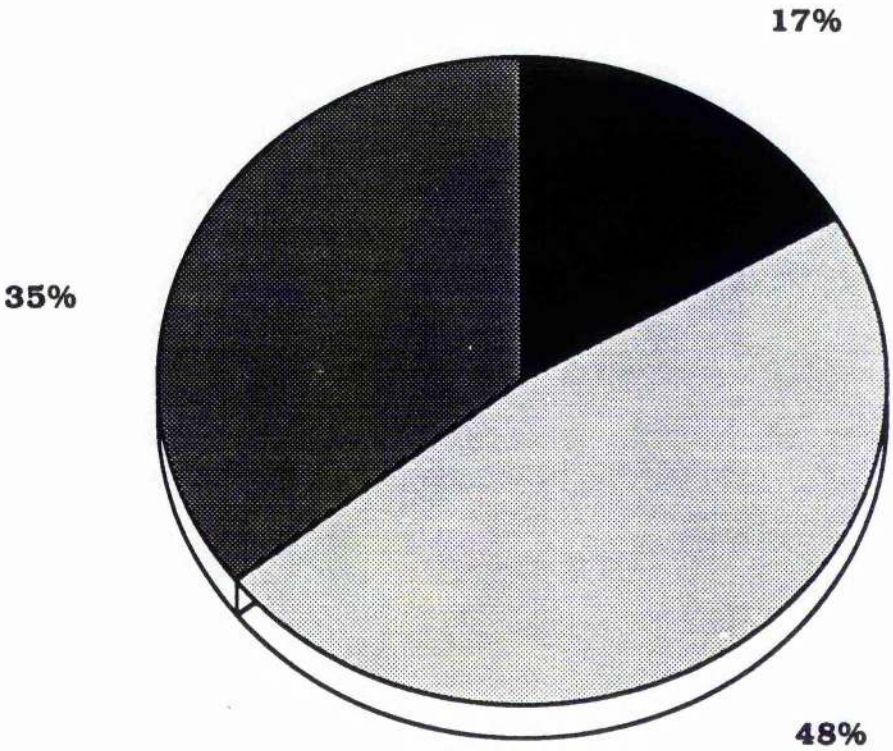
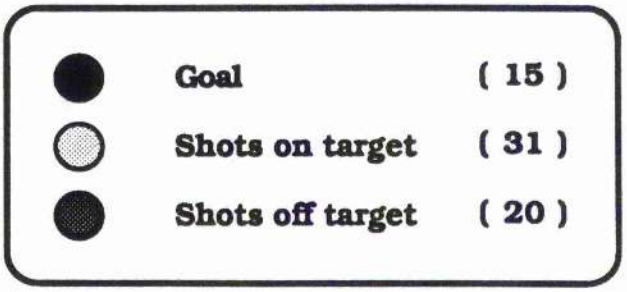


Figure 6.9

Numbers and percentages of goals, shots on target and shots off target conceded by team E during its defensive strategies in home matches against the successful attacking patterns of play of opponent teams.



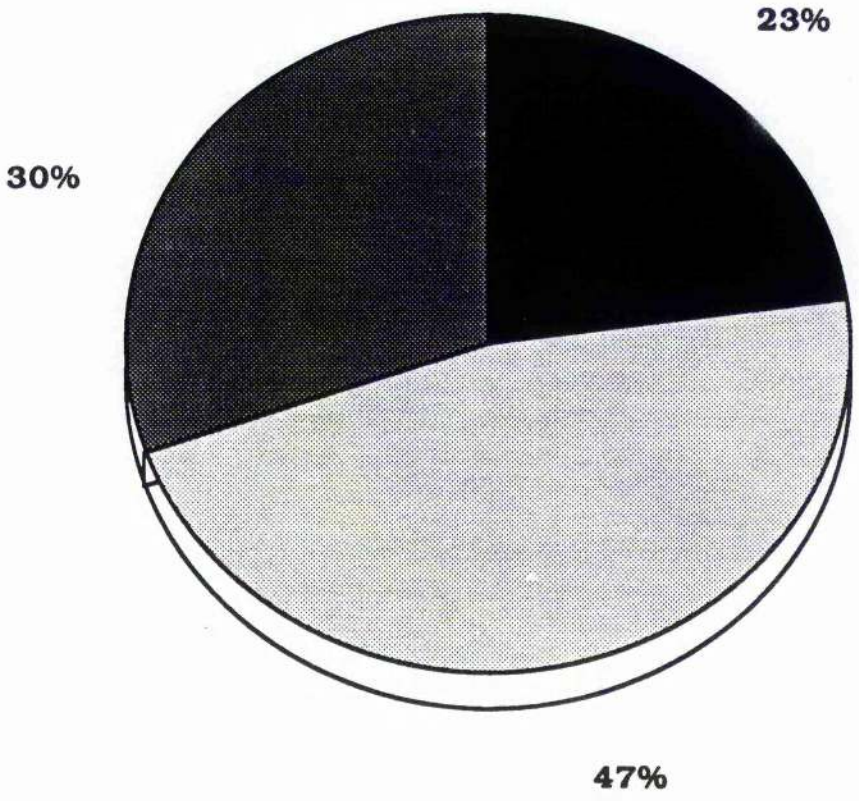


Table 6.10

Summary of the frequency distribution of defensive elements for team D in away matches against the successful attacking patterns of play of opponent teams. (Value of chi-squared statistic = 7.5 ; P = N.S.).

Defensive elements	Successful attacking patterns of play				Row total %
	P.1	P.2	P.3	P.4	
Close Marking	12	8	9	16	45 17%
No Marking	32	26	22	30	110 41%
Interception	17	16	6	10	49 18%
Tackle	16	18	9	21	64 24%
Total %	77 29%	68 25%	46 17%	77 29%	268 100%

Table 6.11

Summary of the frequency distribution of defensive elements for team E in away matches against the successful attacking patterns of play of opponent teams. (Value of chi-squared statistic = 6.4 ; P = N.S.).

Defensive elements	Successful attacking patterns of play				Row total %
	P.1	P.2	P.3	P.4	
Close Marking	14	17	6	4	41 14%
No Marking	49	35	28	33	145 51%
Interception	12	9	3	11	35 12%
Tackle	20	17	14	12	63 22%
Total %	95 34%	78 28%	51 18%	60 21%	284 100%

D and **E** respectively).

(iii) Interception and close marking were used least frequently of all the defensive elements against the successful attacking patterns of play (i.e. 18% and 12% of all the defensive elements were interception for teams **D** and **E** respectively; 17% and 14% of all the defensive elements were close marking for teams **D** and **E** respectively).

Clearly the above observations indicate that teams **D** and **E** failed primarily to mark their opponent players as opposed to the top teams who rarely left their opponent players unmarked. Also, the close marking and tackling elements made up lower percentages of the defensive elements of teams **D** and **E** than the corresponding percentages of the better teams, a similar observation to performance in home games.

From **Figures 6.10** and **6.11**, which indicate the number of goals and shots on/off target conceded by teams **D** and **E**, the following points have emerged:

(i) The average number of shots conceded per home match was high compared to that of the top teams (i.e. (14 goals + 35 shots on target + 26 shots off target)/7 = 10.7 shots per match for team **D** and similarly 77/8 = 9.6 shots per match for team **E**)).

(ii) More than 65% and 70% of all shots conceded were on target for both teams **D** and **E**.

Summary of analysis of performance for poorer teams :

In summary, the analysis of the defensive strategies of teams **D** and **E** against the successful attacking patterns of play during their home and away matches showed a particular distribution in the defensive elements used. No marking was observed most frequently of all the

Figure 6.10

Numbers and percentages of goals, shots on target and shots off target conceded by team D during its defensive strategies in away matches against the successful attacking patterns of play of opponent teams.

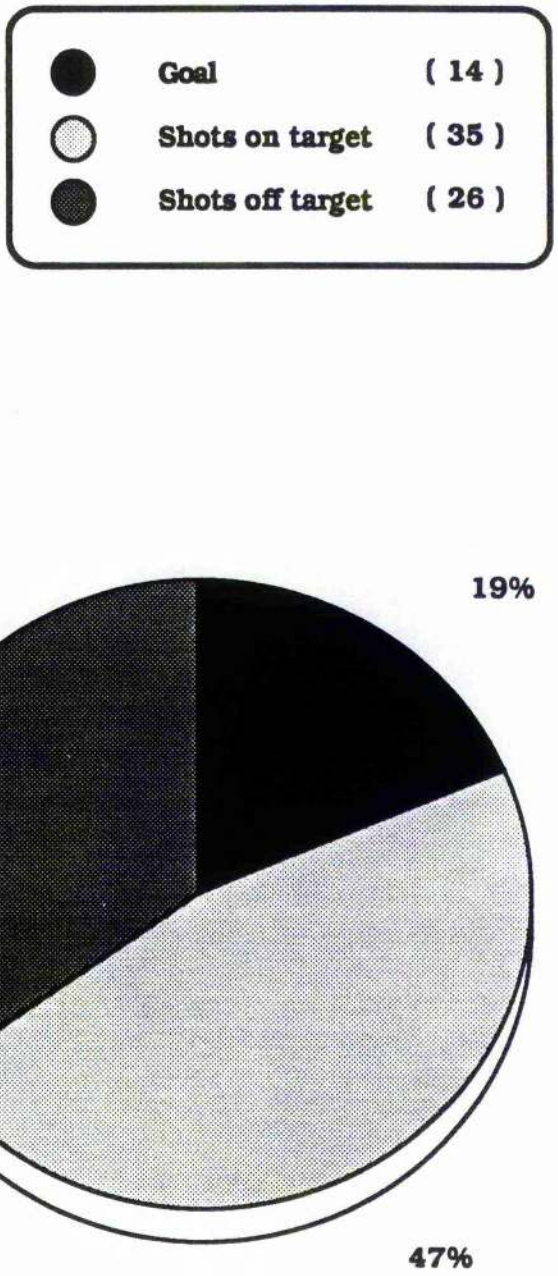
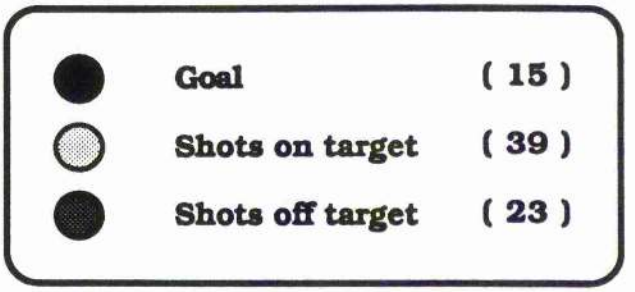
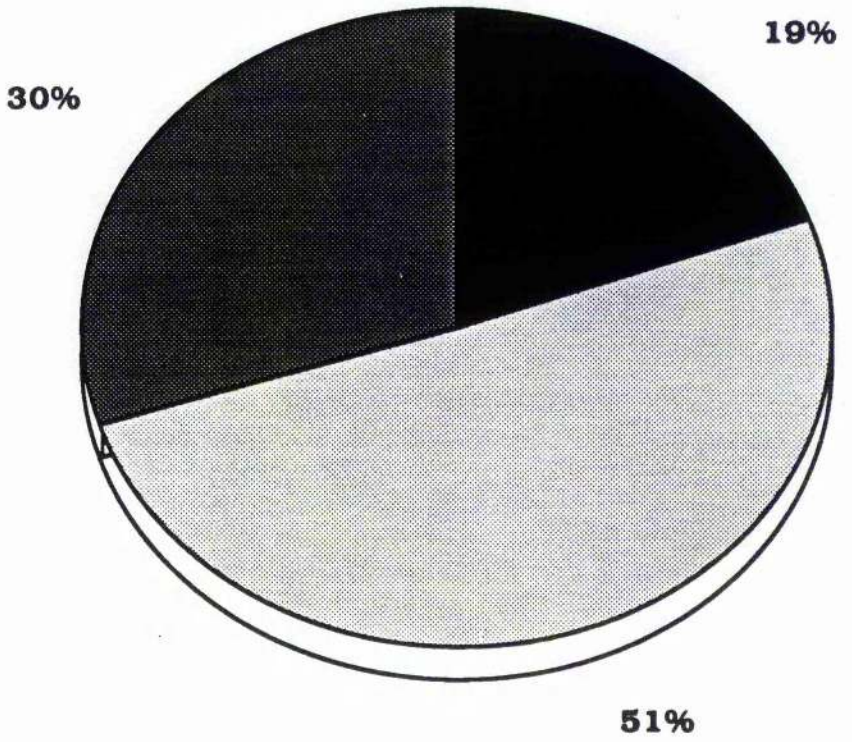


Figure 6.11

Numbers and percentages of goals, shots on target and shots off target conceded by team E during its defensive strategies in away matches against the successful attacking patterns of play of opponent teams.





defensive elements used against the successful attacking patterns of play followed by tackling and interception. The opponent players were rarely marked. It can not be assumed that the teams were trying but failing to mark opponents, although this was almost certainly the case to some extent. It is possible that the teams adopted a policy of none marking, relying on other strategies such as interception to gain possession.

The analysis of number of goals and shots on or off target conceded by teams **D** and **E** showed that the average number of shots conceded per home match was high compared to that of the top teams. This indicated how the defence of teams **D** and **E** in home and away matches was not very effective in nullifying successful attacking patterns of play, since it conceded a considerable number of goals and shots on target, and of these, one in four shots resulted in a goal.

There were surprising similarities in the defensive strategies employed at home and away matches against successful attacking patterns of play. There may be several reasons for similarities in the ineffective defensive strategies used by teams **D** and **E** at home and away matches. These could be as follows:

(i) Both teams lacked good organisation and preparation of defensive strategies for both home and away matches.

(ii) Both teams had fewer substitute players who were capable of successfully employing the defensive elements, such as close marking and tackling, who could replace injured players; whilst the top teams have a greater number of substitute players who are equally as capable of successfully employing the defensive elements as the first eleven.

(iii) Both teams had not identified the attacking strategies being used successfully against it so were unprepared to counteract them.

6.4 DISCUSSION :

The main purpose of the analysis described in this chapter was to identify defensive strategies employed by the teams for defending against the 4 clusters (clusters 1, 2, 3 and 4 in **Figure 4.27**) of successful attacking patterns of play as identified in Chapter Four for the five league teams. A further aim was to find out if there were any differences between the defensive strategies of good and poor teams, and whether similar defensive strategies were used in home and away matches. It should be realised that these four clusters represent 535 attacks out of the total of 2166 attacks used by all five teams in the thirty-seven matches examined.

Defensive performance analysis :

The analysis of defensive strategy of each team against the successful attacking patterns of play has clearly revealed a number of similarities and dissimilarities.

One might think that the top teams, **A** and **B**, and the poor teams, **D** and **E**, would utilise different defensive strategies at home than those utilised in away matches, but the results clearly showed that there were similar defensive strategies of play for the top teams in both home and away matches and for the poorer teams in both home and away matches. For example, teams **A** and **B** emphasised close marking at home and away, and teams **D** and **E** had similar frequencies of tackling at home and away.

It is possible that all teams adopt the same strategies but may be poorer teams do not have the ability to adopt "close marking" as effectively as the better teams. Further investigation is required to clarify this point.

The good teams, **A** and **B**, had successful defensive strategies in home and away matches – their defensive elements mainly consisted of close marking and tackling. The poorer teams, however, both had the same unsuccessful defensive strategies in home and away matches – their defensive elements mainly consisted of no marking. This indicates that the better teams employed a different repertoire of defensive elements, such as close marking and tackling, and this might explain why they were effective in nullifying the opponents' attacks. There may be a number of possible reasons for top teams being more successful in defensive strategies: for example, they have a greater number of individual, more skilful, experienced and confident players which enable them to tackle and mark attacking players more successfully and they may have analysed opposing teams and rehearsed defensive moves.

It is worthwhile to explore whether there are any differences in the numbers and percentages of goals, shots on target and shots off target conceded by the top and the poorer teams. The results indicate that the top teams had a surprisingly low average number of shots conceded per match and more than 54% of all shots conceded were off target. The poorer teams, however, had a high average number of shots conceded per match and more than 64% of all shots conceded were on target.

It is clear from the above discussion that the defensive strategies of the top teams in home and away matches were effective in nullifying successful attacking patterns of play, and they did not concede a large number of shots on target.

Comparison analysis :

It is worth considering whether teams use the same defensive strategies in home and in away matches. The results indicate that the top teams, **A** and **B**, had distinct successful defensive strategies which were similar in home and away matches. The numbers and percentages of goals, shots on and shots off target conceded by the top teams, **A** and **B** were also similar. The poorer teams, also had distinct defensive strategies which were similar in home and away matches but these were, of course, less successful than those of teams **A** and **B**.

These findings clearly indicate that there are similarities in the employment of defensive strategies in home and away matches for all teams, irrespective of ability. It is also clear that the defensive strategies of the top and the poorer teams were markedly dissimilar. There are a number of possible reasons for this:

(i) Organisation and preparation: the top teams may be better organised and prepared in defensive strategies in both home and away matches than the poorer teams.

(ii) Individual players: the top teams possibly have a greater number of individual players who would have enough skill to perform the defensive elements such as close marking and tackling successfully.

Summary :

In summary, analysis of defensive strategies against successful patterns of play for all the teams showed that there were similarities and dissimilarities between the top and the poorer teams. These can be summarised as follows:

(i) The top teams, **A** and **B**, employed similar defensive strategies in home and away matches.

(ii) The poorer teams, **D** and **E**, also had similar defensive strategies in home and away matches.

(iii) The results clearly point to close marking being a crucial element of the best defensive strategies (i.e. teams who rarely left their opponent players unmarked, conceded fewer shots on target and goals).

(iv) Close marking and tackling were used more often by those teams which were successful in their defensive strategies; providing a further indication that to be successful a team needs to use close marking and tackling, and to use them frequently.

(v) The defensive strategies for the top teams are distinctly different from those of the poorer teams (e.g. the distributions of defensive elements for the top teams, **A** and **B**, at home and away were different from the distributions of defensive elements for the poorer teams, **D** and **E**, at home and away). Although the results of defensive strategies vary between the better and poorer teams, and their defensive strategies may be similar, the better teams are more effective in close marking.

(vi) The top teams, **A** and **B**, had conceded a lower average number of shots per match than the poorer teams, **D** and **E**.

(vii) Less than 46% of the shots conceded by the top teams, **A** and **B**, were on target, whilst more than 64% of those conceded by the poorer teams, **D** and **E**, were on target.

CHAPTER SEVEN

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

7.1 SUMMARY :

7.2 CONCLUSIONS :

Analysis of attacking patterns of play for the league teams :

Analysis of attacking patterns of play for the international team :

Analysis of defensive performance for the league teams :

7.3 RECOMMENDATIONS :

7.1 SUMMARY :

This study emerged from an interest in the relative tactical performance of professional soccer teams. There is no doubt that statistical analysis is of use to soccer managers and coaches. For example, careful collection and evaluation of the observable details associated with each movement of play in the game for each team may lead to meaningful trend analysis. In fact, most coaches and managers at international and professional levels of the game compile some statistics which convey information on their opponents as well as their own teams.

The purpose of match analysis is, of course, to obtain as much information as possible concerning the specific strengths and weaknesses of both one's own team and an opponent team. Whilst each match is an event that will never specifically recur, the strengths and weaknesses of a team recur regularly. These patterns are particularly suited to trend analysis. Most soccer teams normally follow similar patterns of play when confronted with similar situations, but modified by predetermined strategies. Thus, for planning purposes in soccer it is important that detailed information concerning both the opponent team and one's own team be known to managers and coaches.

It is clear from the available literature discussed in chapters one and two that the need for an objective method in analysing interaction team sports such as soccer is crucial, since association football is one of the world's most popular sports both among players and spectators, but one to which the attention of scientists has not been appropriately directed. In particular, tactical aspects have been the subject of much speculation but little investigation.

Any soccer analysis system should allow the retrieval of the

tendencies of a team in a particular situation and be able to calculate the probability of success or failure based upon previous attempts in the same or similar situations. The analysis technique developed must be sufficiently flexible to allow the observations to provide answers to the soccer analysis questions with minimal effort. It must be practical – i.e. usable in the many situations in which soccer is played. It should also be flexible enough to provide information retrieval in an easily understandable form on demand. The report of analysis should be in a form appropriate to the needs of the user.

An analysis of patterns of play may be utilised to identify successful strategies, the adoption of which could eliminate weaknesses in a team. Managers and coaches should base their team plans on such analyses, enabling their teams to counter the game plans of the opposition; providing the team with opportunities to optimise its attributes and to create many goal scoring chances.

The main aim in the third chapter of this study was to examine the suitability and accuracy of the two methods of obtaining objective data on patterns of play; the live match analysis technique and the video recording technique with subsequent analysis. The results showed that both techniques produced the same results; however, the former was more convenient.

The live match analysis method has several advantages over the video recording method. It is quick, cheap, and can be used effectively by a well trained observer whose errors are negligible. It is useful for providing quickly stored and easily translated records, it allows statistics of success to be calculated quite easily, it does not require extra people to help with the observations or the analysing process, and it may be easier to obtain permission from the clubs to do this

kind of analysis. In view of this, and because both techniques produce the same results the data for this study has been obtained by using the live match analysis technique.

In the fourth chapter it was desirable to assess whether there were any similar patterns of play for the five league teams, and if these successful patterns of play occurred more often in home or away matches. A further aim was to discover how frequently the successful patterns of play are seen for good and poor teams.

The analysis of patterns of play of each team during free play has clearly revealed a number of similarities. In each match a given team had a large number of attacking moves. Most of these attacks were similar, and could be classified into a distinct pattern of play. Surprisingly, the distinct patterns of play identified for each team in both home and away matches were few in number (between 4 and 6 patterns for each team) and accounted for a very high percentage of all attacks. Good and poor teams had the same number of patterns of play (4–6).

One might think that good teams would utilise a greater number of patterns of play, but the results clearly showed that there were a similar number of patterns of play for all the teams. The possible reason for good and poor teams having the same number of patterns of play has yet to be determined and further investigation is required to clarify this point. The difference between the good and the poor teams would appear to be in the implementation of these patterns of play.

Good teams **A** and **B** had the same number of successful patterns of play in home and away matches. The poorer teams also had the same number of successful patterns in home and away matches but they were fewer in number. This indicates that the better teams had a

greater repertoire of successful patterns of free play, and this might explain why they were better teams. There may be a number of possible reasons for top teams having more successful patterns of play, for instance they have a greater number of skilful, experienced and confident players who are able to create more successful attacking moves.

To find out if there is a limited number of patterns of play common to all teams, the forty-seven patterns of play identified earlier in the chapter from all five teams were further analysed. This produced 10 clusters, each cluster representing a group of similar patterns of play. Of the ten major clusters, all the successful patterns of play were grouped together into four clusters (clusters 1, 2, 3 and 4 in **Figure 4.27**). For example, Cluster 1 and Cluster 2 represented three similar successful patterns of play, Cluster 3 represented five similar successful patterns of play and Cluster 4 represented four similar successful patterns of play. Similarly, the 32 unsuccessful patterns of play can be classified into 6 categories (i.e. clusters 5–10 in **Figure 4.27**).

It was desirable to see whether the teams used the same successful patterns of play in home and in away matches. The results indicated that the top teams, **A** and **B**, had distinct successful patterns of play from each other (e.g. as can be seen from **Figures 4.32, 4.33, 4.34** and **4.35** for team **A** and **Figures 4.28, 4.29, 4.30 and 4.31** for team **B**).

Team **A** had successful patterns of play at home which were markedly similar to its successful patterns of play in away matches (see **Patterns AA.1/AH.3** and **AA.3/AH.2**). These patterns of play shared common features, for example, in Patterns AA.1 and AH.3 both moves were initiated in the same location of the pitch, had a similar number of passes and were concluded with a long cross into the penalty area for shooting (see **Figures 4.32 and 4.33**). Team **B** also had successful patterns of play at home which were markedly similar to its successful patterns of play in away matches (see **Patterns BA.1/BH.2 and BA.4/BH.5**). These patterns of play shared common features, for example, in Patterns BA.1 and BH.2 both moves were initiated in the same location of the pitch, had a similar number of passes and were concluded by a long cross into the penalty area for shooting (see **Figures 4.28 and 4.29**). The above discussion clearly showed that top teams, **A** and **B**, apply the same strategies when they are playing at home and away.

For the poorer teams, most of their successful patterns of play in home matches were different from those successful patterns of play in away matches (e.g. team **D**'s successful pattern of play in home matches was initiated from the left of the centre circle of the pitch whereas the successful pattern of play in away matches was initiated from the right side line of the pitch and moved along the right wing; furthermore they did not share common features). One possible explanation is that the poorer team squads are composed of a small number of players, and they have very few good substitutes. When the team has a player injured, the substitute player does not fit into the team's strategies. This may be because of lack of experience or tactical knowledge. The top teams have a greater number of good substitutes,

and they are able to replace the injured player without any effect on the team's style of play.

The result of the set plays analysis showed that the top and the average teams had used similar set pieces but no relationship has been found between the patterns of play at offensive set pieces, and the outcome of each move. It should be noted that the number of attacking set pieces in a match did not give any indication of success for any of the teams, a similar finding to free attacks. It is clear from the results of set plays that as many set plays as possible should end up with a shot, and this is further supported by examining the effectiveness of set plays. Teams had a greater total number of shots on target from set pieces in those matches which were won than in those matches which were lost.

Set plays were found to be a little more successful for top teams than for the poor teams (e.g. team **A** concluded 57 shots on target from set plays during seven home matches, whereas team **D** concluded only 11 shots on target from set plays during the same number of home matches).

There are a number of possible reasons for this:

(i) Individual players: obviously top teams have far more better individual players than poor teams and also top teams have probably utilised their best players in employing these set plays, since such players would have enough skill to perform them successfully.

(ii) Organisation: perhaps top teams are better organised and also more aware of tactical planning in employing set plays than the poor teams and also may be better prepared to cope with these situations.

In the fifth chapter the main purpose was to find out if there were any similar patterns of play for an international team. A further aim

was to find out whether the successful patterns of play that occurred for the international team were the same as those successful patterns of play which were found in Chapter Four for the league teams.

The analysis of patterns of play of the international team during free play has clearly revealed a number of similarities with the patterns of free play of the league teams. In each match the team had a large number of attacking moves. Most of these attacks were similar, and could be classified into distinct patterns of play. There were five distinct patterns of play identified for the international team in home matches which accounted for a very high percentage of all attacks; this number of patterns of play was similar to that for the league teams (4-6).

The international team and the poorer league teams, **D** and **E**, had the same number of successful patterns of play in home matches. One possible explanation for the international team having a lesser number of successful patterns of play than the good league teams is that the international team is composed of players from different teams, who rarely train together or play many matches together unlike the club teams.

It should be noted that the results showed clearly that successful pattern of play appeared more often in those matches which the team won, providing a further indication that to be successful a team needed to use a successful pattern of attack, and to use it frequently; a similar finding was found for the league teams.

The forty-seven patterns of play which were identified earlier in Chapter Four from all five league teams and the five patterns of play identified for the international team were further analysed to find out if they had common features and to investigate if the successful

patterns of play were the same for all of the teams. The successful pattern of play for the international team belonged to cluster 1. Cluster 1 consisted of patterns BA.1, BH.2 and CH.1 for league teams and IH.2 for the international team, and all of these successful patterns had similar common features. All of these moves were initiated from the same location, moved towards the offensive half of the pitch along the right wing, then towards the corner flag with a similar number of passes and dribbling sections and were terminated by a long cross into the penalty area for shooting (see **Figures 4.28** and **5.5**). The least successful patterns of play for the international team were also grouped together with the unsuccessful patterns of play for the league teams into six separate clusters (clusters 5, 6, 7, 8, 9 and 10 in **Figure 5.4**).

One might expect to see the unsuccessful patterns of play for the international team differing from those unsuccessful patterns of play for the league teams, but the results clearly show that there were no differences. This indicated that regardless of whether the team was playing at league or at international level, it would not achieve success by using these patterns of play.

There are a number of possible reasons for the international and league teams having the same successful and unsuccessful patterns of play, these are as follows:

(i) The same players who play for the league teams also play for the international team.

(ii) Often players are playing in the same positions regardless of whether they are playing for the international or a league team.

(iii) An international team will meet together only occasionally and briefly, so the manager does not have sufficient time to build new

strategies and he may ask the players to play their successful club strategies.

It was surprising to find from the shooting analysis that the number of free attacking moves and set pieces in a match did not give any indication of success for the international and league teams. However, in those matches which were won, the teams had a greater total number of shots than in those matches which were lost and there was a greater proportion of attacks producing shots.

It is clear from the above findings that as many free attacks and set pieces as possible should end up with a shot, and this is further supported by examining the accuracy of shooting. For both league teams and the international team, a team had a greater total number of shots on target in those matches which were won than in those matches which were lost. This indicated that teams won matches when they had a large number of shots on target and a greater proportion of attacks producing shots on target regardless of whether the team was playing at league or international level.

Chapter six described the analysis of the defensive strategy of each team against the successful attacking patterns of play already identified. One might think that the top teams, **A** and **B**, and the poor teams, **D** and **E**, would utilise different defensive strategies at home from those utilised in away matches. The results, however, clearly showed that there were similar defensive strategies of play for the top teams in both home and away matches and the poorer teams in both home and away matches. For example, teams **A** and **B** emphasised close marking at home and away, and teams **D** and **E** had similar frequencies of tackling at home and away. Although the results of defensive strategies vary between the better and poorer teams, and

their defensive strategies may be similar, the better teams are more effective in close marking.

The good teams, **A** and **B**, had successful defensive strategies in home and away matches mainly consisting of close marking and tackling. The poorer teams, however, both had the same unsuccessful defensive strategies in home and away matches, their defensive elements mainly consisting of no marking. This indicated that the better teams employed a different repertoire of defensive elements, such as close marking and tackling, and this might explain why they were effective in nullifying the opponents' attacks. There may be a number of possible reasons for top teams being more successful in defensive strategies: for example, they have a greater number of individual, more skilful, experienced and confident players which enable them to tackle and mark attacking players more successfully and they may have analysed opposing teams and rehearsed defensive moves.

It is worthwhile exploring whether there were any differences in the numbers and percentages of goals, shots on target and shots off target conceded by the top and the poorer teams. The results indicated that the top teams had a surprisingly low average number of shots conceded per match (e.g. the team **A** conceded 3.6% and 3.4% of shots per match in home and away respectively) and more than 55% of all shots conceded were off target. The poorer teams, however, had a high average number of shots conceded per match (e.g. the team **D** conceded 6.9% and 10.7% of shots per match in home and away respectively) and more than 64% of all shots conceded were on target.

It is clear from the above discussion that the top teams' defensive strategies in home and away matches were effective in nullifying

successful attacking patterns of play, and they did not concede a large number of shots on target. The results also pointed to close marking being a crucial defensive elements of the best defensive strategies, i.e. teams who marked their opponent players most frequently, succeeded in nullifying successful attacking patterns of play.

7.2 CONCLUSIONS :

This is a new area of research and the study was intended to be as much an exploratory investigation as a provision of conclusive evidence. Nevertheless, a number of statements can be made with confidence whilst others require further research.

Analysis of attacking patterns of play for the league teams :

Analysis of patterns of play for the five league teams showed that there were similarities and dissimilarities between the top and poorer teams. The distinct patterns of play identified for each team in both home and away matches were few in number (between 4 and 6 patterns for each team) and accounted for a very high percentage of all attacks. Top teams, **A** and **B**, had the same number of successful patterns of play in home and away matches. The poorer teams, **D** and **E**, also had the same number of successful patterns of ply in home and away matches but they were fewer in number. Successful patterns of play appeared more often in those matches which teams won.

The top teams, **A** and **B**, applied the same strategies in home and away matches (see **Figures 4.32, 4.33, 4.34** and **4.35** for team **A** and **Figures 4.28, 4.29, 4.30** and **4.31** for team **B**). For the poorer teams, **D** and **E**, strategies were different for home and away matches (see **Figures 4.37** and **4.38**).

The number of attacking moves in a match did not give any indication of success for any of the teams. However, in those matches which were won, the teams had a greater total number of shots than in those matches which were lost and there was a greater ratio of shots to attacks.

The number of attacking set pieces in a match did not give any indication of success for any of the teams, a similar finding to that for free attacks. It is clear from the results of set plays that as many set plays as possible should end up with a shot, and this is further supported by examining the effectiveness of set plays. Teams had a greater total number of shots on target from set pieces in those matches which were won than in those matches which were lost.

Analysis of attacking patterns of play for the international team :

The distinct patterns of play identified for the international team were similar in number to the league teams (between 4 and 6 patterns for each team) and accounted for a very high percentage of all attacks. The international team and the poorer league teams, **D** and **E**, had the same number of successful patterns of play in home matches but they were fewer in number than those successful patterns of play for the top league teams, **A** and **B**. Successful patterns of play appeared more often for the international and league teams in those matches which were won, providing further evidence that to be successful a team needs to use the successful patterns of attack frequently. The international team and league teams, **B** and **C**, had the same successful patterns of play and applied the same strategies.

The number of free attacking moves and set pieces in a match did not give any indication of success for the international team, a similar

finding to that for the league teams. It is clear from the results of free attacks and set plays that as many free attacks and set plays as possible should end up with a shot, and this is further supported by examining the effectiveness of free attacks and set plays. A team had a greater total number of shots on target from free attacks and set pieces in those matches which were won than in those matches which were lost. A team wins when it has a greater number of shots on target and a greater proportion of attacks producing shots regardless of whether the team is playing at international or league level.

Analysis of defensive performance for the league teams :

The top teams employed similar defensive strategies in home and away matches. The poorer teams also had similar defensive strategies in home and away matches. The results clearly pointed to close marking being a crucial element of the best defensive strategies (i.e. teams, who marked their opponent players most frequently, succeeded in nullifying successful attacking patterns of play). Close marking and tackling was used more often by those teams which were successful in their defensive strategies. It is possible that all teams adopt the same strategies, but may be poorer teams do not have the ability to adopt "close marking" as effectively as the better teams. The most common feature of the poorer teams' defensive was the absence of close marking. The top teams, had conceded a lower average number of shots per match than the poorer teams. Less than 46% of the shots conceded by the top teams were on target, whilst more than 64% of those conceded by the poorer teams were on target.

7.3 RECOMMENDATIONS :

The analysis of patterns of play in association football for the league teams and the international team carried out in this study has raised a number of issues for which there is no information presently available and further research is required. Also, some of the techniques employed were being used for the first time and experience has shown where improvements can be made. It is clear from the available literature, which was discussed in chapters one and two, that the need for an objective method of analysing interactive team sports such as soccer is crucial.

It should be noted that the method used in this study involved analysing moves in isolation – for example, an attack was defined to begin when a team gained possession (for example: goal kick, throw-in or free-kick) and continued until either the other team gained possession or the ball went out of play (for example: corner-kick, throw-in or free-kick). Consequently, there may be a number of attacks from the same team which follow on consecutively. It would be of value to develop this technique further to enable sequences of attacks to be analysed. This may reveal more information about the game and could be done with today's advanced technology (i.e., by using a portable computer with a large memory, a researcher could obtain a large amount of data without difficulty). Analysing sequences of attacks may have many advantages from the tactical point of view. For example, when a team gains a corner-kick from a number of attacking moves made consecutively, it would be of value to see whether, and if so, how, this corner-kick could produce a scoring opportunity because of the pressure from the previous sequence of attacking moves. Furthermore, it would be of value to develop a computerised system

for analysing a live game which would provide coaches and managers with comprehensive information revealing weaknesses and strengths of their team and the opponent team as the game progresses. This could be especially useful at half time or in deciding upon substitutions. For example, a team may be shown to have a precise long forward pass during an attack when playing another team which has a weak defence in such a situation. Another team may be very successful in attacking set play situations because its opponent is particularly vulnerable in set plays. If this information were available to coaches and managers during the game, they could plan and reorganise their players to cope with these situations, leading to the likelihood of greater success.

The analysis technique developed, however, must be sufficiently flexible to allow the observations to provide answers to analysis questions with minimal effort. It must be practical – i.e., usable in the many situations in which soccer is played. It should also be flexible enough to provide information retrieval in an easily understandable form on demand. The report of the analysis should be in a form appropriate to the needs of the user. Advances in software programming in recent years should now permit a user friendly system of analysis to be written, based on the work described in this study.

This study is a new area of research which was intended to be as much an exploratory investigation as a provider of conclusive evidence. Nevertheless, a number of statements can be made with confidence whilst others require further research. Analysis of patterns of play for all the teams studied showed that there were few distinct patterns of play identified for each team in both home and away matches (between

4 and 6 patterns for each team). These accounted for a very high percentage of all attacks. It would be of value to see if more patterns of play could be identified when these teams played unfamiliar opponents (e.g., in the European Cup or the Cup Winners Cup competitions).

Also, the results of the analysis of patterns of play for all the teams clearly showed that the most successful patterns of play were those which proceeded along the length of either wing. They provided most scoring and shooting opportunities. Furthermore, it was found that those successful patterns of play appeared more often in those matches which teams won. Therefore, the researcher suggests that managers and coaches plan their own team's tactics accordingly (i.e., emphasising playing along the wings).

The investigator believes that there should be further investigation into these successful patterns of play to see why they have arisen (e.g. they may have arisen because of coaching emphasis: it is possible that teams have repeated these types of patterns in practice more often than others, believing that these patterns fit better into the particular style of play that the team employs). Alternatively, teams may have utilised their best players in creating these patterns, since such players would have enough skill to perform them successfully. There may be other factors, for example, the styles of long and short passes, the weather and the condition of the playing surface. These possible reasons could be examined in various way, for example, by watching the teams during their training sessions, by giving questionnaires to the coaches and manager to hear their views and opinions, by examining the skill and physical condition of those players who are mainly involved in creating the successful patterns of play, and so forth.

The number of attacking moves and set pieces in a match did not give any indication of success for any of the teams. It was shown from the results of set plays and free attacks that in those matches which were won, the teams had a greater total number of shots than in those matches which were lost and there was a greater ratio of shots to attacks. It is clear from the results of set plays and free attacks that as many set plays or free attacks as possible should end up with a shot. This researcher recommends teams should emphasise the practice of shooting during their training sessions and the players should be aware of the importance of accuracy in shooting. It is important to practice all set plays with a view to ending them with a shot on target. Of course, it would be of value to carry out an investigation into shooting analysis to further clarify this point, for example, by examining players for their shooting capability in different teams and at different standards.

The results suggested that all the teams employed similar defensive strategies in home and away matches. It is possible that all teams adopt the same strategies, but perhaps the poorer teams do not have the ability to adopt "close marking" as effectively as the better teams. The results clearly pointed to close marking being a crucial element of the best defensive strategies (i.e. teams, who marked their opponent players most frequently, succeeded in nullifying successful attacking patterns of play). Therefore, the researcher recommends that all teams should employ close marking in their defensive strategies. This can be practised regularly during training sessions by practising man to man marking in various parts of the pitch (i.e., not only should close marking be adopted in their penalty area and in their own half of the pitch but over the whole pitch). This may be particularly beneficial in

the opposition's third of the pitch since **Bate (1988)** has shown that more goals are scored when a team regains possession quickly as the opposition is moving out of defence having just gained possession.

The investigator believes that the results of this study could be helpful to football managers, coaches and players. They could show them how important certain attacking and defending patterns are to the result of a match, and so help them plan their own team's tactics accordingly.

This study will add to the very sparse literature on football, particularly in showing how to assess the success of given attacking patterns of play of professional soccer teams. Hopefully, it will encourage others to follow the same path for further studies. The need for this is crucial, since association football is one of the world's most popular sports both among players and spectators, but one to which the attention of scientists has not been appropriately directed. The tactical aspects of soccer games have been the subject of much speculation but little investigation. The results of this study should give valuable information on the strategies employed by professional soccer teams.

Today's technology provides important opportunities for the teaching and analysis of sport, and the promotion of interest in sport. An analysis of the techniques and tactics of the world's best soccer teams may reveal successful patterns of play and players' movement, it is not clear how much the analysis of players' performance, both positive and negative, can contribute to the advancement of certain aspects of the game. However, it is strongly believed that an analysis with objective methods can make a significant contribution to the game. Analysing various aspects of the game can provide valuable

feedback to the players, coaches and managers to help them to optimise the team's successes and to minimise its failures. Recently there has been an increasing awareness and confidence among football coaches and managers that information from scientific endeavours can contribute both to the understanding and to the solution of the problems that confront them.

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APPENDIX A

APPENDIX A1

A 1:1 The result of Eigenvalues of video analysis technique and of a live match technique in attacking moves.

A 1:2 The result of Eigenvalues of video analysis technique and of a live match technique in a defensive moves.

Appendix A 1:1

A. The result of Eigenvalues of video analysis technique and of a live match technique in free attacking moves.

Variables	Live Technique	Video Technique
1	0.724	0.724
2	0.121	0.121
3	0.786	0.786
4	0.538	0.538
5	0.434	0.434
6	0.298	0.298
7	0.276	0.276
8	0.199	0.199
9	0.120	0.120
10	0.695	0.695
11	0.156	0.156
12	0.709	0.707
13	0.486	0.487
14	0.121	0.119
15	0.246	0.247
16	0.196	0.196
17	0.132	0.132
18	0.862	0.863
19	0.604	0.603
20	0.470	0.470
21	0.334	0.333
22	0.215	0.215
23	0.173	0.174
24	0.122	0.122
25	0.781	0.780
26	0.378	0.376
27	0.205	0.206

Appendix A 1:1

A. Continued.

Variables	Live Technique	Video Technique
28	0.272	0.274
29	-0.258	-0.258
30	-0.955	-0.956
31	-0.136	-0.136
32	-0.238	-0.236
33	-0.407	-0.407
34	-0.463	-0.463
35	-0.705	-0.705
36	-0.124	-0.124
37	-0.131	-0.132
38	-0.381	-0.381
39	-0.480	-0.480
40	-0.132	-0.131
41	-0.186	-0.185
42	-0.214	-0.214
43	-0.527	-0.527
44	-0.626	-0.626
45	-0.886	-0.886
46	-0.217	-0.217
47	-0.464	-0.464
48	-0.122	-0.122

Appendix A 1:1

B. The result of Eigenvalues of video analysis technique and a live match technique of corner-kicks in attacking moves.

Variables	Live Technique	Video Technique
1	0.692	0.695
2	0.120	0.119
3	0.101	0.100
4	0.391	0.391
5	0.175	0.175
6	0.150	0.147
7	0.124	0.125
8	0.584	0.584
9	0.375	0.377
10	0.165	0.165
11	0.124	0.121
12	0.434	0.434
13	0.175	0.176
14	-0.622	-0.622
15	-0.503	-0.503
16	-0.281	-0.283
17	-0.408	-0.408
18	-0.928	-0.927
19	-0.100	-0.100
20	-0.135	-0.135
21	-0.210	-0.211
22	-0.362	-0.362
23	-0.684	-0.683

Appendix A 1:1

C. The result of Eigenvalues for video analysis technique and a live match technique of throw-ins in attacking moves.

Variables	Live Technique	Video Technique
1	0.557	0.555
2	0.676	0.676
3	0.612	0.611
4	0.241	0.240
5	0.232	0.232
6	0.187	0.186
7	0.140	0.140
8	0.118	0.118
9	0.106	0.105
10	0.869	0.870
11	0.799	0.799
12	0.724	0.724
13	0.699	0.697
14	0.600	0.600
15	0.527	0.527
16	0.457	0.456
17	0.428	0.428
18	0.362	0.362
19	0.334	0.333
20	0.315	0.315
21	0.273	0.271
22	0.244	0.244
23	0.199	0.199
24	0.192	0.191
25	0.179	0.179
26	0.157	0.157

Appendix A 1:1

C. Continued.

Variables	Live Technique	Video Technique
27	0.148	0.146
28	0.140	0.140
29	0.131	0.131
30	0.107	0.106
31	0.103	0.103
32	0.929	0.929
33	0.726	0.725
34	0.642	0.642
35	0.515	0.515
36	0.446	0.445
37	0.363	0.363
38	0.317	0.316
39	0.168	0.168
40	0.107	0.107
41	0.626	0.626
42	-0.240	-0.241
43	-0.386	-0.385
44	-0.928	-0.928
45	-0.119	-0.119
46	-0.153	-0.154
47	-0.196	-0.196
48	-0.242	-0.242
49	-0.349	-0.349
50	-0.419	-0.419
51	-0.521	-0.521
52	-0.554	-0.555
53	-0.580	-0.581
54	-0.570	-0.570
55	-0.863	-0.862

Appendix A 1:1

C. Continued.

Variables	Live Technique	Video Technique
56	-0.875	-0.875
57	-0.103	-0.102
58	-0.107	-0.107
59	-0.121	-0.120
60	-0.125	-0.125
61	-0.137	-0.135
62	-0.164	-0.166
63	-0.175	-0.173
64	-0.182	-0.180
65	-0.221	-0.221
66	-0.237	-0.237
67	-0.239	-0.239
68	-0.278	-0.277
69	-0.302	-0.300
70	-0.332	-0.332
71	-0.381	-0.381
72	-0.428	-0.427
73	-0.448	-0.445
74	-0.474	-0.473
75	-0.498	-0.498
76	-0.595	-0.595
77	-0.672	-0.672
78	-0.912	-0.912
79	-0.961	-0.961
80	-0.118	-0.118
81	-0.177	-0.176
82	-0.202	-0.202
83	-0.230	-0.231
84	-0.673	-0.673

Appendix A 1:1

D. The result of Eigenvalues of video analysis technique and a live match technique of free-kicks in attacking moves.

Variables	Live Technique	Video Technique
1	0.983	0.981
2	0.403	0.403
3	0.345	0.345
4	0.155	0.154
5	0.134	0.133
6	0.111	0.111
7	0.999	0.999
8	0.673	0.675
9	0.603	0.603
10	0.543	0.543
11	0.421	0.421
12	0.362	0.361
13	0.308	0.308
14	0.245	0.244
15	0.220	0.220
16	0.179	0.179
17	0.152	0.152
18	0.136	0.135
19	0.118	0.118
20	0.946	0.946
21	0.619	0.619
22	0.543	0.544
23	0.396	0.396
24	-0.222	-0.222
25	-0.117	-0.117
26	-0.253	-0.252

Appendix A 1:1

D. Continued.

Variables	Live Technique	Video Technique
27	-0.280	-0.280
28	-0.322	-0.322
29	-0.368	-0.368
30	-0.737	-0.737
31	-0.160	-0.160
32	-0.254	-0.254
33	-0.374	-0.374
34	-0.438	-0.438
35	-0.589	-0.588
36	-0.679	-0.679
37	-0.787	-0.787
38	-0.886	-0.886
39	-0.113	-0.113
40	-0.128	-0.128
41	-0.130	-0.130
42	-0.159	-0.159
43	-0.176	-0.176
44	-0.219	-0.219
45	-0.253	-0.255
46	-0.287	-0.287
47	-0.311	-0.311
48	-0.387	-0.387
49	-0.408	-0.410
50	-0.567	-0.567
51	-0.594	-0.593
52	-0.905	-0.905
53	-0.163	-0.163

Appendix A 1:2

A. The result of Eigenvalues of video analysis technique and of a live match technique in a defensive moves.

Variables	Live Technique	Video Technique
1	0.107	0.107
2	0.734	0.734
3	0.425	0.426
4	0.126	0.126
5	0.833	0.832
6	0.556	0.556
7	0.396	0.397
8	0.309	0.309
9	0.255	0.256
10	0.150	0.151
11	0.132	0.131
12	0.100	0.102
13	0.506	0.506
14	0.466	0.466
15	0.167	0.167
16	0.624	0.624
17	0.131	0.132
18	0.104	0.104
19	0.506	0.505
20	0.466	0.466
21	0.167	0.167
22	0.624	0.625
23	0.153	0.153
24	0.970	0.970
25	0.451	0.451
26	0.748	0.748
27	0.894	0.894

Appendix A 1:2

A. Continued.

Variables	Live Technique	Video Technique
28	0.451	0.450
29	-0.748	-0.748
30	-0.895	-0.895
31	-0.182	-0.182
32	-0.201	-0.201
33	-0.369	-0.370
34	-0.461	-0.461
35	-0.116	-0.116
36	-0.165	-0.165
37	-0.121	-0.121
38	-0.581	-0.581
39	-0.160	-0.160
40	-0.154	-0.154
41	-0.428	-0.428
42	-0.118	-0.118
43	-0.325	-0.325
44	-0.226	-0.227
45	-0.387	-0.387
46	-0.115	-0.115
47	-0.150	-0.150
48	-0.189	-0.189
49	-0.277	-0.276
50	-0.929	-0.929
51	-0.694	-0.694
52	-0.366	-0.366
53	-0.303	-0.303
54	-0.203	-0.203
55	-0.467	-0.467

Appendix A 1:2

B. The result of Eigenvalues of video analysis technique and a live match technique of corner-kicks in defensive moves.

Variables	Live Technique	Video Technique
1	0.140	0.140
2	0.350	0.350
3	0.891	0.891
4	0.479	0.479
5	0.678	0.678
6	0.503	0.503
7	0.406	0.406
8	0.191	0.191
9	0.274	0.274
10	0.128	0.128
11	0.630	0.630
12	0.341	0.341
13	-0.469	-0.469
14	-0.342	-0.342
15	-0.153	-0.153
16	-0.663	-0.663
17	-0.833	-0.833
18	-0.644	-0.644
19	-0.327	-0.328
20	-0.303	-0.303
21	-0.891	-0.891

Appendix A 1:2

C. The result of Eigenvalues for video analysis technique and a live match technique of throw-ins in defensive moves.

Variables	Live Technique	Video Technique
1	0.222	0.222
2	0.191	0.191
3	0.474	0.474
4	0.422	0.422
5	0.154	0.154
6	0.548	0.547
7	0.663	0.663
8	0.140	0.140
9	0.189	0.189
10	0.205	0.204
11	0.307	0.307
12	0.647	0.647
13	0.502	0.502
14	0.278	0.278
15	0.465	0.465
16	0.308	0.308
17	0.876	0.876
18	0.459	0.459
19	0.115	0.115
20	0.417	0.417
21	0.138	0.138
22	0.543	0.543
23	0.643	0.643
24	0.149	0.149
25	0.262	0.262
26	0.305	0.304

Appendix A 1:2

C. Continued.

Variables	Live Technique	Video Technique
27	0.743	0.743
28	0.546	0.546
29	0.444	0.444
30	0.201	0.201
31	0.243	0.243
32	0.155	0.154
33	0.351	0.351
34	-0.342	-0.341
35	-0.187	-0.187
36	-0.222	-0.222
37	-0.532	-0.532
38	-0.137	-0.137
39	-0.321	-0.321
40	-0.432	-0.432
41	-0.128	-0.128
42	-0.574	-0.573
43	-0.745	-0.745
44	-0.123	-0.123
45	-0.342	-0.343
46	-0.867	-0.867
47	-0.354	-0.354
48	-0.443	-0.442
49	-0.654	-0.655
50	-0.121	-0.121
51	-0.311	-0.311
52	-0.449	-0.449
53	-0.342	-0.342
54	-0.185	-0.185
55	-0.267	-0.266

Appendix A 1:2

C. Continued.

Variables	Live Technique	Video Technique
56	-0.734	-0.734
57	-0.114	-0.114
58	-0.366	-0.366
59	-0.359	-0.359
60	-0.479	-0.479
61	-0.350	-0.350
62	-0.890	-0.890
63	-0.647	-0.647
64	-0.333	-0.333
65	-0.501	-0.501
66	-0.308	-0.308
67	-0.662	-0.662
68	-0.439	-0.439
69	-0.195	-0.195
70	-0.501	-0.502
71	-0.125	-0.125
72	-0.663	-0.663
73	-0.131	-0.131
74	-0.221	-0.221
75	-0.891	-0.891
76	-0.437	-0.436
77	-0.307	-0.307
78	-0.254	-0.254
79	-0.113	-0.113
80	-0.228	-0.228
81	-0.231	-0.231
82	-0.443	-0.443
83	-0.532	-0.532
84	-0.321	-0.321
85	-0.130	-0.130
86	-0.432	-0.432

Appendix A 1:2

D. The result of Eigenvalues of video analysis technique and a live match technique of free-kicks in defensive moves.

Variables	Live Technique	Video Technique
1	0.245	0.245
2	0.111	0.111
3	0.633	0.633
4	0.321	0.321
5	0.113	0.113
6	0.432	0.432
7	0.543	0.543
8	0.334	0.333
9	0.187	0.187
10	0.419	0.419
11	0.333	0.333
12	0.165	0.165
13	0.287	0.288
14	0.157	0.157
15	0.118	0.118
16	0.161	0.161
17	0.770	0.770
18	0.789	0.789
19	0.453	0.453
20	0.193	0.193
21	0.875	0.875
22	0.321	0.321
23	0.119	0.119
24	0.111	0.110
25	0.332	0.332
26	0.543	0.543
27	0.765	0.765

Appendix A 1:2

D. Continued.

Variables	Live Technique	Video Technique
28	-0.457	-0.457
29	-0.985	-0.985
30	-0.113	-0.113
31	-0.543	-0.543
32	-0.666	-0.666
33	-0.453	-0.453
34	-0.187	-0.188
35	-0.349	-0.349
36	-0.133	-0.133
37	-0.556	-0.556
38	-0.431	-0.431
39	-0.654	-0.654
40	-0.333	-0.333
41	-0.578	-0.578
42	-0.252	-0.253
43	-0.337	-0.337
44	-0.121	-0.121
45	-0.311	-0.311
46	-0.435	-0.435
47	-0.197	-0.198
48	-0.122	-0.122
49	-0.341	-0.341
50	-0.452	-0.452
51	-0.151	-0.151

APPENDIX A2

A 2:1 List of results for all the teams.

A 2:2 Graphs of patterns of play for all the teams.

A 2:3 Abbreviations of patterns of play for all the teams.

A 2:4 Patterns of play for all the teams.

A 2:5 Set plays results for all the teams.

APPENDIX A2:1

No. of matches and results for all the teams.

1 No. of atches and results of the team A.

2 No. of matches and results of the team B.

3 No. of matches and results of the team C.

4 No. of matches and results of the team D.

5 No. of matches and results of the team E.

Appendix A 2:1

1. Matches and results of the team A in which their attacking moves were analysed.

Team A

Opponent	Home	Away
B	1 - 2 0 - 0	0 - 0 2 - 1
C	3 - 0	1 - 1 2 - 1
D	4 - 0 1 - 0	1 - 2 4 - 0
E	3 - 2 2 - 0	1 - 0 2 - 0

Appendix A 2:1

2. Matches and results of the team B in which their attacking moves were analysed.

Team B

Opponent	Home	Away
A	0 - 0 1 - 2	2 - 1 0 - 0
C	1 - 3 1 - 0	1 - 1 2 - 0
D	1 - 0	0 - 0
E	3 - 0 0 - 0	1 - 4 2 - 1

Appendix A 2:1

3. Matches and results of the team C in which their attacking moves were analysed.

Team C

Opponent	Home	Away
A	1 - 1 1 - 2	0 - 3
B	1 - 1 0 - 2	3 - 1 0 - 1
D	5 - 0 2 - 0	1 - 0 1 - 6
E	3 - 1 4 - 2	3 - 0 6 - 0

Appendix A 2:1

4. Matches and results of the team D in which their attacking moves were analysed.

Team D

Opponent	Home	Away
A	2 - 1 0 - 4	0 - 4 0 - 1
B	0 - 0	0 - 1
C	0 - 1 6 - 1	0 - 5 0 - 2
E	0 - 0 0 - 1	0 - 0 0 - 1

Appendix A 2:1

5. Matches and results of the team E in which their attacking moves were analysed.

Team E

Opponent	Home	Away
A	0 - 1	2 - 3
	0 - 2	0 - 2
B	4 - 1	0 - 3
	1 - 2	0 - 0
C	0 - 3	1 - 3
	0 - 6	2 - 4
D	0 - 0	0 - 0
	1 - 0	1 - 0

APPENDIX A 2:2

Graphs of patterns of play in home and in away matches for all the teams.

1 Graphs of patterns of play in home and in away matches for team A.

2 Graphs of patterns of play in home and in away matches for team B.

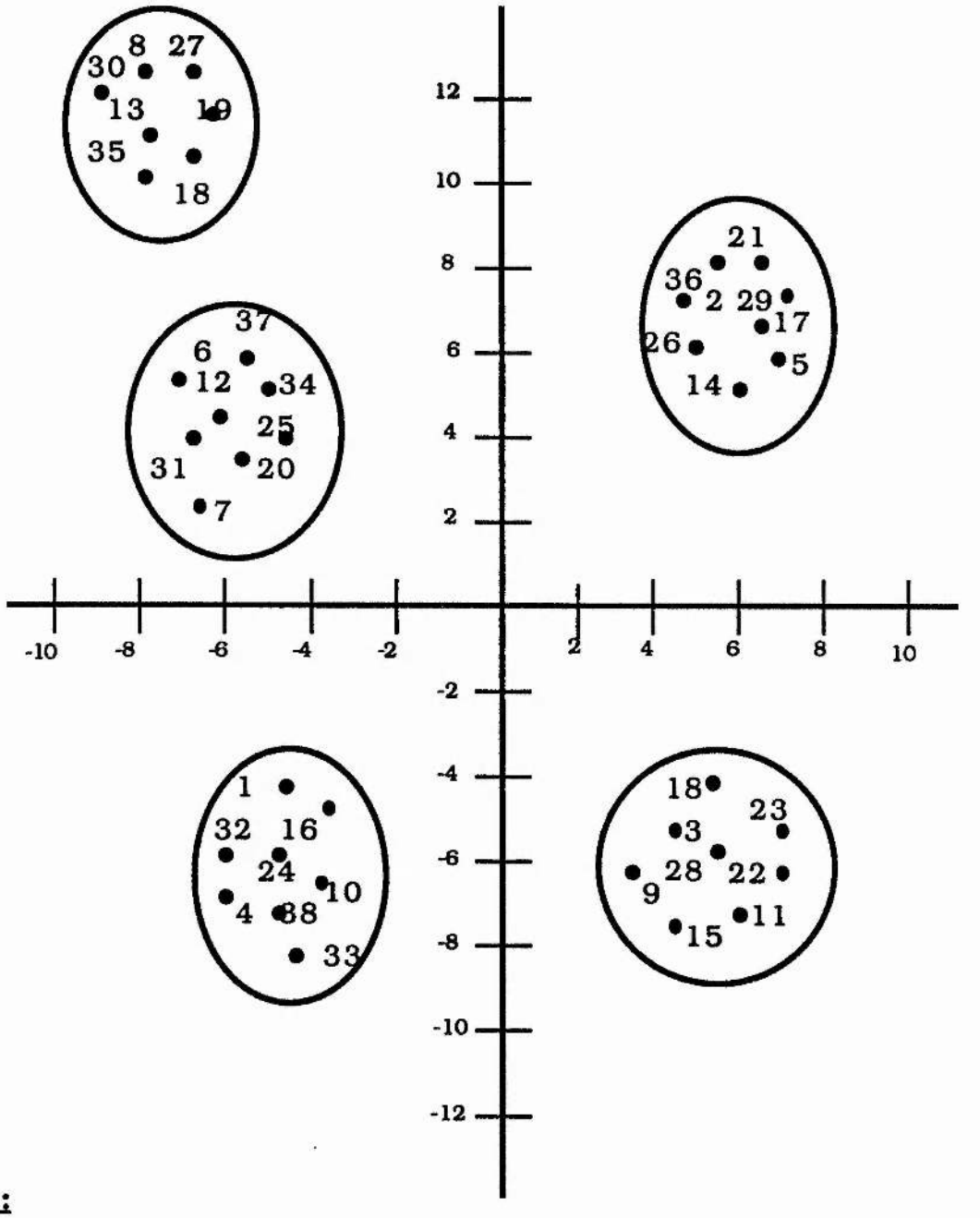
3 Graphs of patterns of play in home and in away matches for team C.

4 Graphs of patterns of play in home and in away matches for team D.

5 Graphs of patterns of play in home and in away matches for team E.

Appendix A 2:2

(A) Example of a graph, showing attacking movements; the five clusters represent similar movement patterns of play, for team A in home matches.

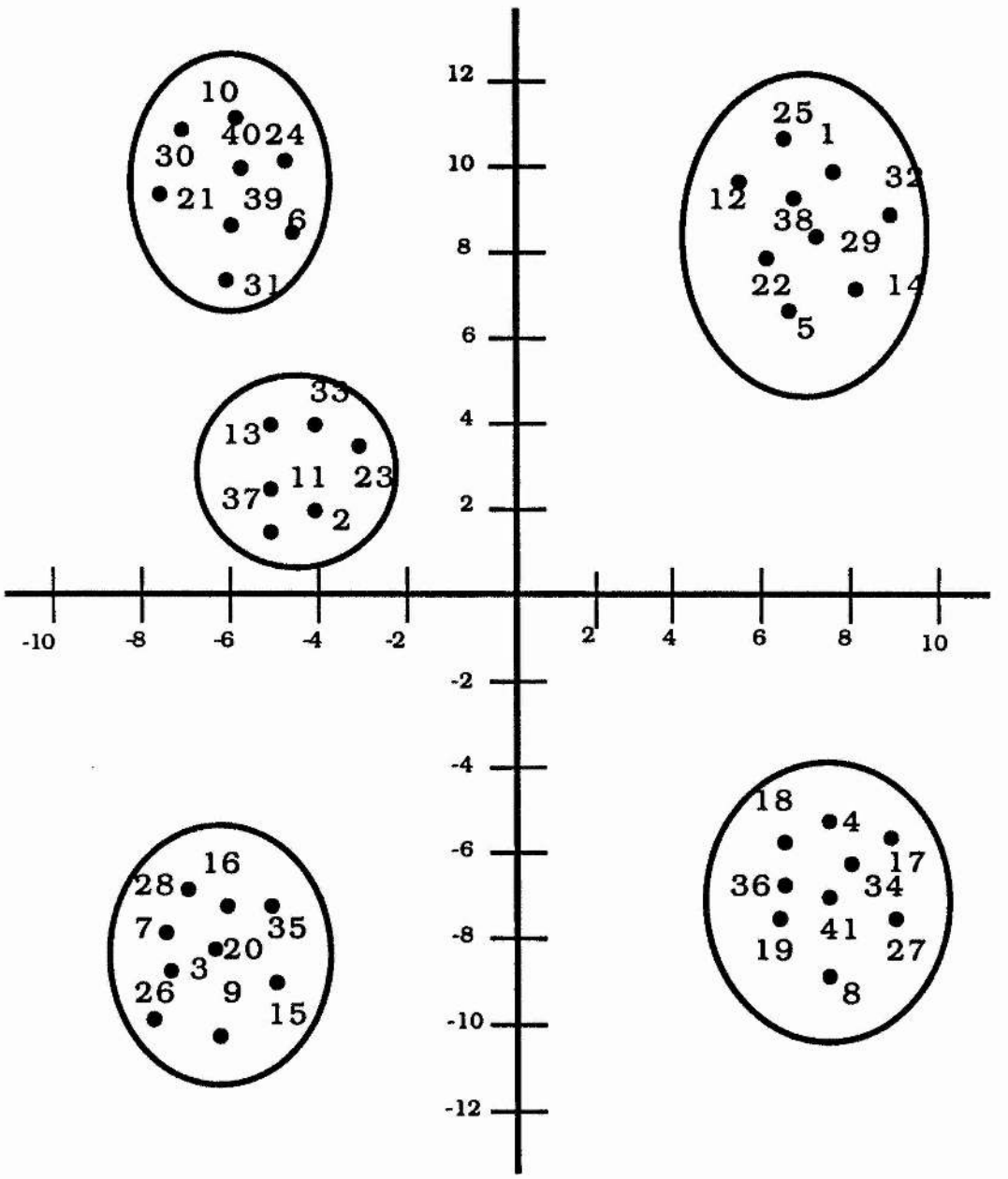


Note :

- **Moves within a cluster demonstrating a pattern of play.**

Appendix A 2:2

(B) Example of a graph, showing attacking movements; the five clusters represent similar movement patterns of play, for team A in away matches.

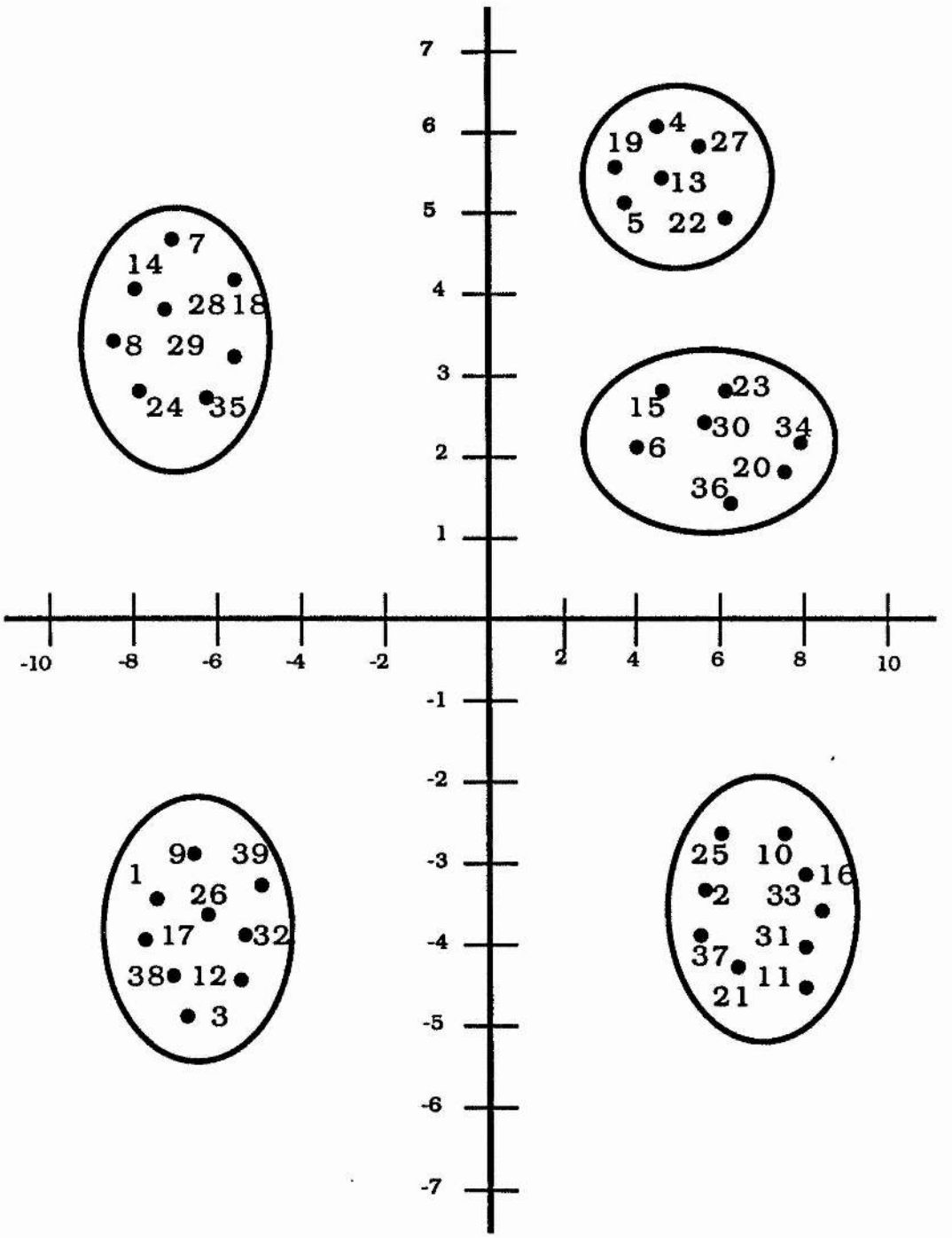


Note :

- **Moves within a cluster demonstrating a pattern of play.**

Appendix A 2:2

(A) Example of a graph, showing attacking movements; the five clusters represent similar movement patterns of play, for team B in home matches.

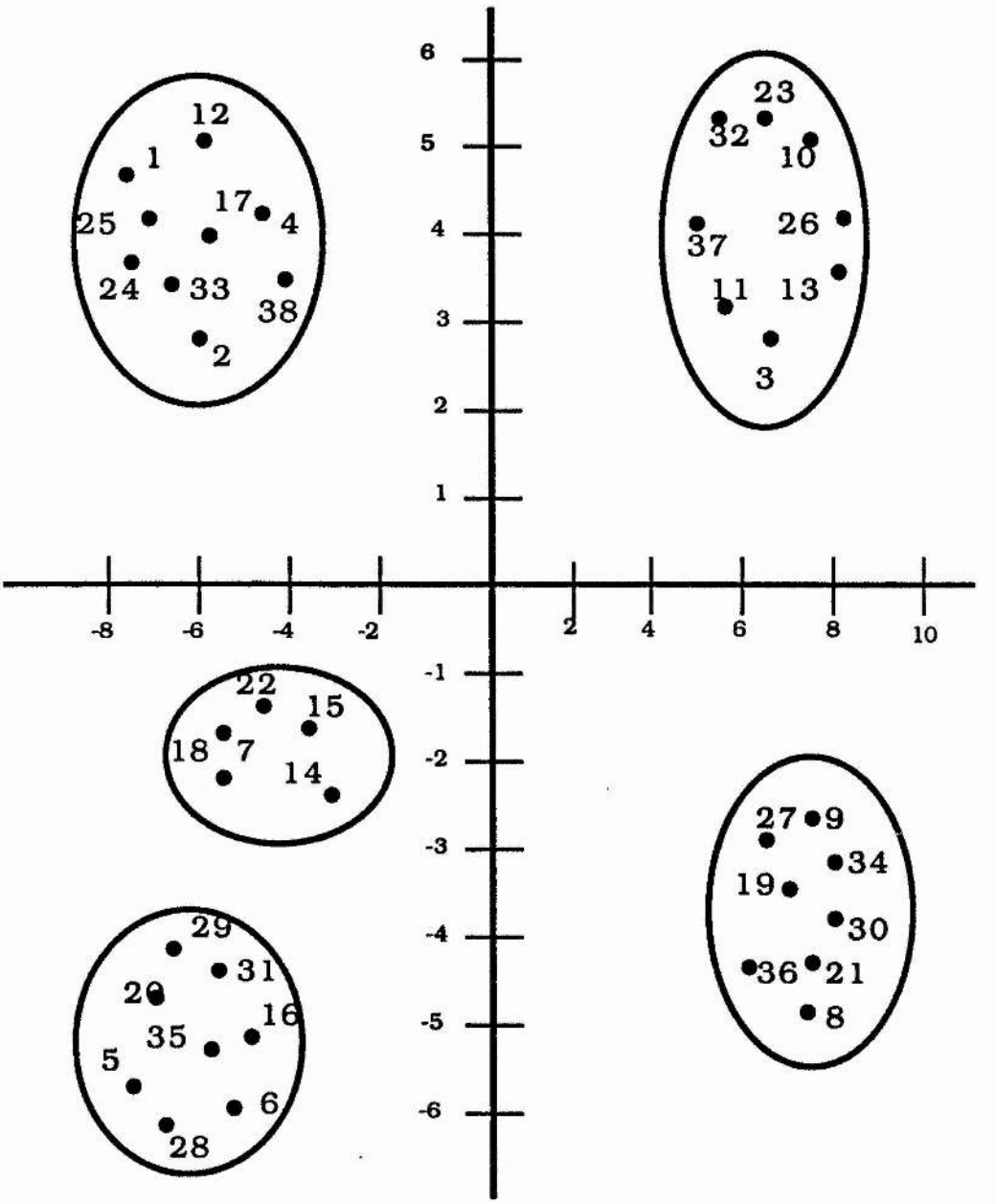


Note :

- **Moves within a cluster demonstrating a pattern of play.**

Appendix A 2:2

(B) Example of a graph, showing attacking movements; the five clusters represent similar movement patterns of play, for team B in away matches.

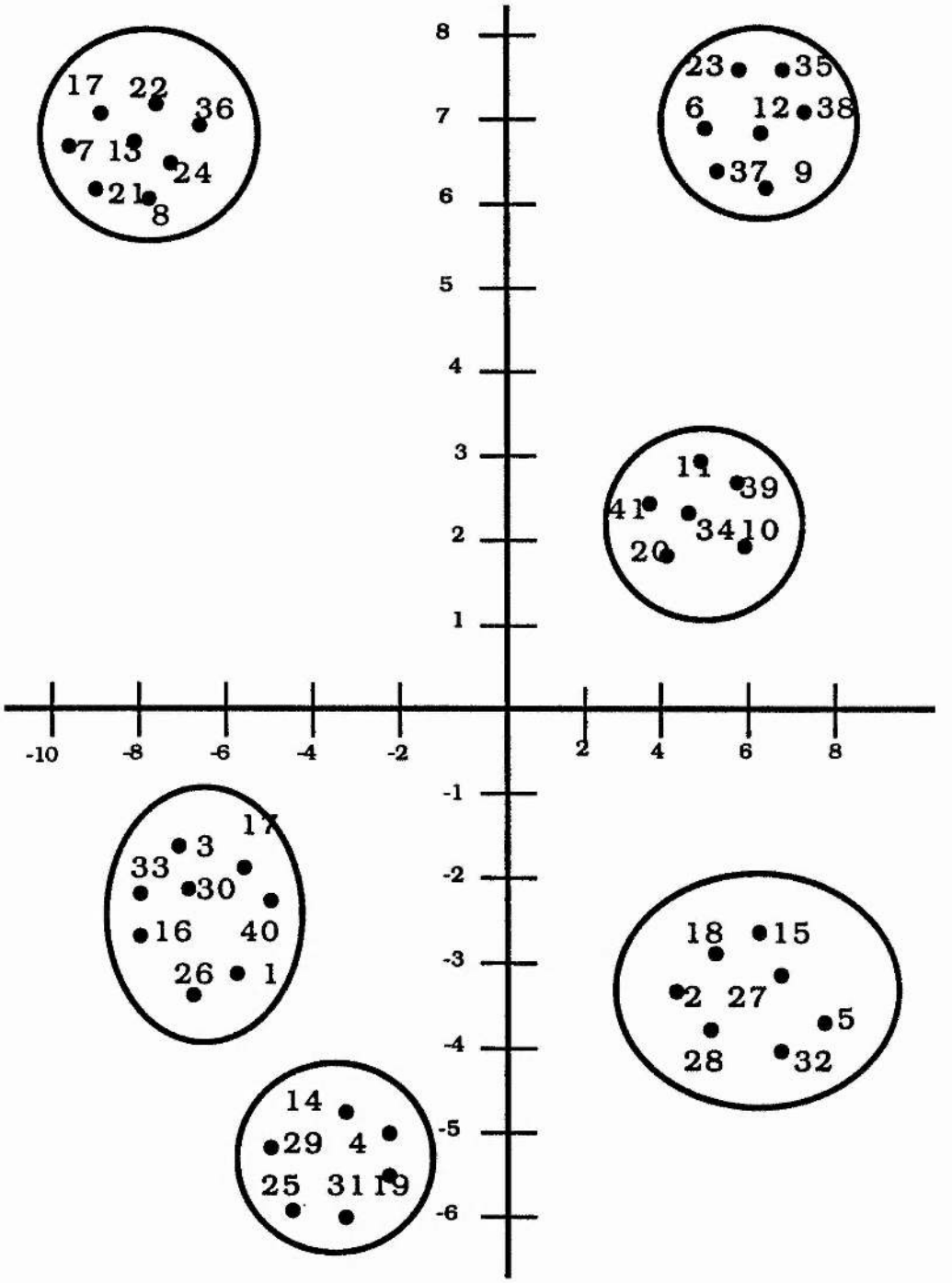


Note :

- **Moves within a cluster demonstrating a pattern of play.**

Appendix A 2:2

(A) Example of a graph, showing attacking movements; the five clusters represent similar movement patterns of play, for team C in home matches.

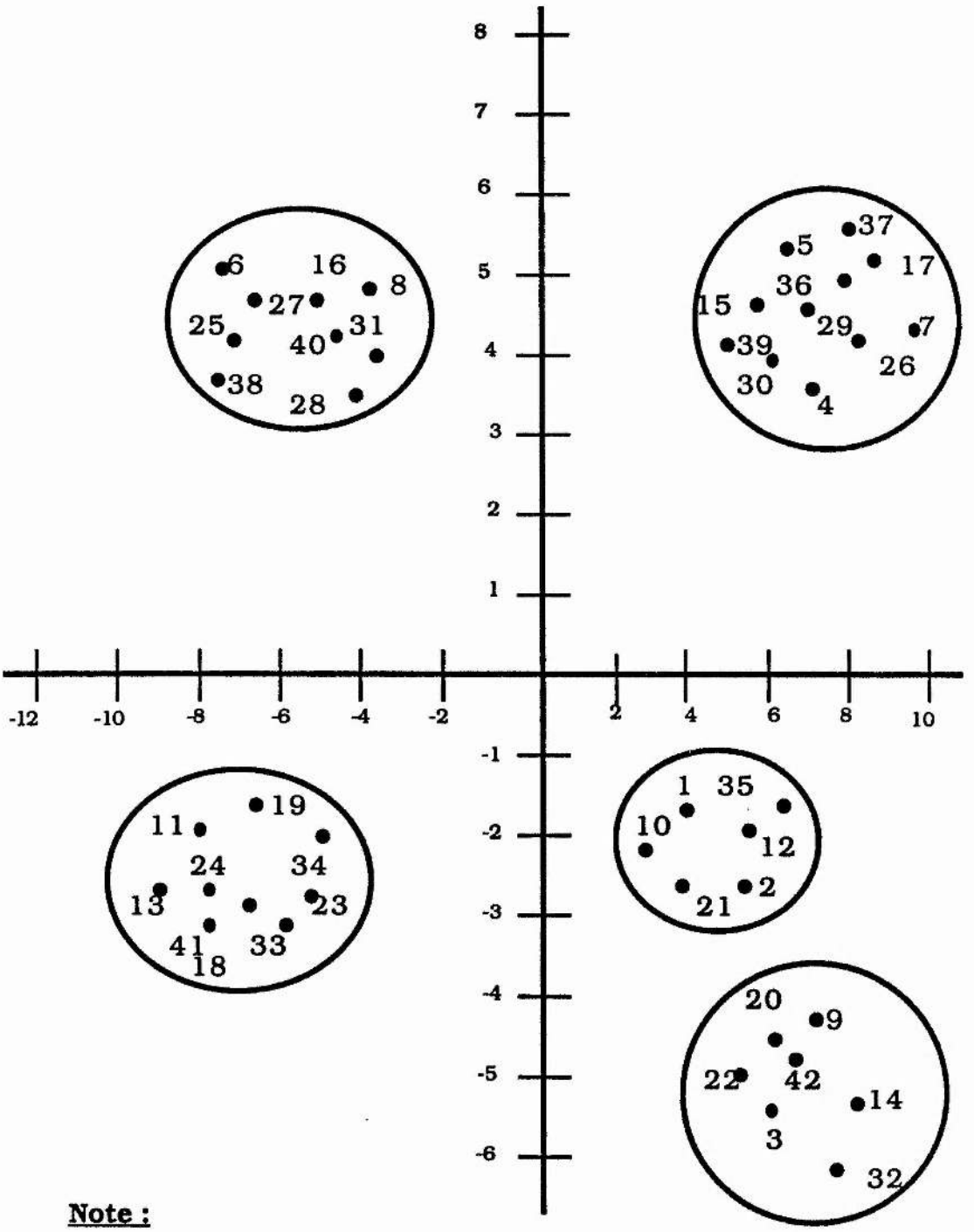


Note :

- **Moves within a cluster demonstrating a pattern of play.**

Appendix A 2:2

(B) Example of a graph, showing attacking movements; the five clusters represent similar movement patterns of play, for team C in away matches.

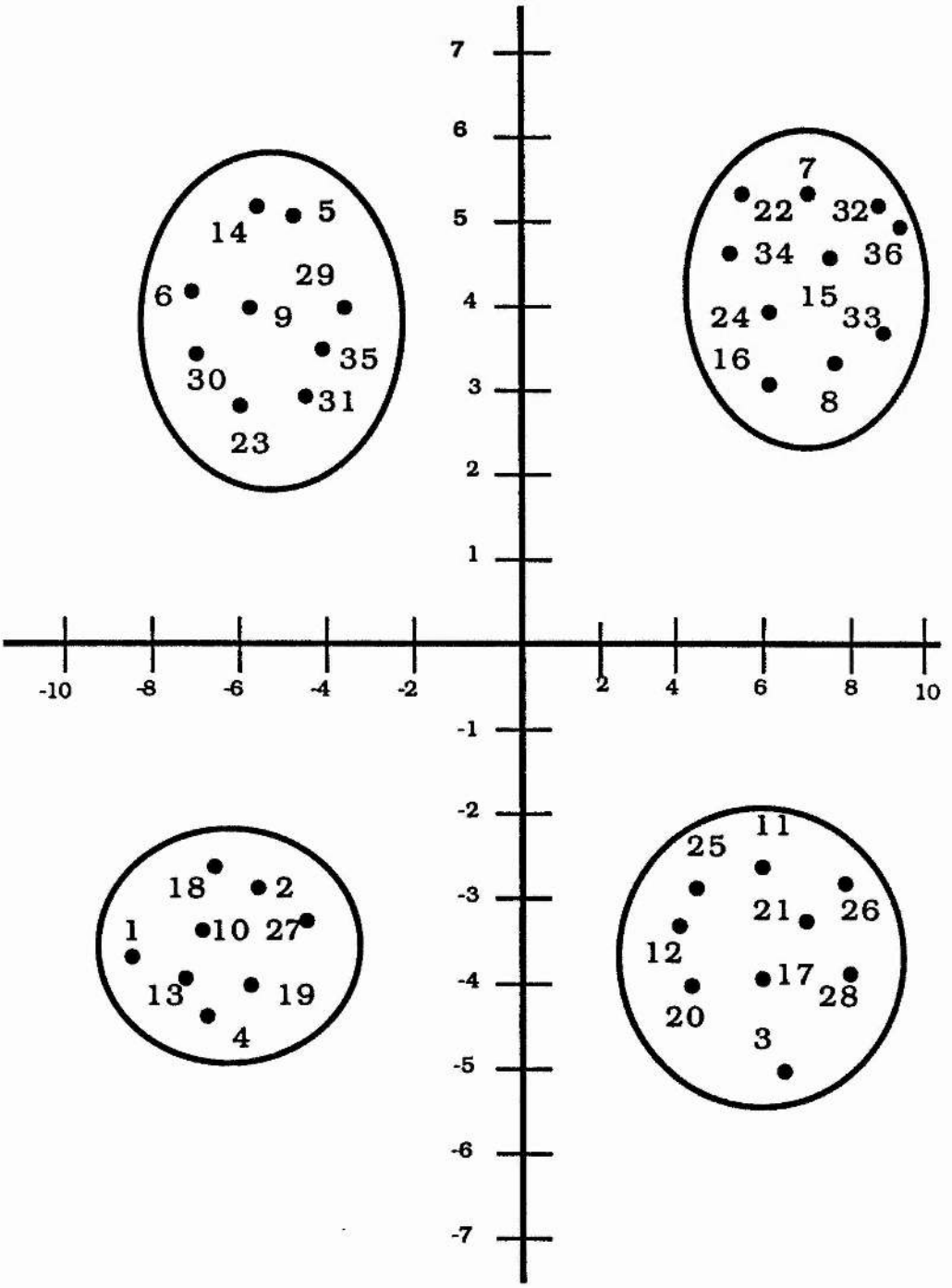


Note :

- **Moves within a cluster demonstrating a pattern of play.**

Appendix A 2:2

(A) Example of a graph, showing attacking movements; the four clusters represent similar movement patterns of play, for team D in home matches.

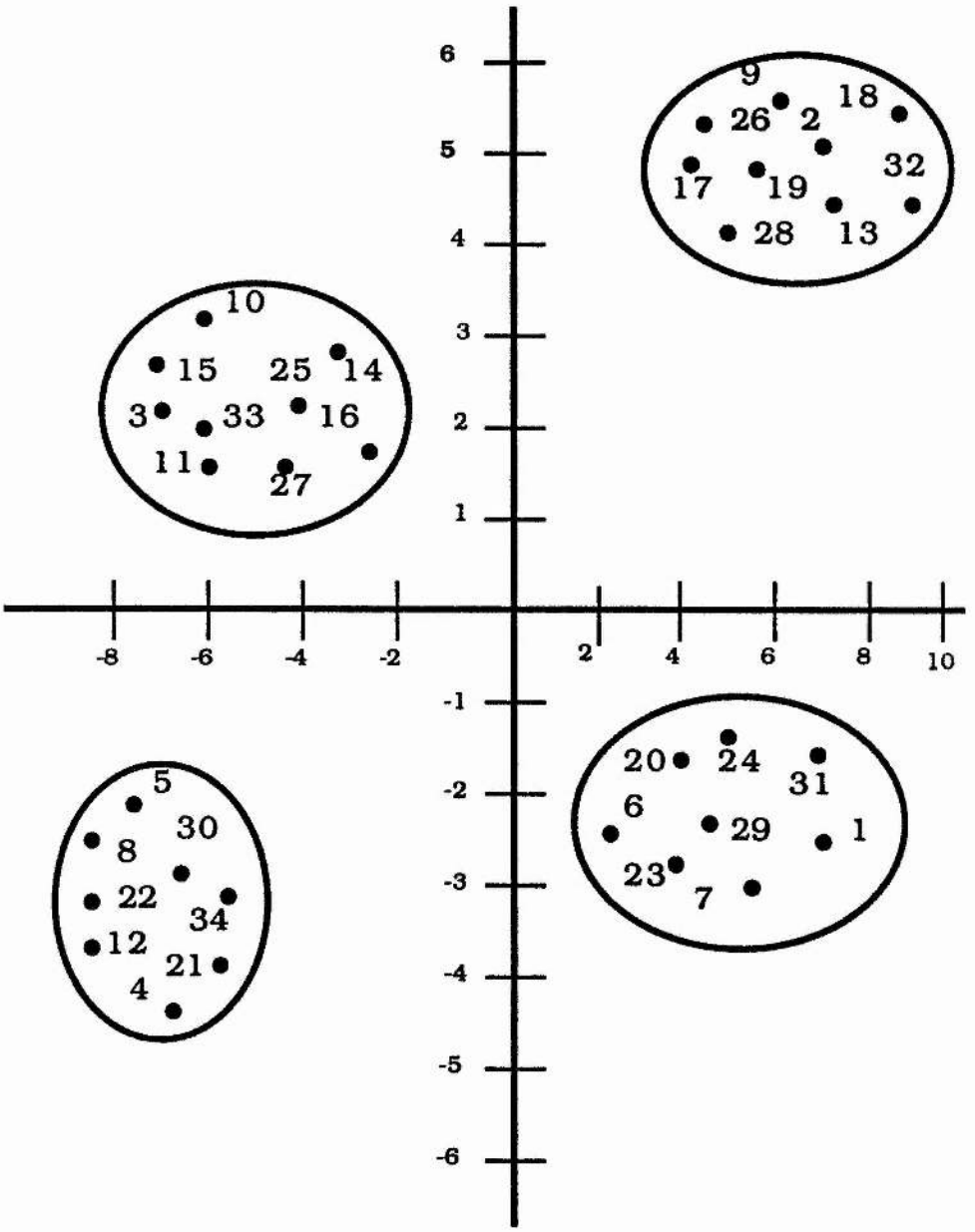


Note :

- **Moves within a cluster demonstrating a pattern of play.**

Appendix A 2:2

(B) Example of a graph, showing attacking movements; the four clusters represent similar movement patterns of play, for team D in away matches.

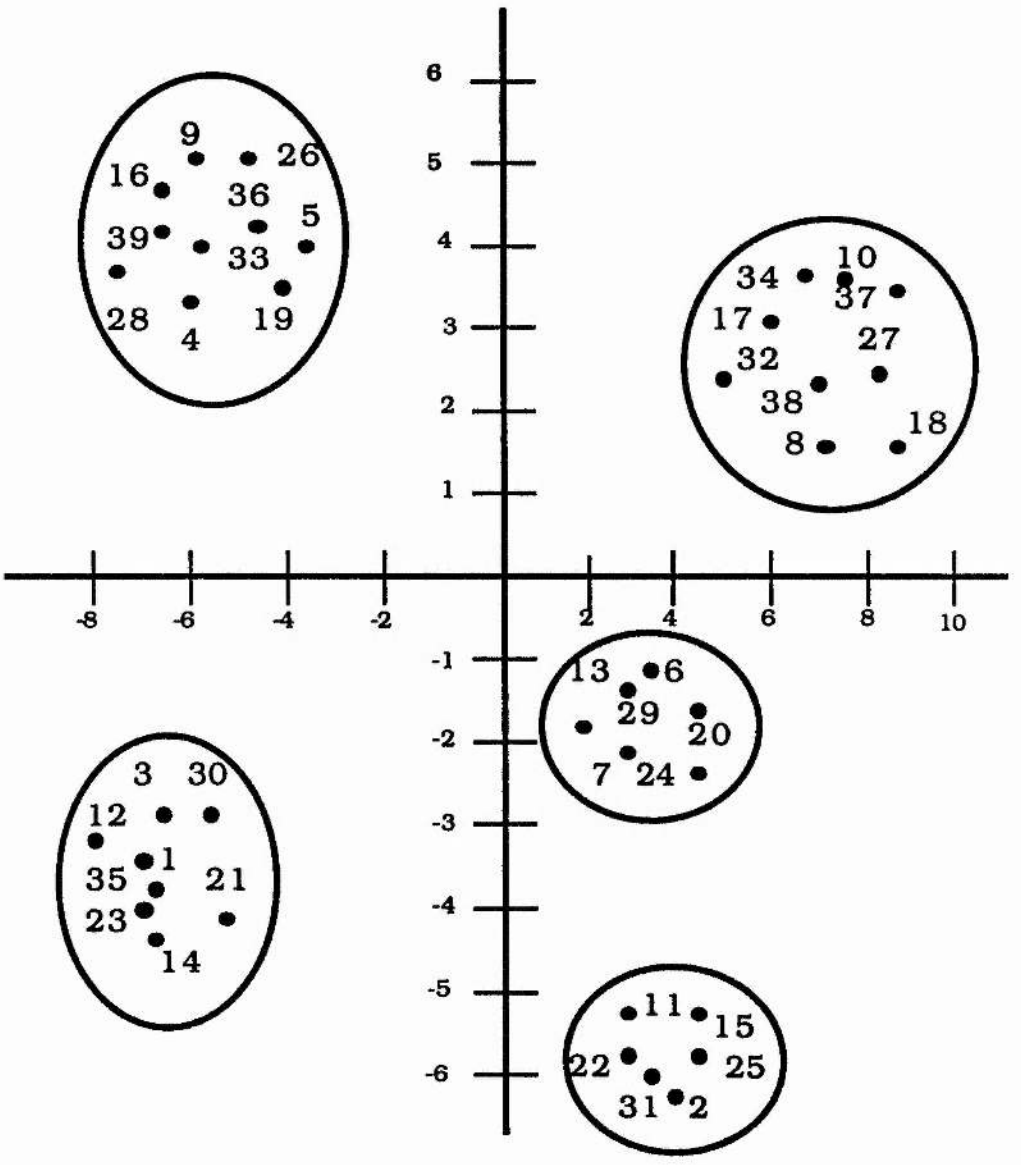


Note :

- **Moves within a cluster demonstrating a pattern of play.**

Appendix A 2:2

(A) Example of a graph, showing attacking movements; the five clusters represent similar movement patterns of play, for team E in home matches.

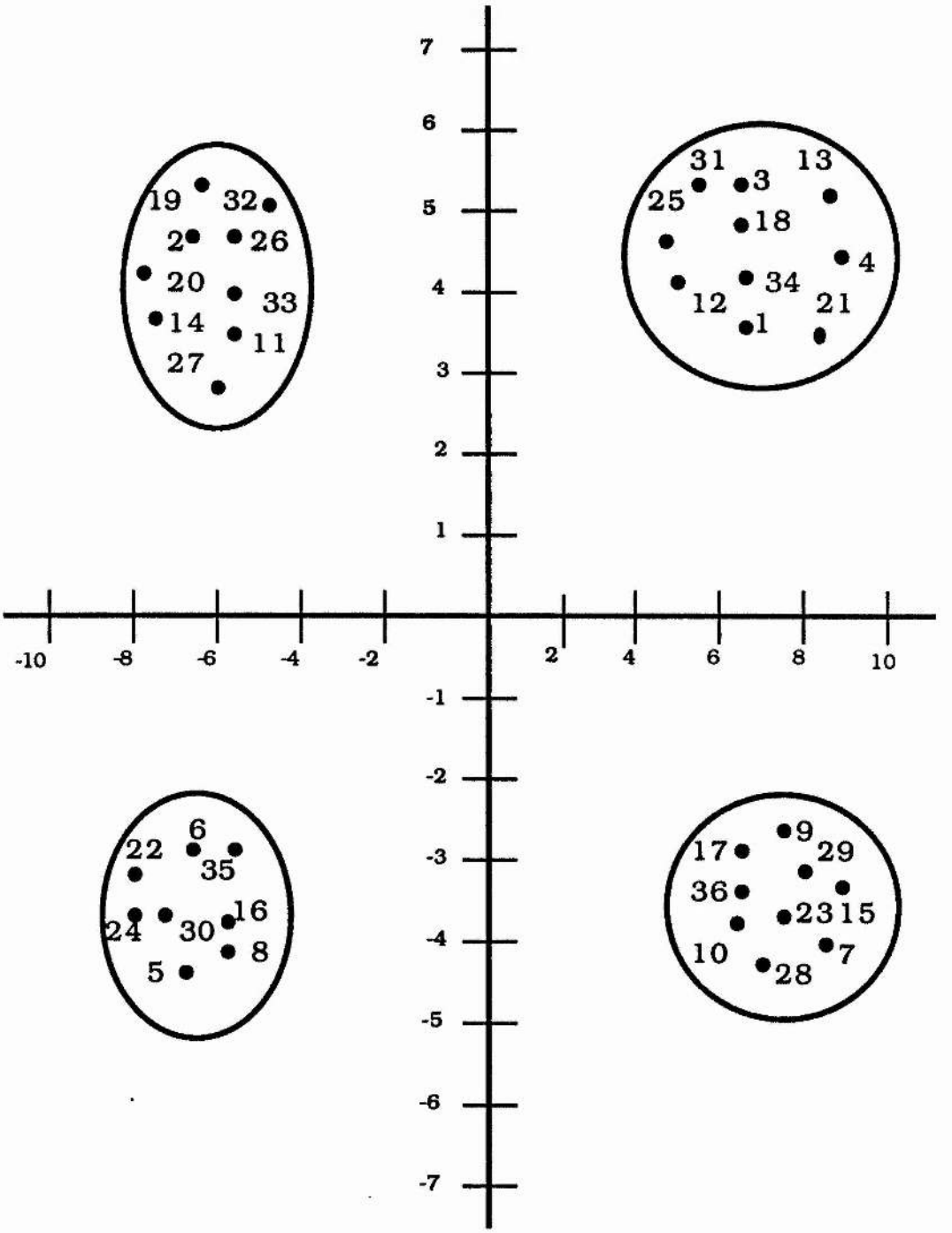


Note :

- **Moves within a cluster demonstrating a pattern of play.**

Appendix A 2:2

(B) Example of a graph, showing attacking movements; the four clusters represent similar movement patterns of play, for team E in away matches.



Note :

- **Moves within a cluster demonstrating a pattern of play.**

APPENDIX A 2:3

Abbreviations of patterns of play for all the teams.

Team A

Pattern AH.1 : Pattern one for team A at home.
Pattern AH.2 : Pattern two for team A at home.
Pattern AH.3 : Pattern three for team A at home.
Pattern AH.4 : Pattern four for team A at home.
Pattern AH.5 : Pattern five for team A at home.

Pattern AA.1 : Pattern one for team A in away.
Pattern AA.2 : Pattern two for team A in away.
Pattern AA.3 : Pattern three for team A in away.
Pattern AA.4 : Pattern four for team A in away.
Pattern AA.5 : Pattern five for team A in away.

Team B

Pattern BH.1 : Pattern one for team B at home.
Pattern BH.2 : Pattern two for team B at home.
Pattern BH.3 : Pattern three for team B at home.
Pattern BH.4 : Pattern four for team B at home.
Pattern BH.5 : Pattern five for team B at home.

Pattern BA.1 : Pattern one for team B in away.
Pattern BA.2 : Pattern two for team B in away.
Pattern BA.3 : Pattern three for team B in away.
Pattern BA.4 : Pattern four for team B in away.
Pattern BA.5 : Pattern five for team B in away.

Team C

Pattern CH.1 : Pattern one for team C at home.
Pattern CH.2 : Pattern two for team C at home.
Pattern CH.3 : Pattern three for team C at home.
Pattern CH.4 : Pattern four for team C at home.
Pattern CH.5 : Pattern five for team C at home.

Pattern CA.1 : Pattern one for team C in away.
Pattern CA.2 : Pattern two for team C in away.
Pattern CA.3 : Pattern three for team C in away.
Pattern CA.4 : Pattern four for team C in away.
Pattern CA.5 : Pattern five for team C in away.

APPENDIX A 2:3

Abbreviations of patterns of play for all the teams.

Team D

Pattern DH.1 : Pattern one for team D at home.
Pattern DH.2 : Pattern two for team D at home.
Pattern DH.3 : Pattern three for team D at home.
Pattern DH.4 : Pattern four for team D at home.

Pattern DA.1 : Pattern one for team D in away.
Pattern DA.2 : Pattern two for team D in away.
Pattern DA.3 : Pattern three for team D in away.
Pattern DA.4 : Pattern four for team D in away.

Team E

Pattern EH.1 : Pattern one for team E at home.
Pattern EH.2 : Pattern two for team E at home.
Pattern EH.3 : Pattern three for team E at home.
Pattern EH.4 : Pattern four for team E at home.
Pattern EH.5 : Pattern five for team E at home.

Pattern EA.1 : Pattern one for team E in away.
Pattern EA.2 : Pattern two for team E in away.
Pattern EA.3 : Pattern three for team E in away.
Pattern EA.4 : Pattern four for team E in away.

APPENDIX A 2:4

patterns of play for all the teams in both home and away matches.

1 Patterns of play for team A in home matches.

2 Patterns of play for team A in away matches.

3 Patterns of play for team B in home matches.

4 Patterns of play for team B in away matches.

5 Patterns of play for team C in home matches.

6 Patterns of play for team C in away matches.

7 Patterns of play for team D in home matches.

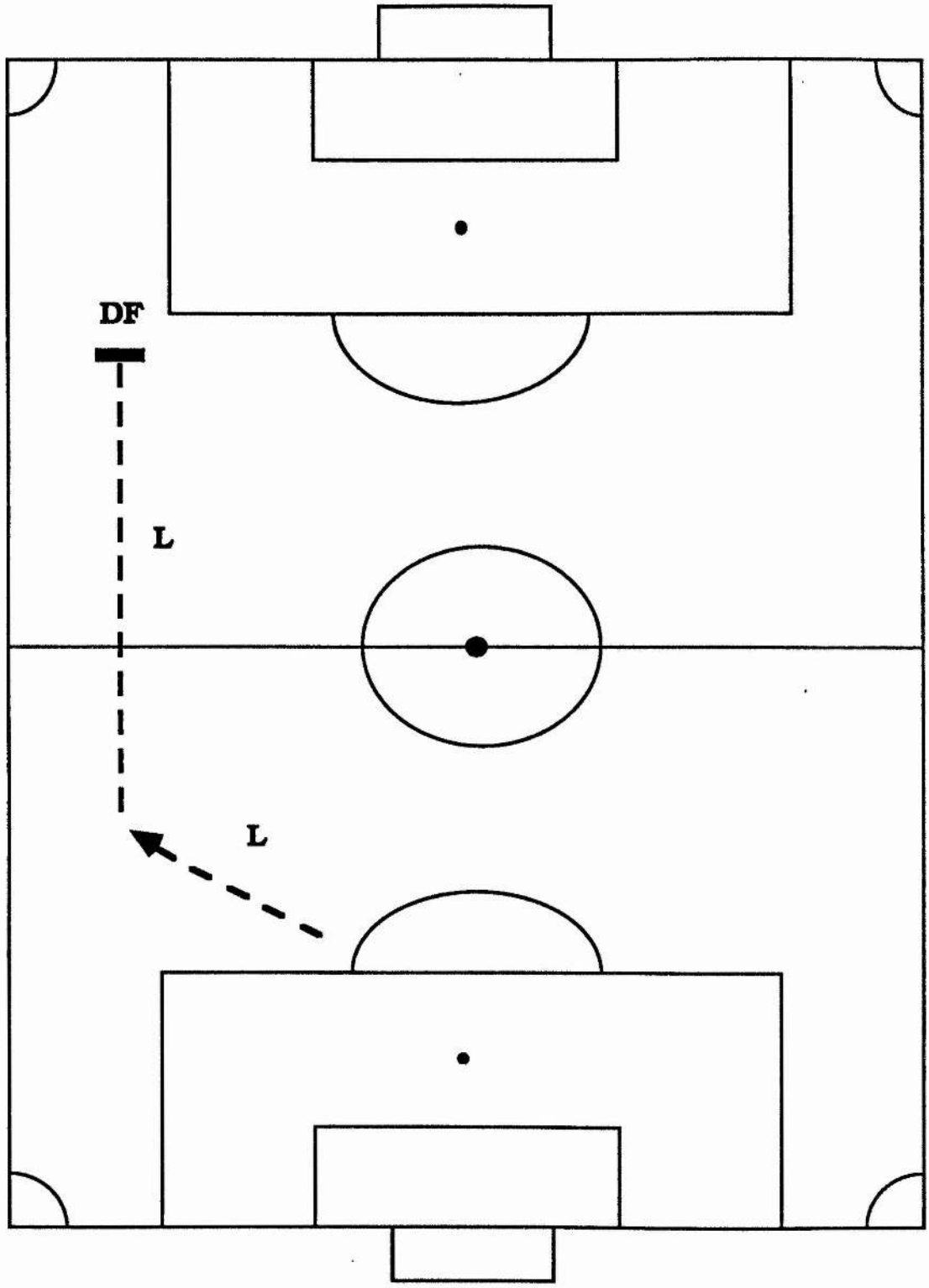
8 Patterns of play for team D in away matches.

9 Patterns of play for team E in home matches.

10 Patterns of play for team E in away matches.

Appendix A 2:4

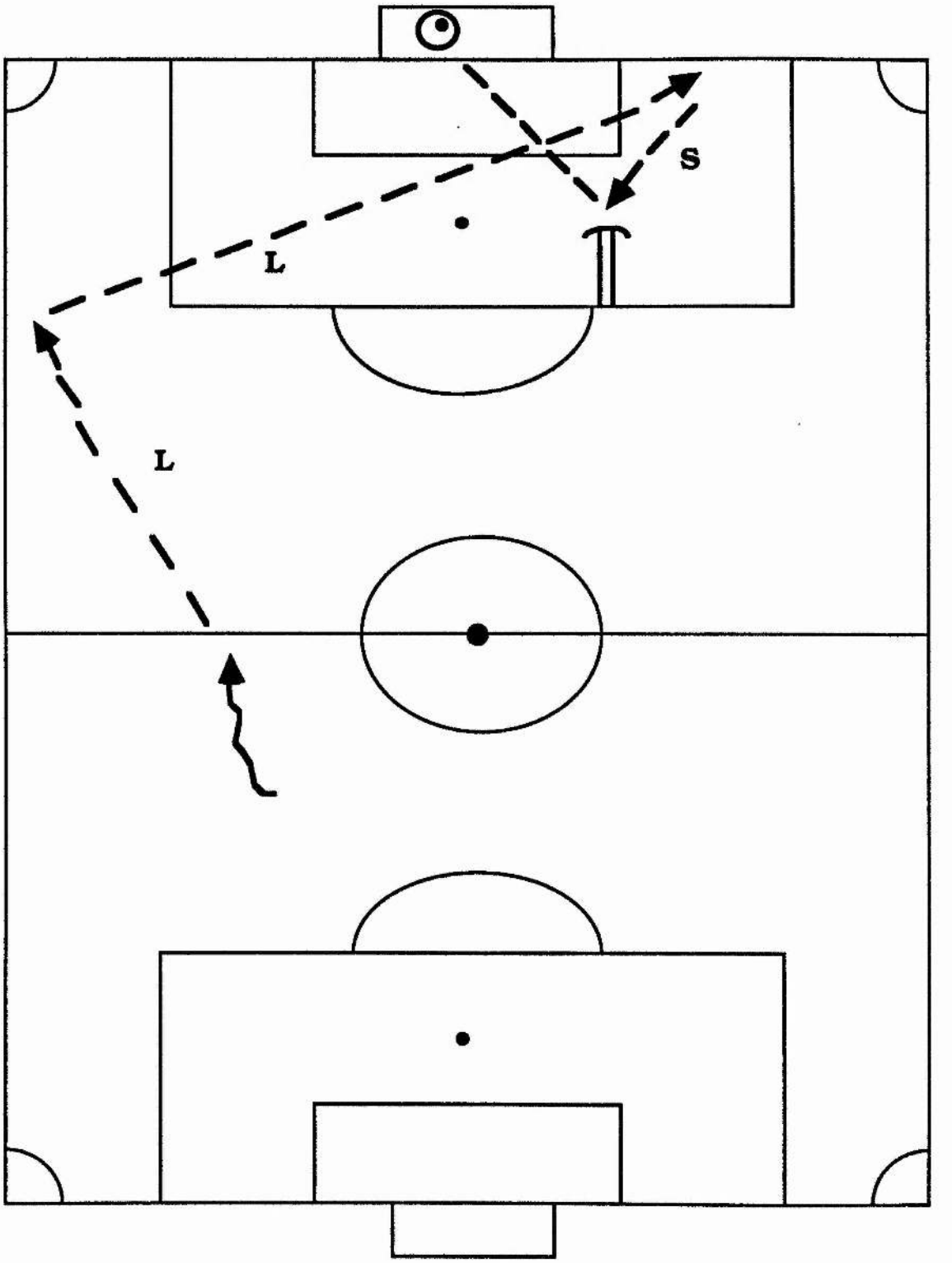
1. An attack typifying pattern AH.1.



Path of ball

DF Ball intercepted by defender

2. An attack typifying pattern AH.2.

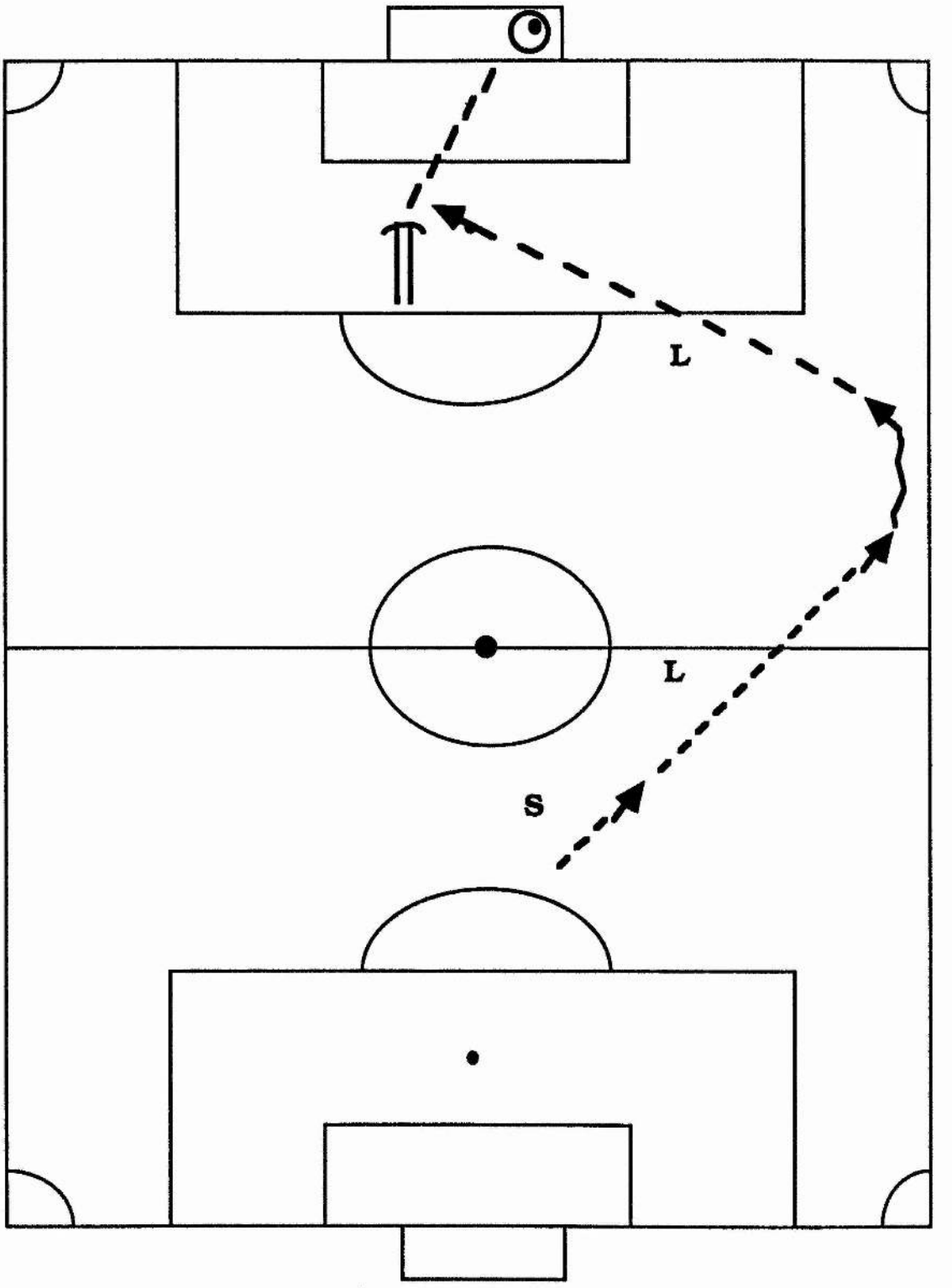


Path of ball

Route of player with ball

Shot on target

3. An attack typifying pattern AH.3.

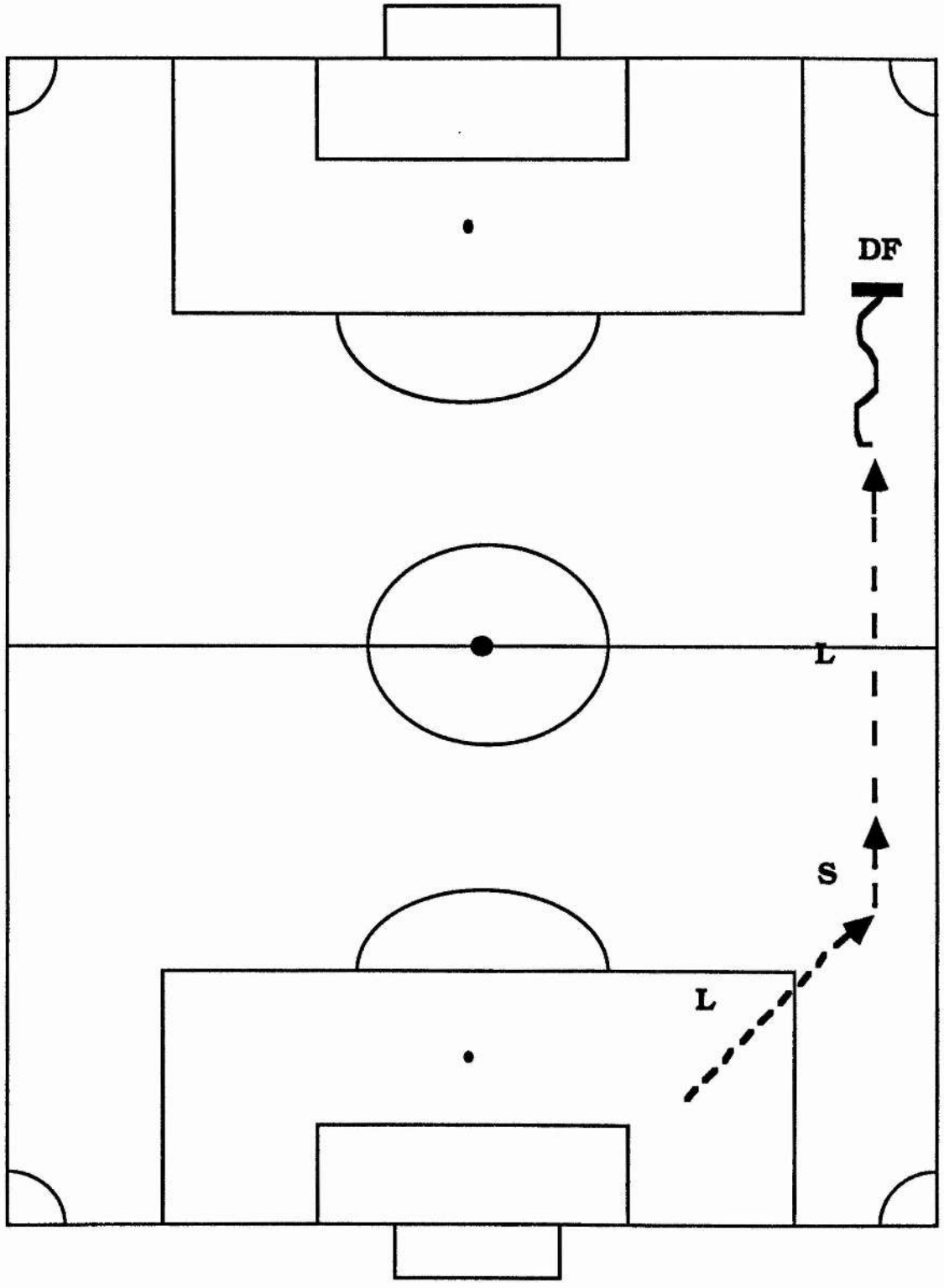


Path of ball

Route of player with ball

Shot on target

4. An attack typifying pattern AH.4.

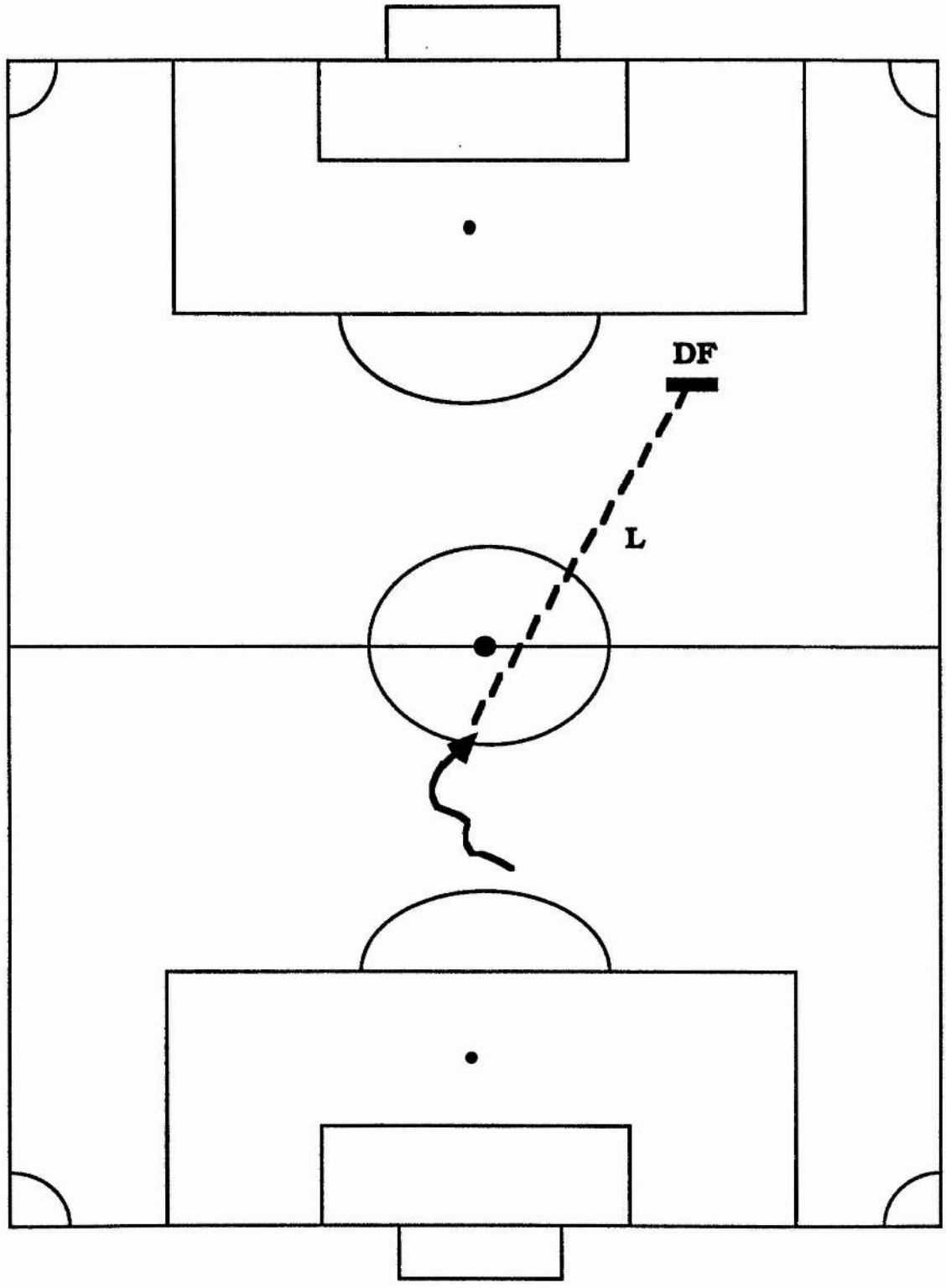


Path of ball

Route of player with ball

DF Ball intercepted by defender

5. An attack typifying pattern AH.5.



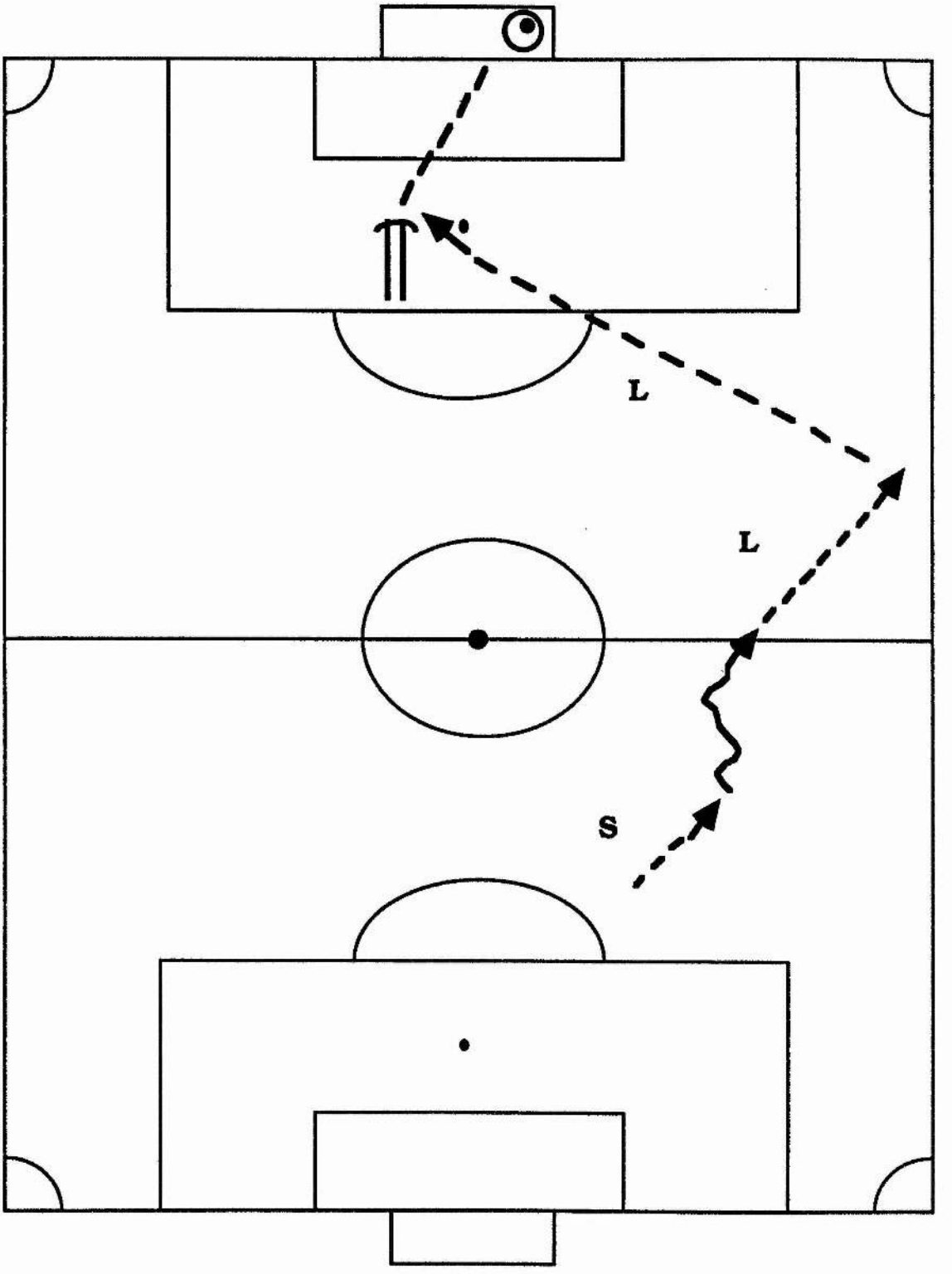
Path of ball

Route of player with ball

DF Ball intercepted by defender

Appendix A 2:4

1. An attack typifying pattern AA.1.

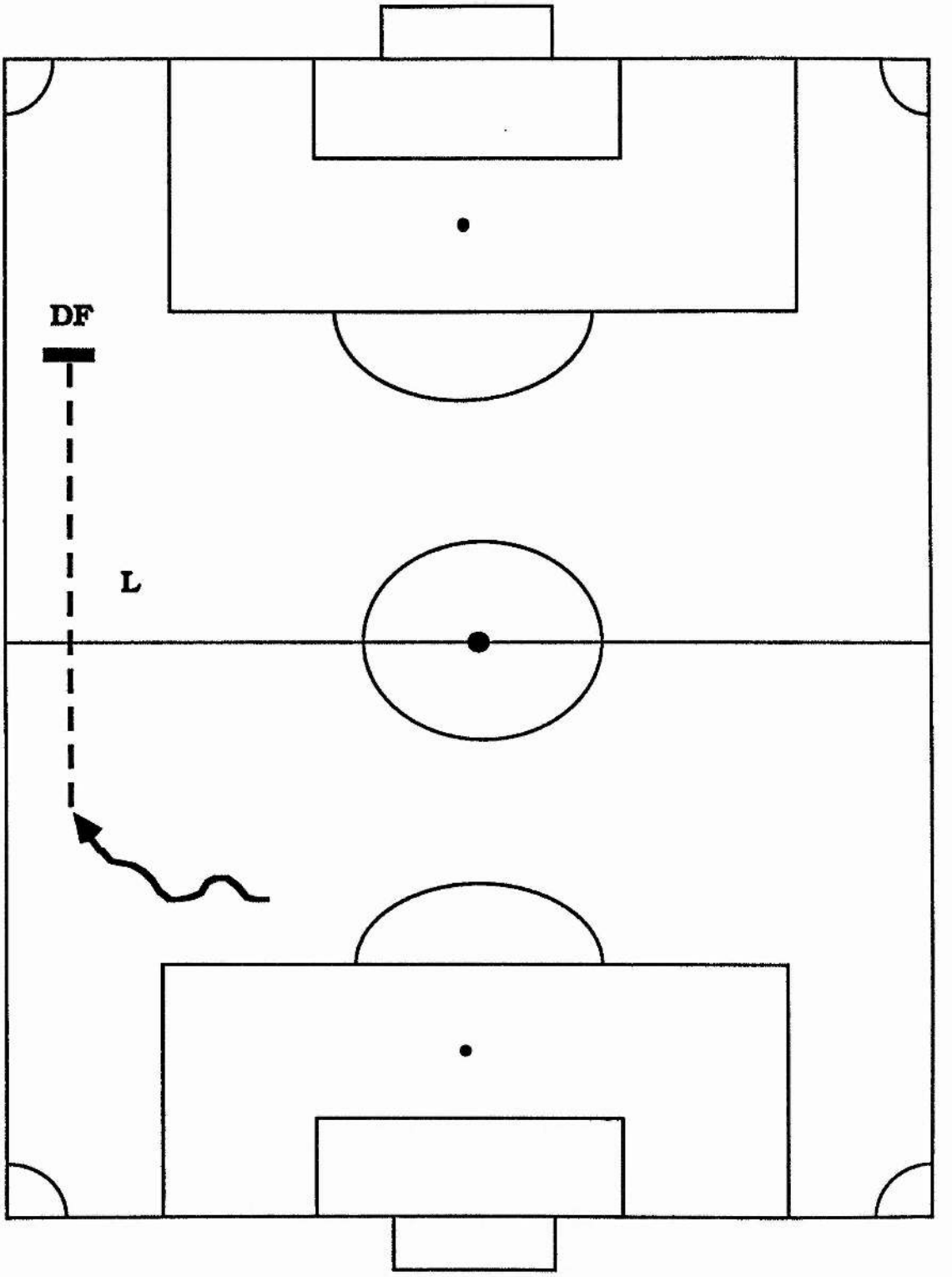


Path of ball

Route of player with ball

Shot on target

2. An attack typifying pattern AA.2.

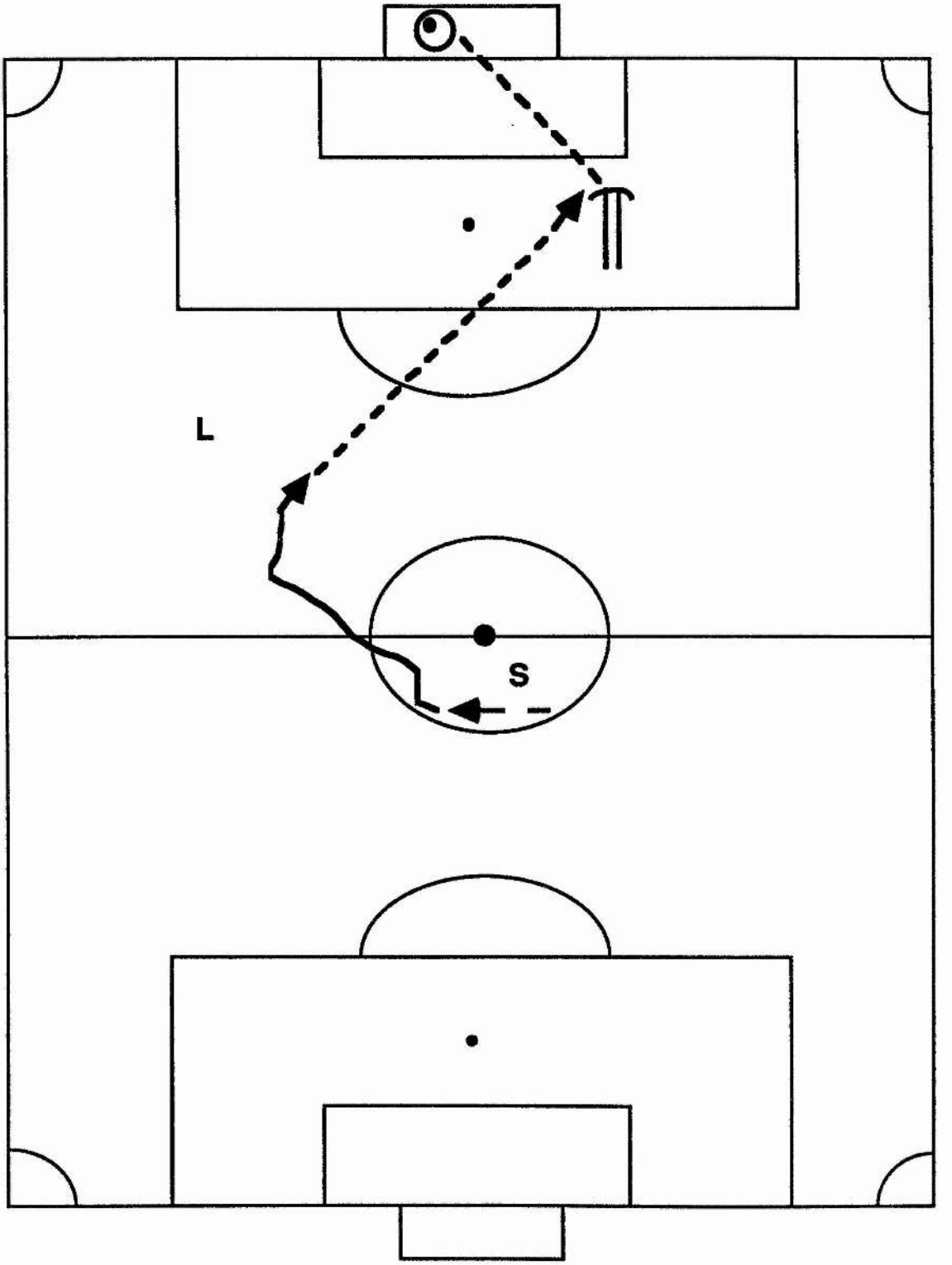


Path of ball

Route of player with ball

DF Ball intercepted by defender

3. An attack typifying pattern AA.3.

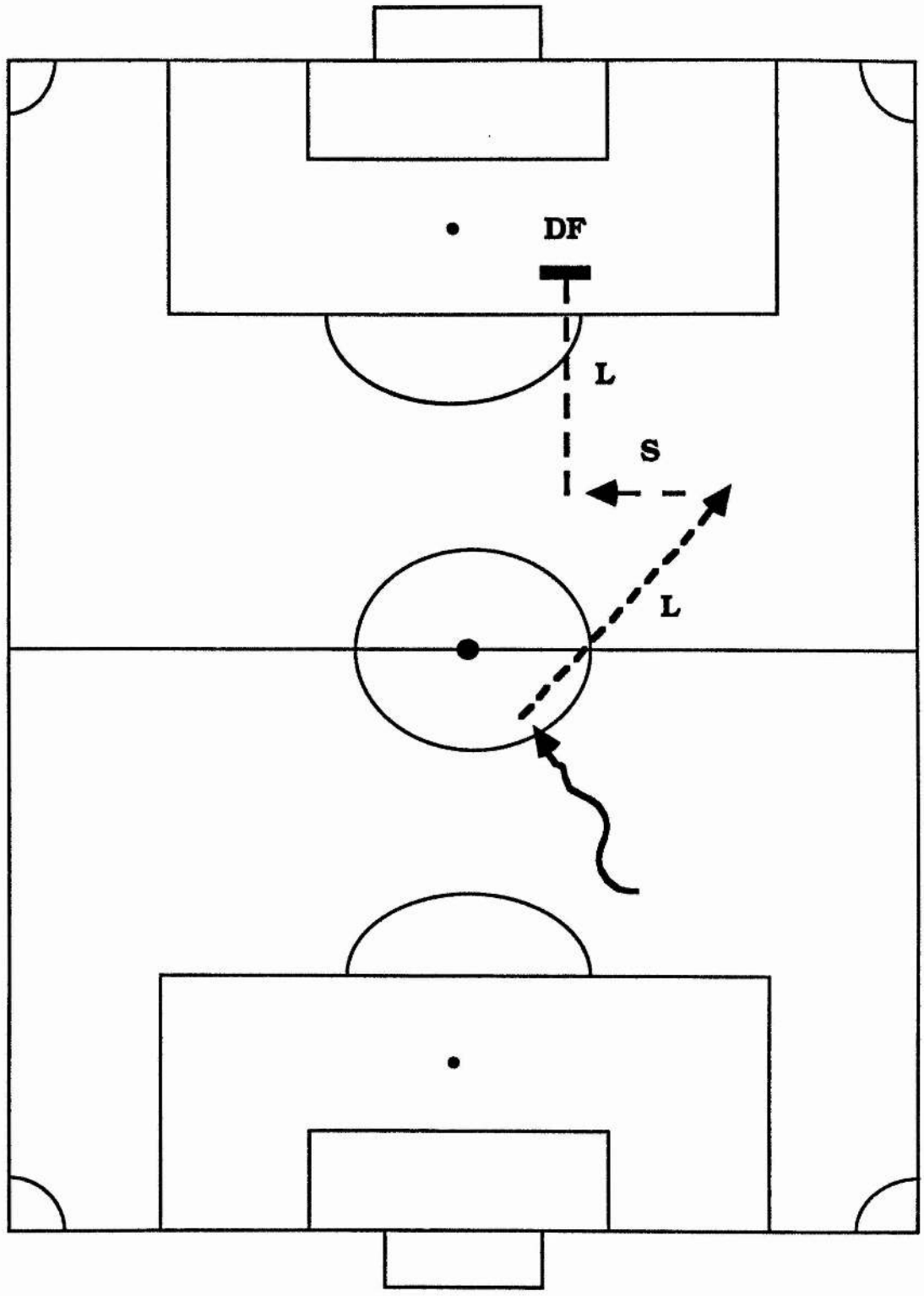


Path of ball

Route of player with ball

Shot on target

4. An attack typifying pattern AA.4.

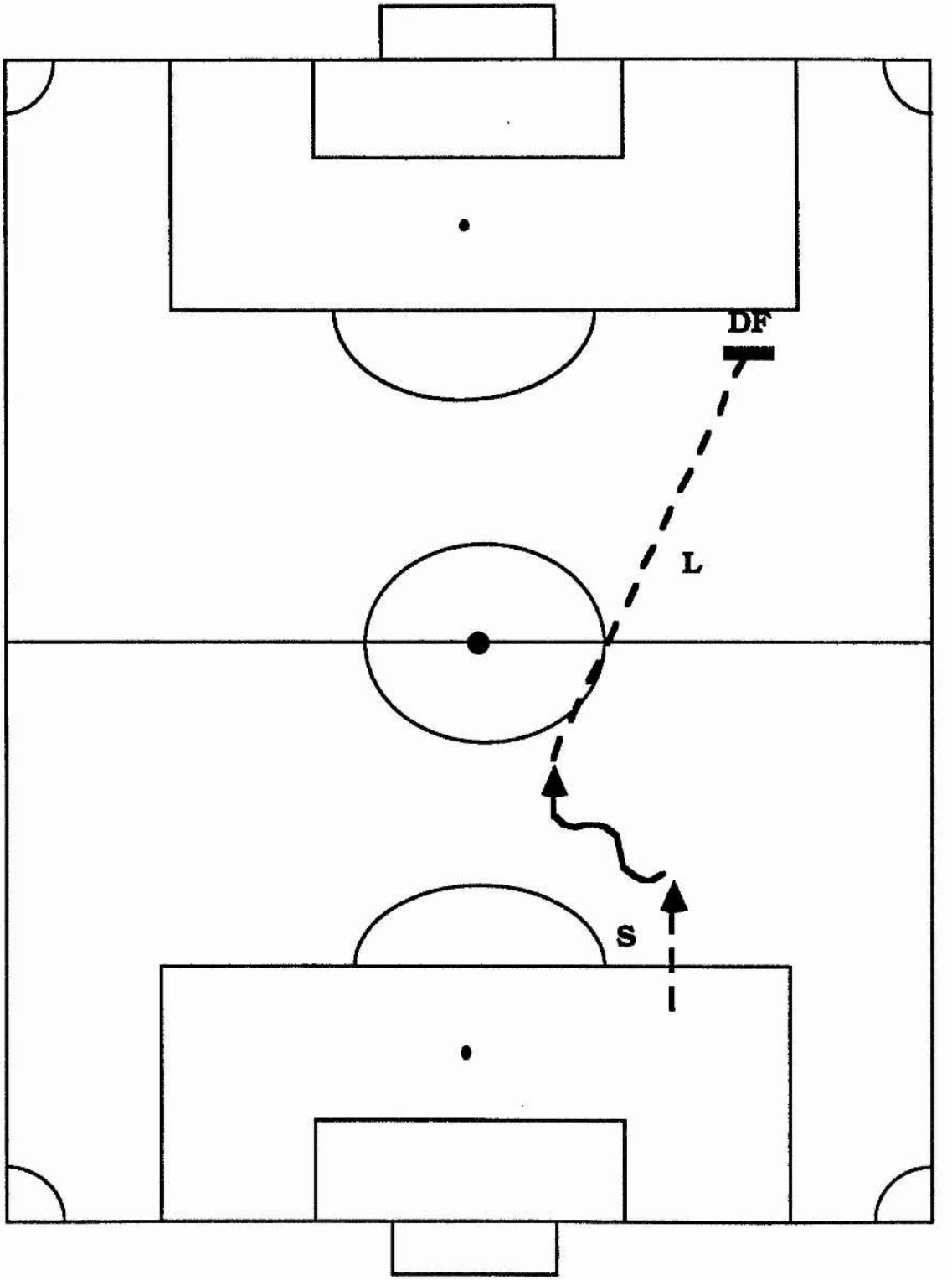


Path of ball

Route of player with ball

DF Ball intercepted by defender

5. An attack typifying pattern AA.5.



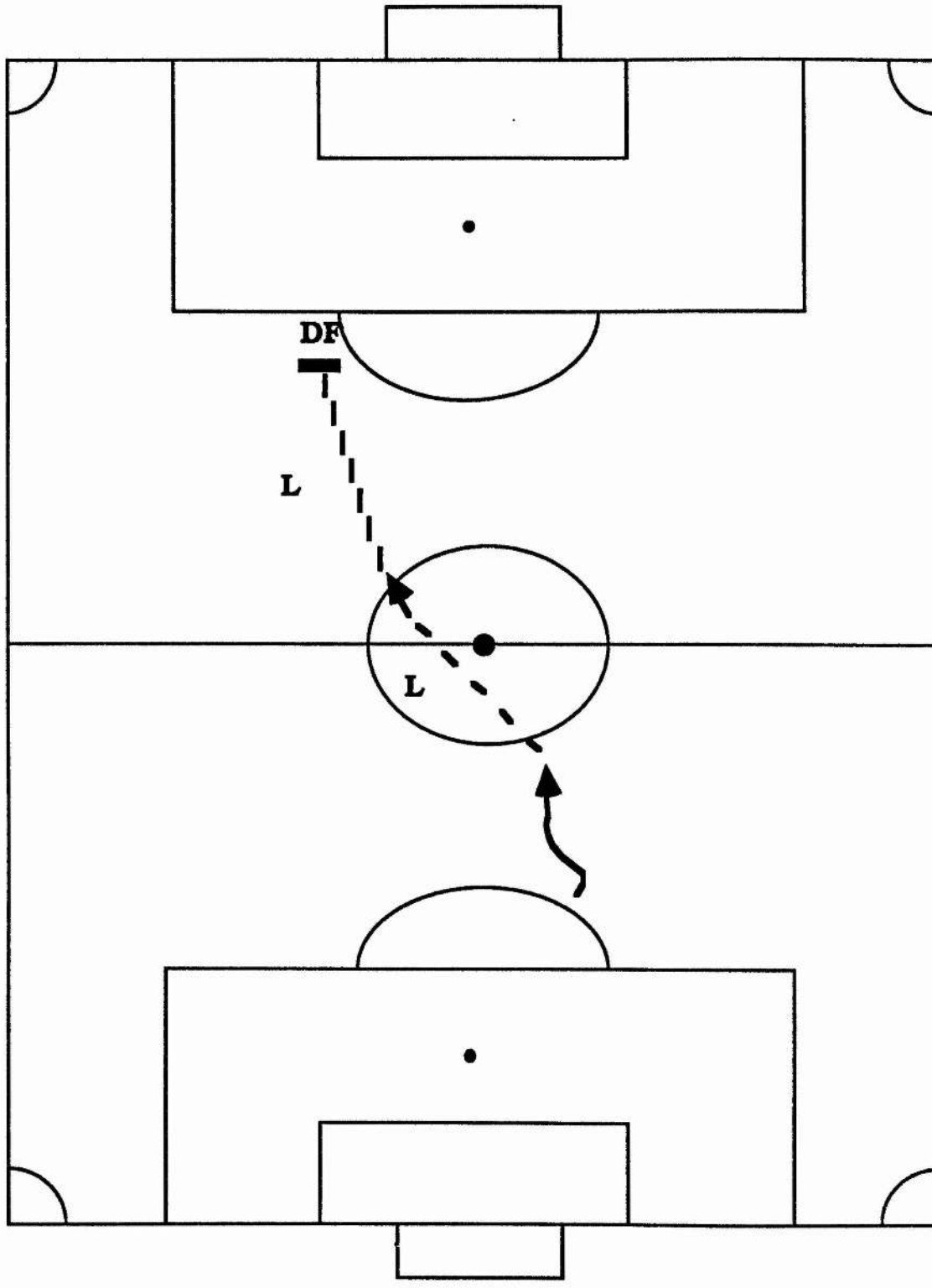
Path of ball

Route of player with ball

DF Ball intercepted by defender

Appendix A 2:4

1. An attack typifying Pattern BH.1.

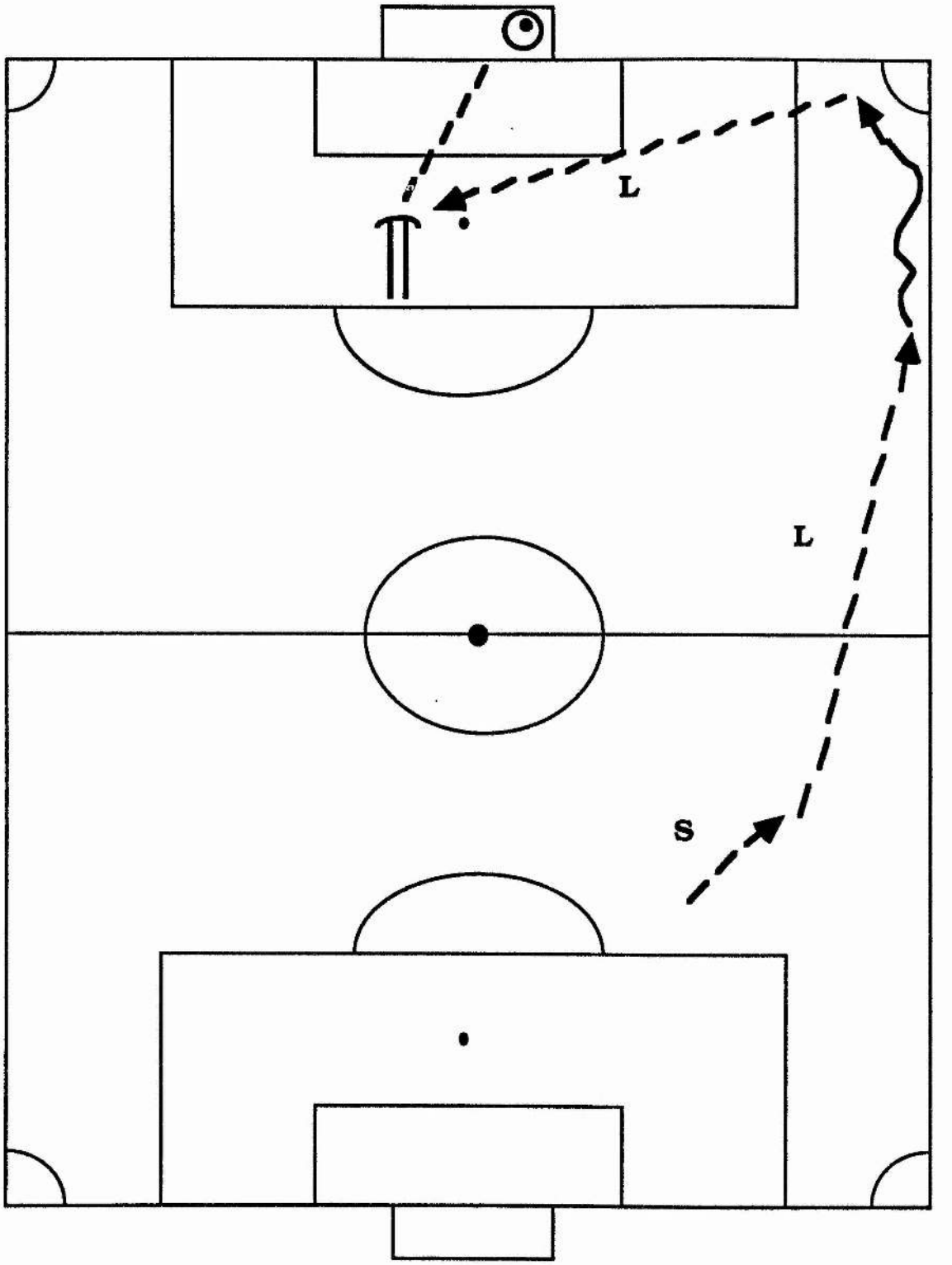


Path of ball

Route of player with ball

DF Ball intercepted by defender

2. An attack typifying Pattern BH.2.

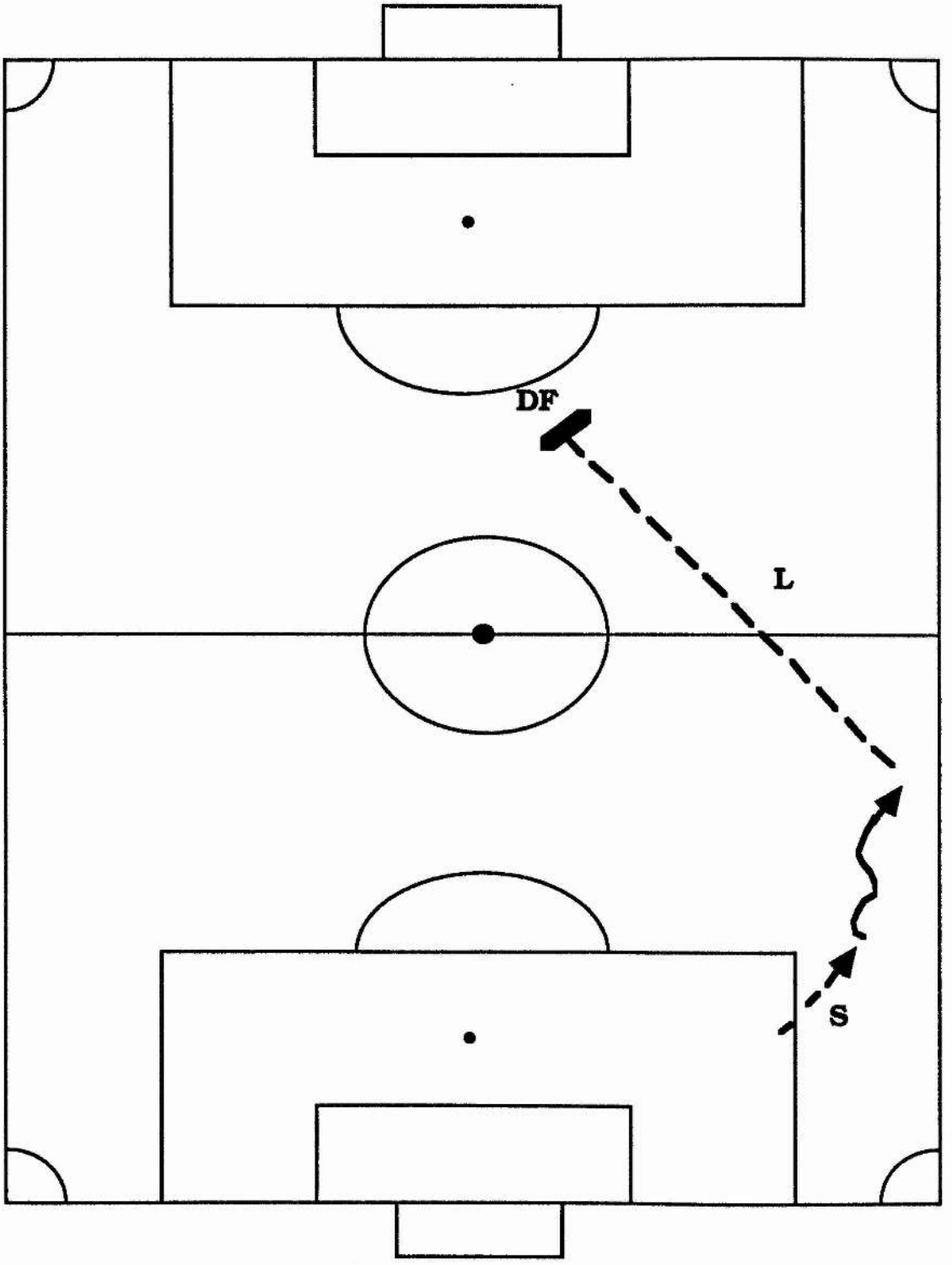


Path of ball

Route of player with ball

Shot on target

3. An attack typifying Pattern BH.3.

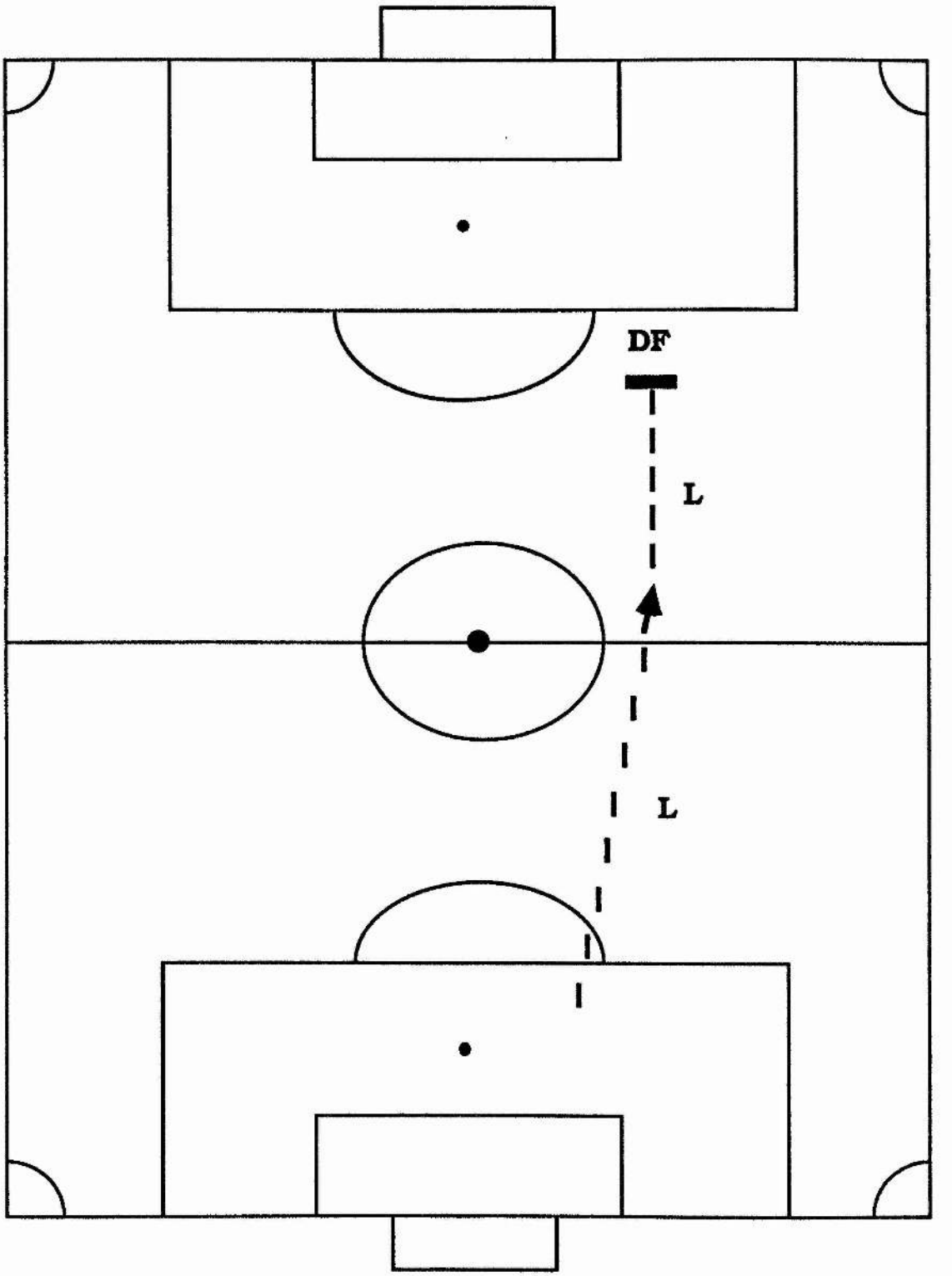


Path of ball

Route of player with ball

DF Ball intercepted by defender

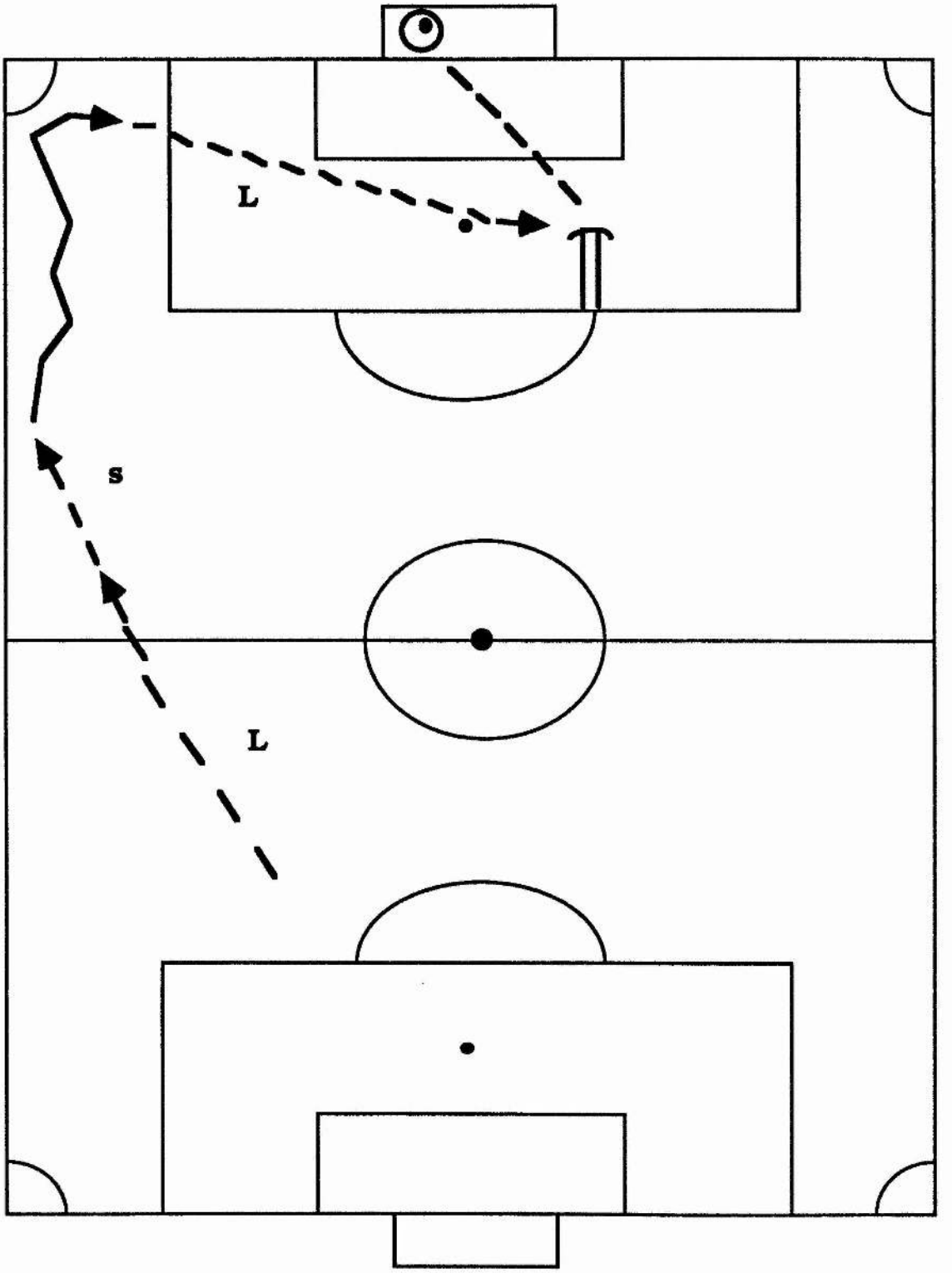
4. An attack typifying Pattern BH.4.



Path of ball

DF Ball intercepted by defender

5. An attack typifying pattern BH.5.



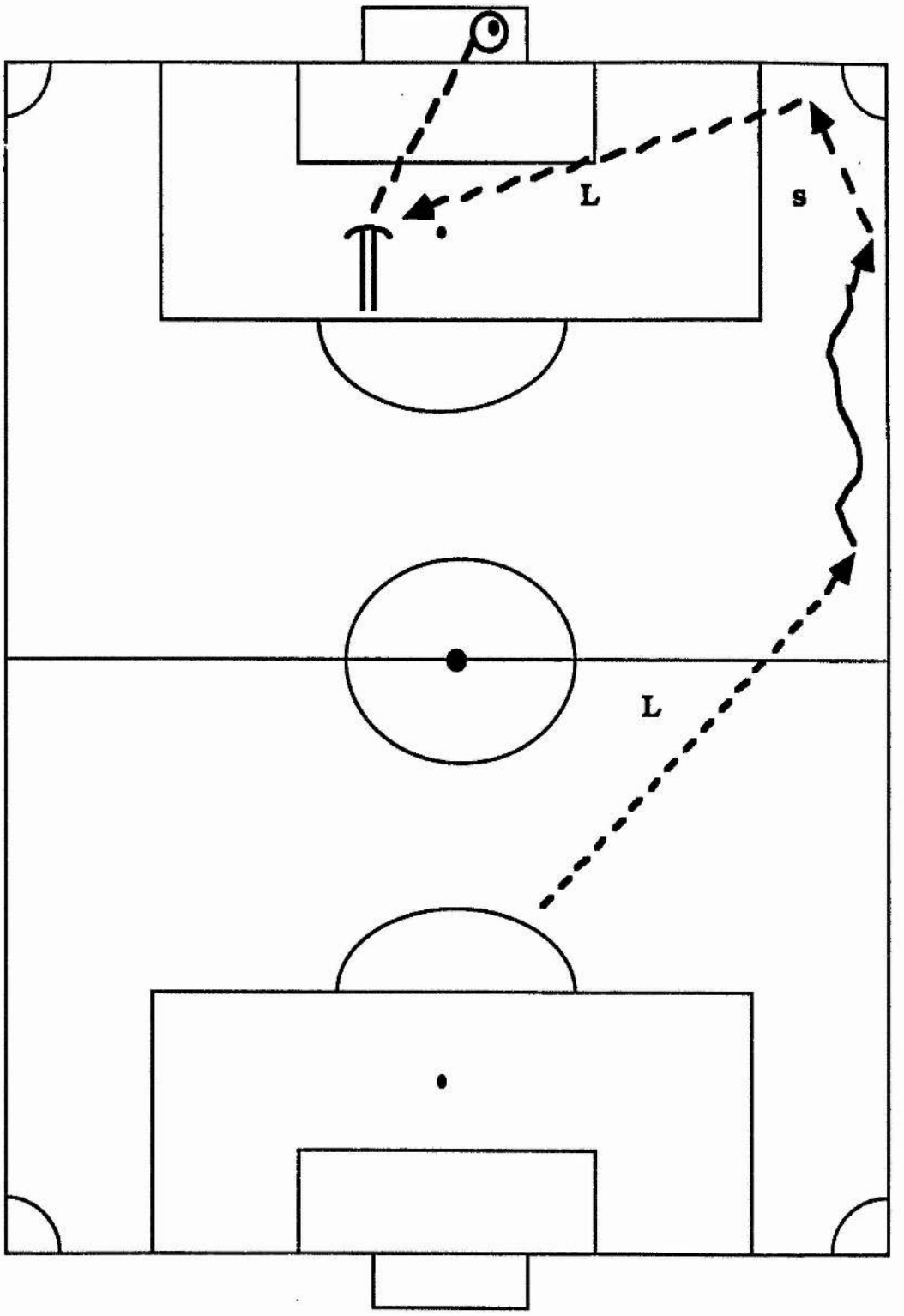
Path of ball

Route of player with ball

Shot on target

Appendix A 2:4

1. An attack typifying pattern BA.1.

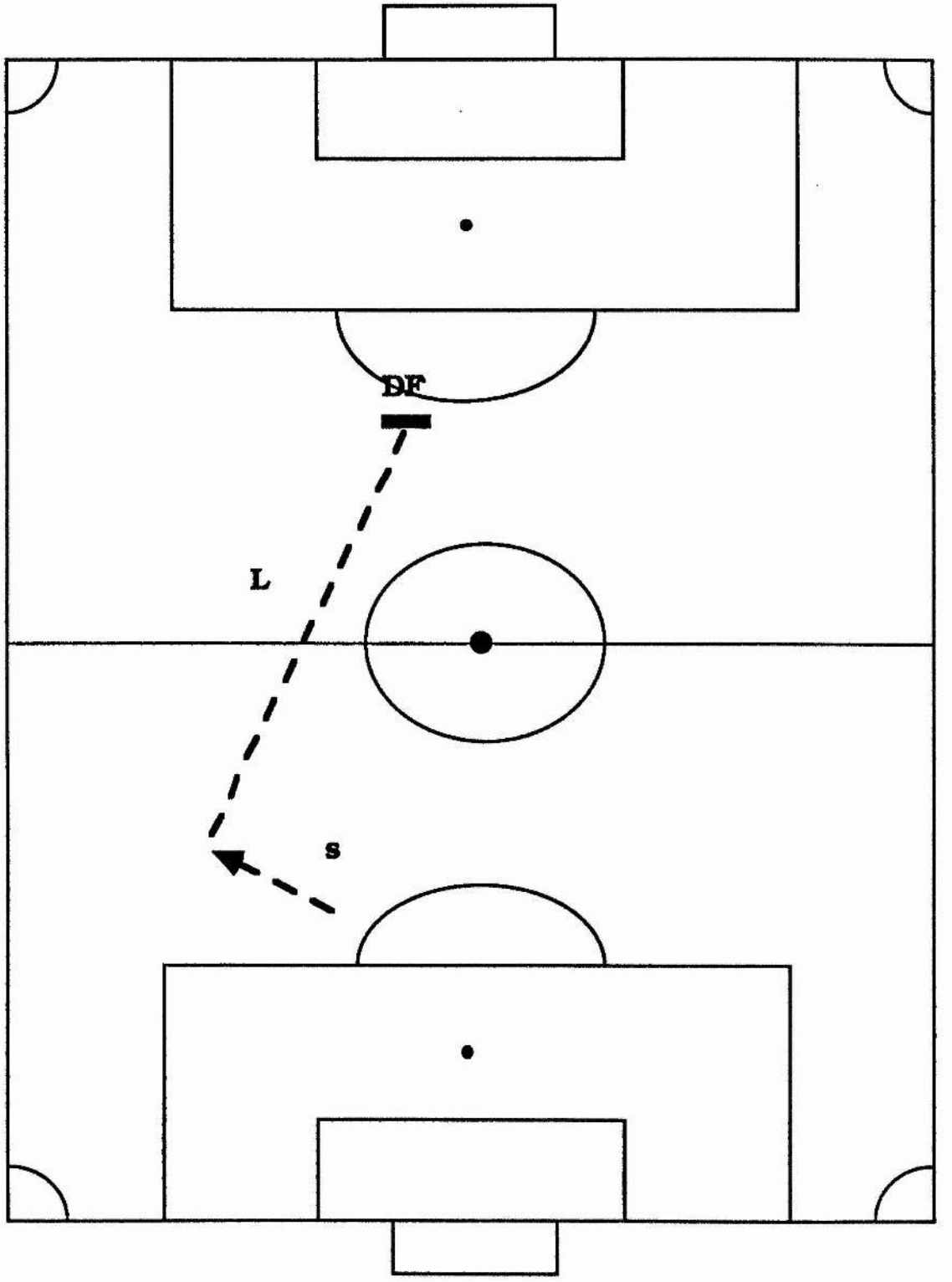


Path of ball

Route of player with ball

Shot on target

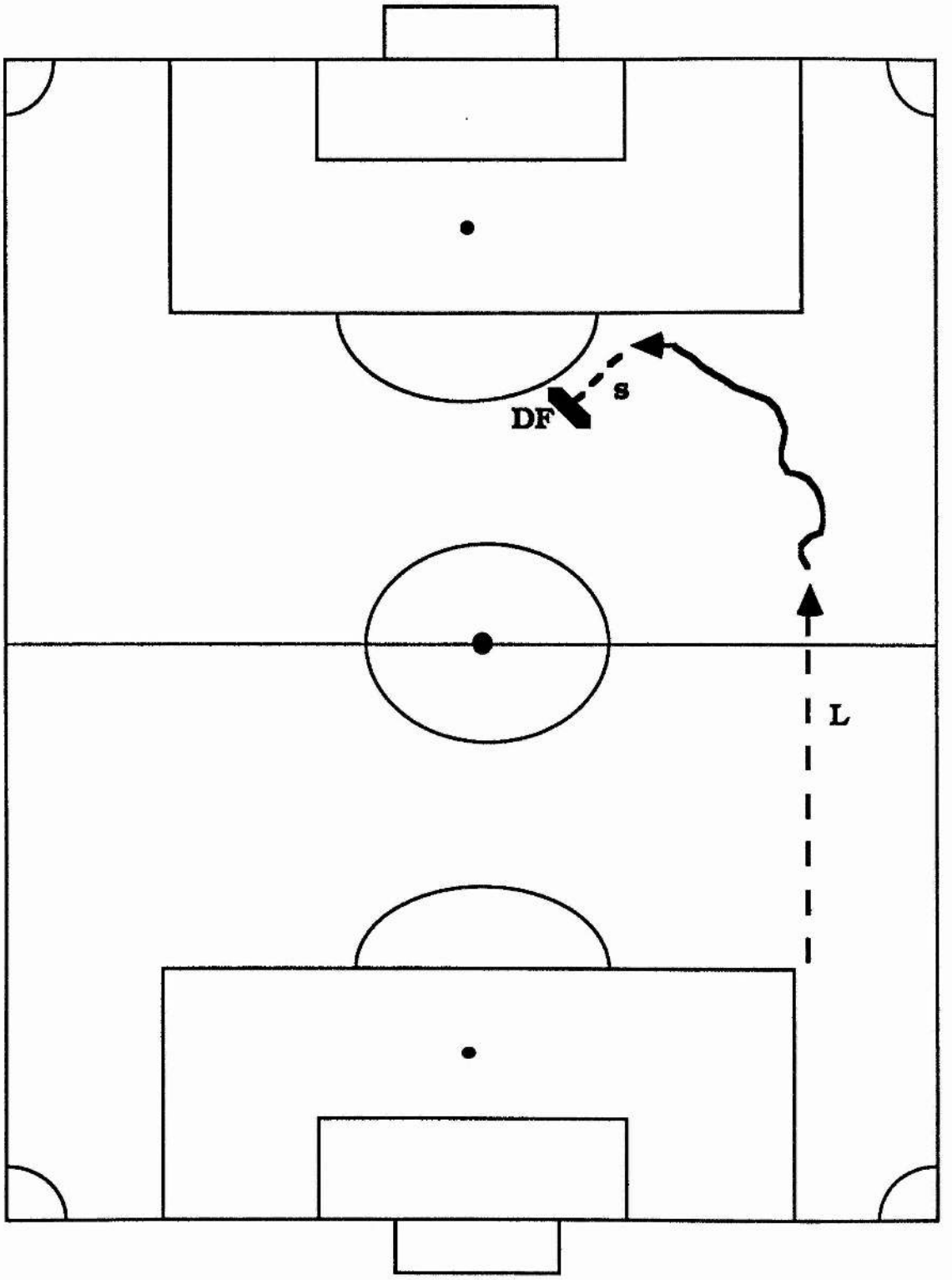
2. An attack typifying Pattern BA.2.



Path of ball

DF Ball intercepted by defender

3. An attack typifying Pattern BA.3.

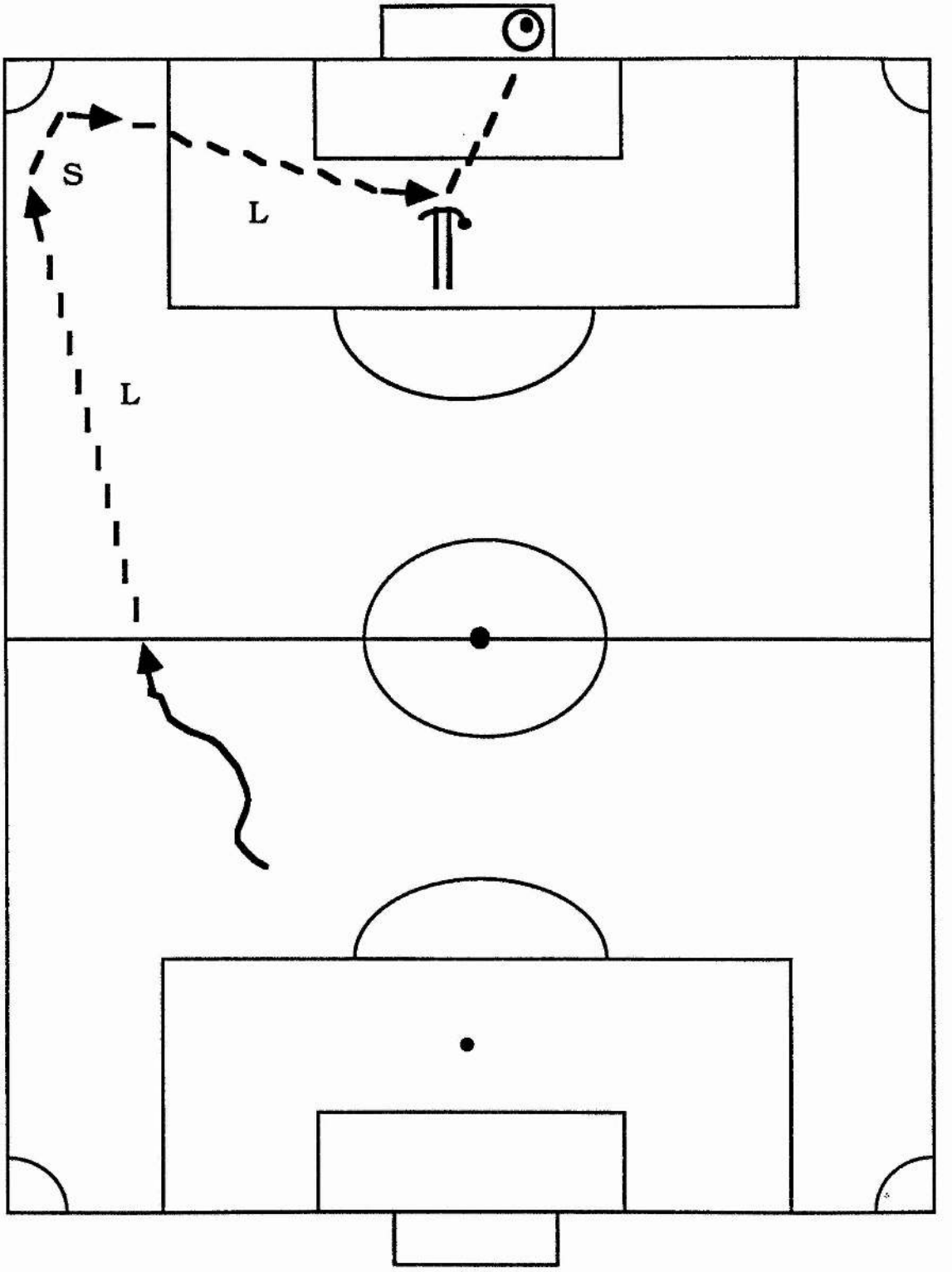


Path of ball

Route of player with ball

DF Ball intercepted by defender

4. An attack typifying Pattern BA.4.

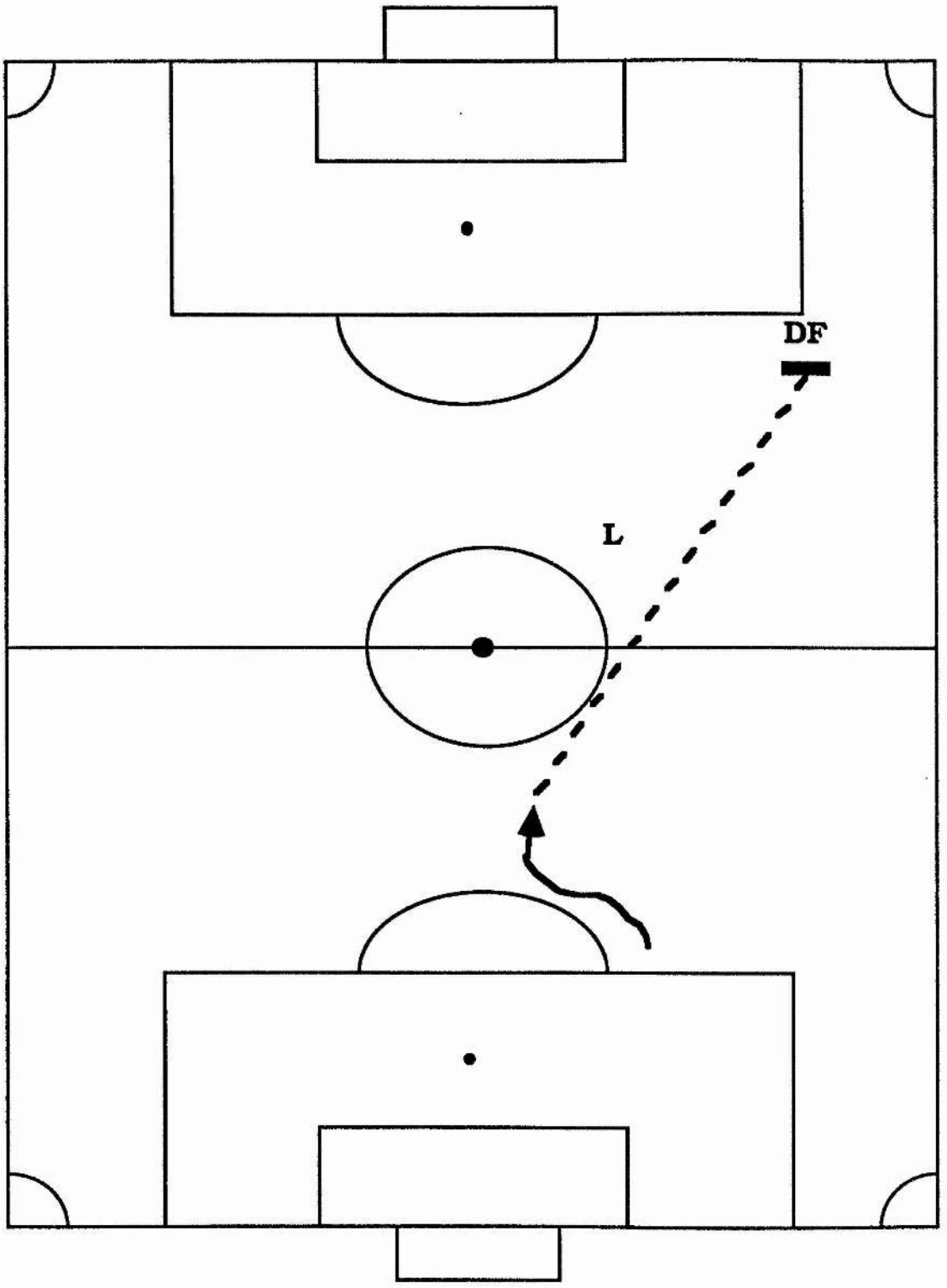


Path of ball

Route of player with ball

Shot on target

5. An attack typifying Pattern BA.5.



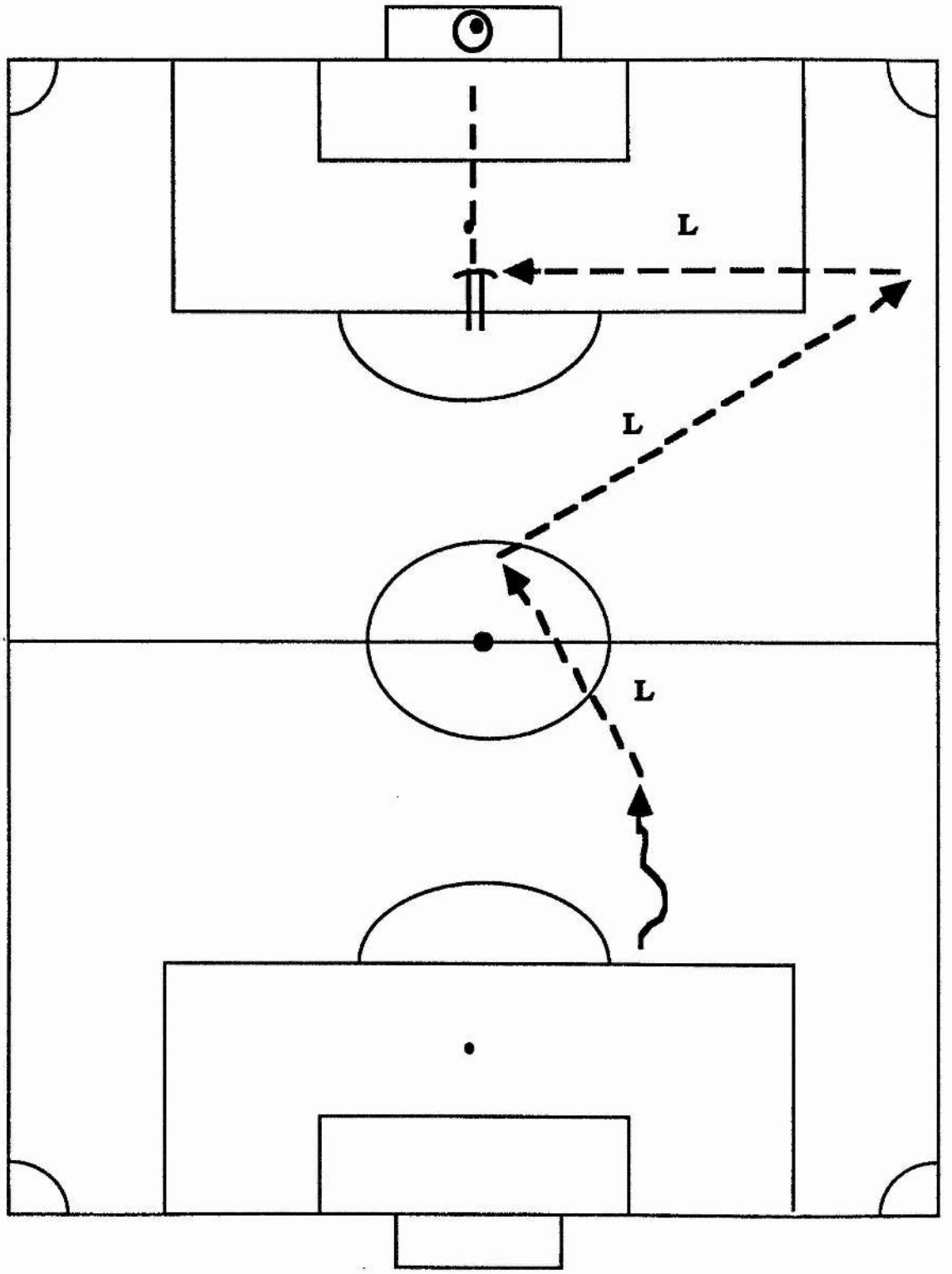
Path of ball

Route of player with ball

DF Ball intercepted by defender

Appendix A 2:4

1. An attack typifying pattern CH.1.

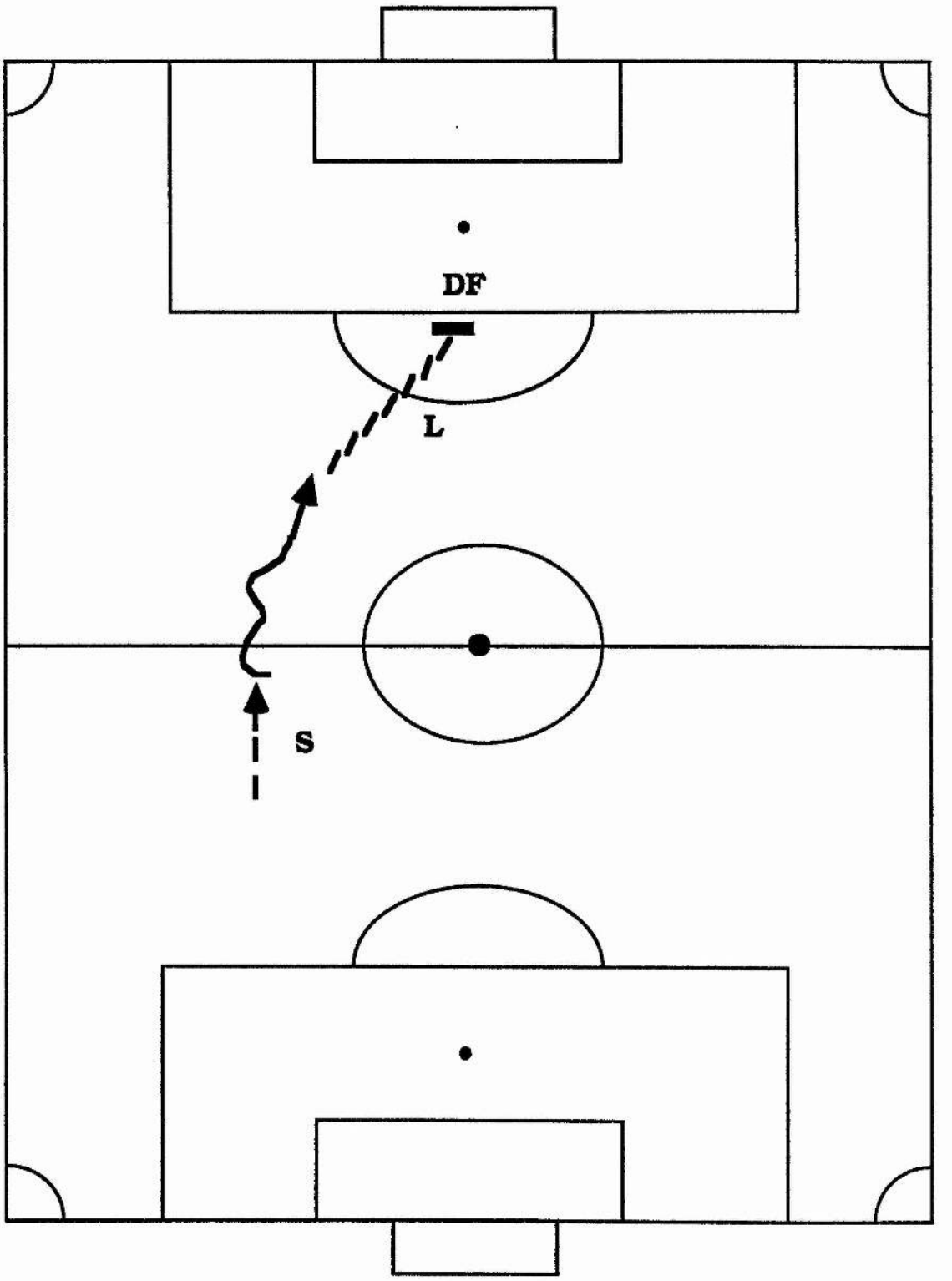


Path of ball

Route of player with ball

Shot on target

2. An attack typifying Pattern CH.2.

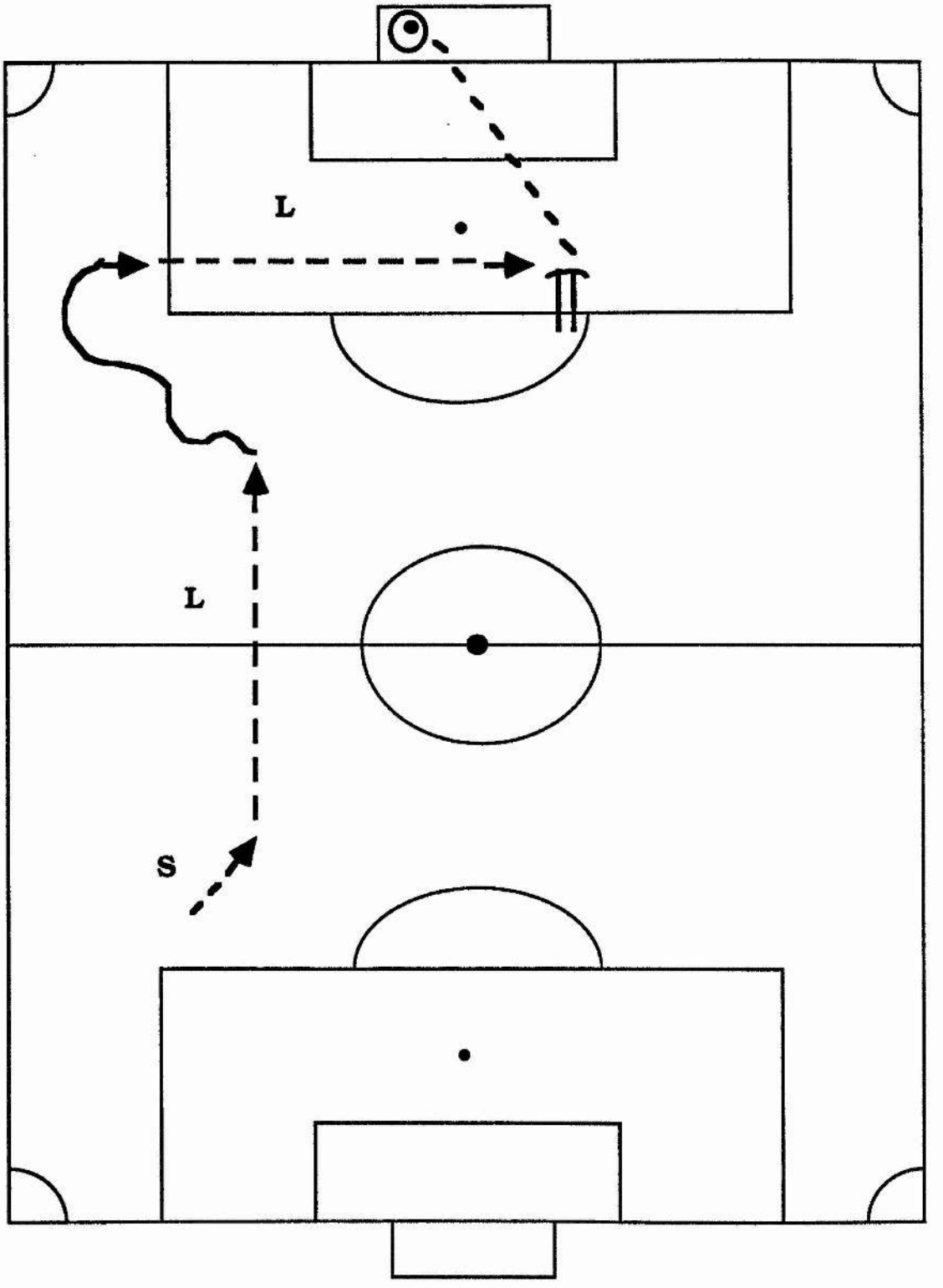


Path of ball

Route of player with ball

DF Ball intercepted by defender

3. An attack typifying pattern CH.3.

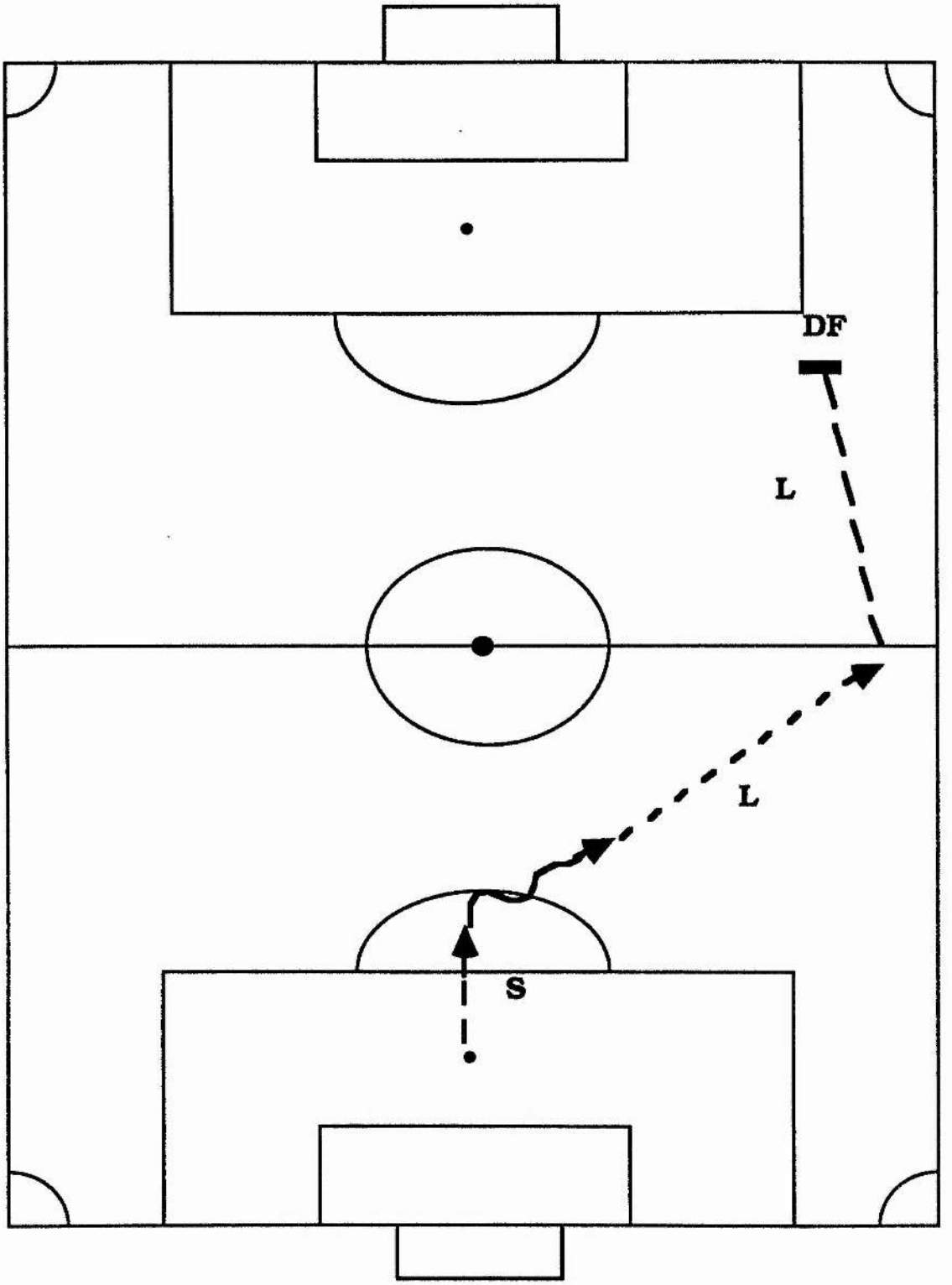


Path of ball

Route of player with ball

Shot on target

4. An attack typifying Pattern CH.4.

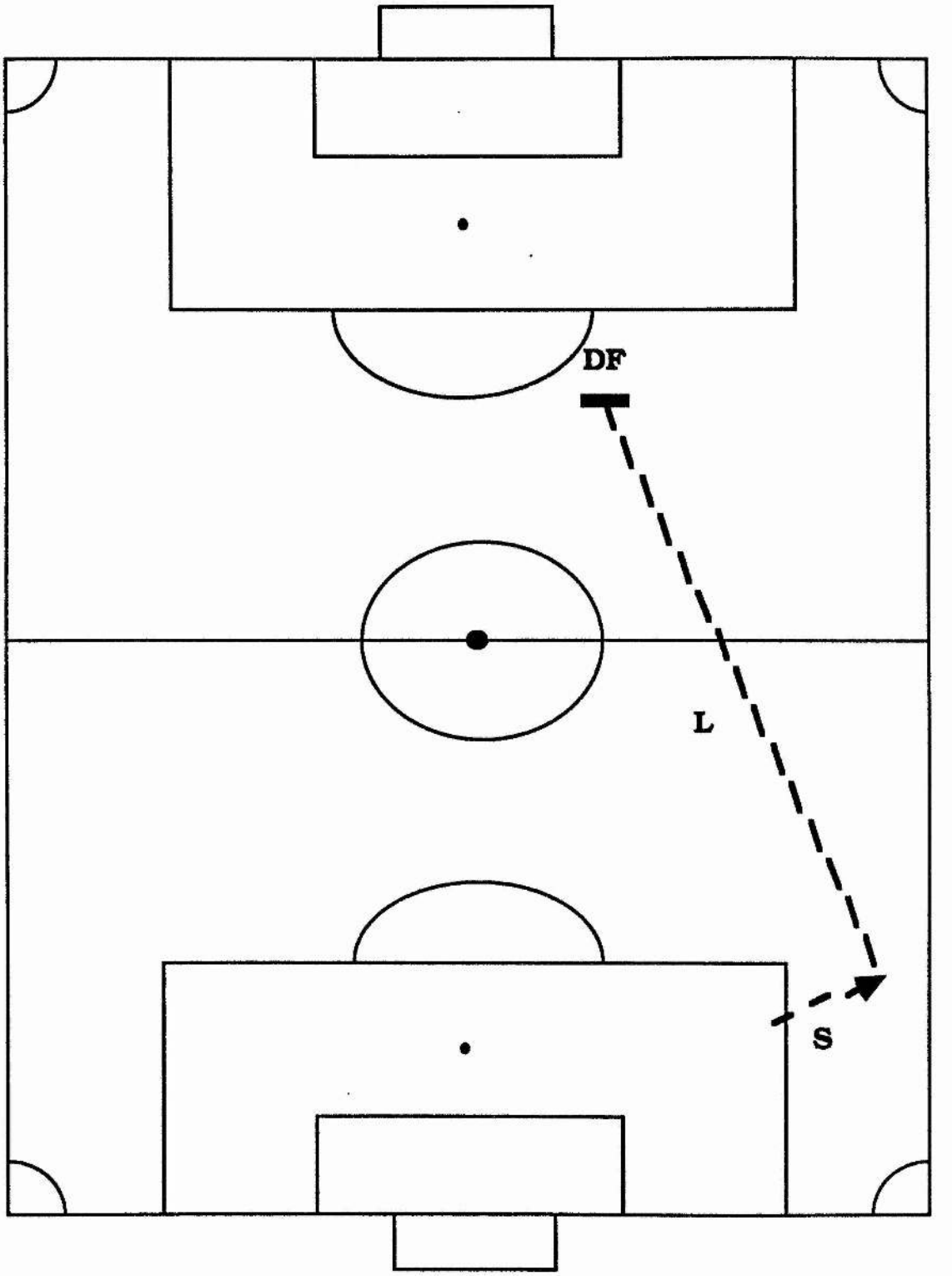


Path of ball

Route of player with ball

DF Ball intercepted by defender

5. An attack typifying Pattern CH.5.

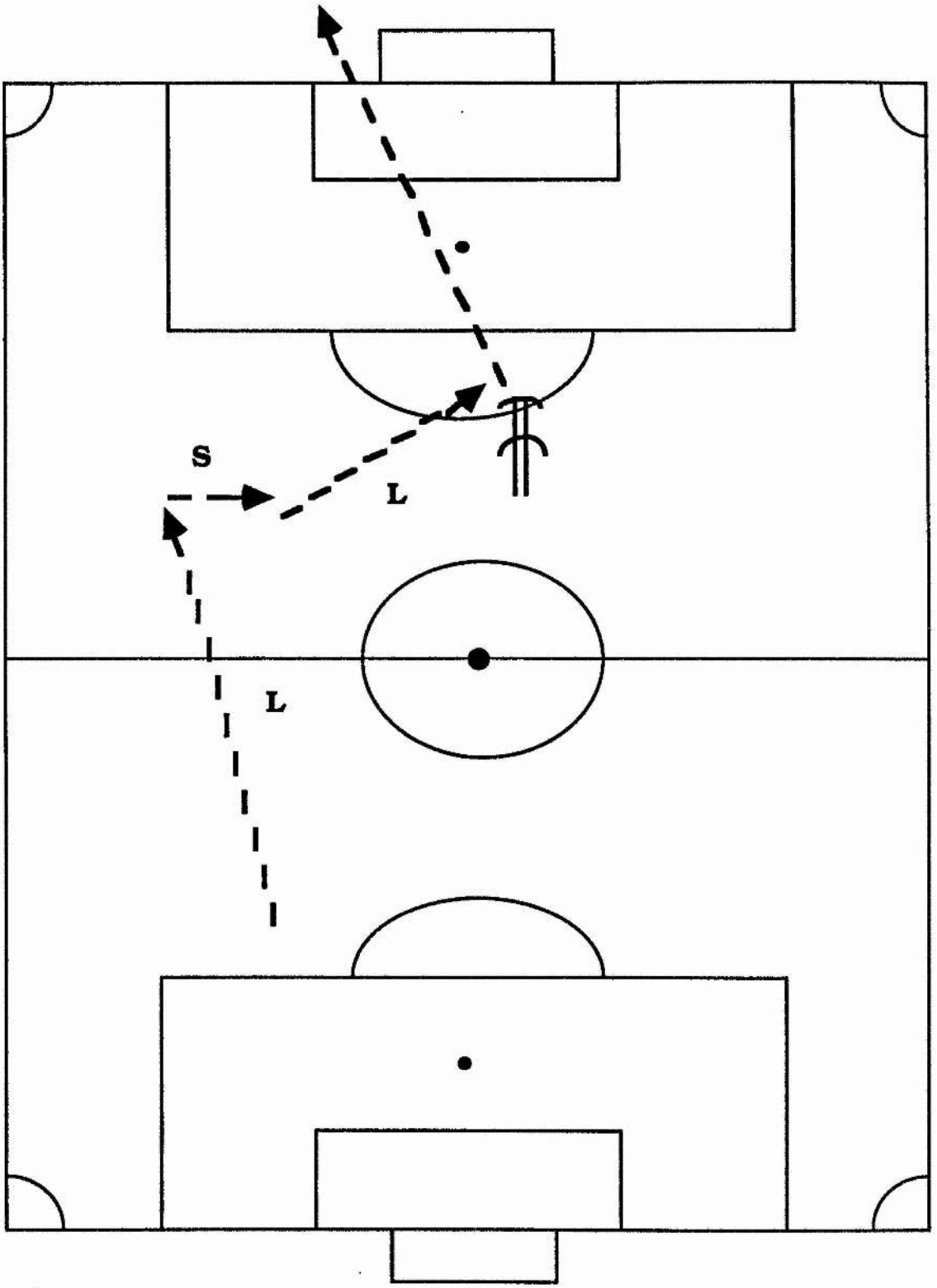


Path of ball

DF Ball intercepted by defender

Appendix A 2:4

1. An attack typifying Pattern CA.1.

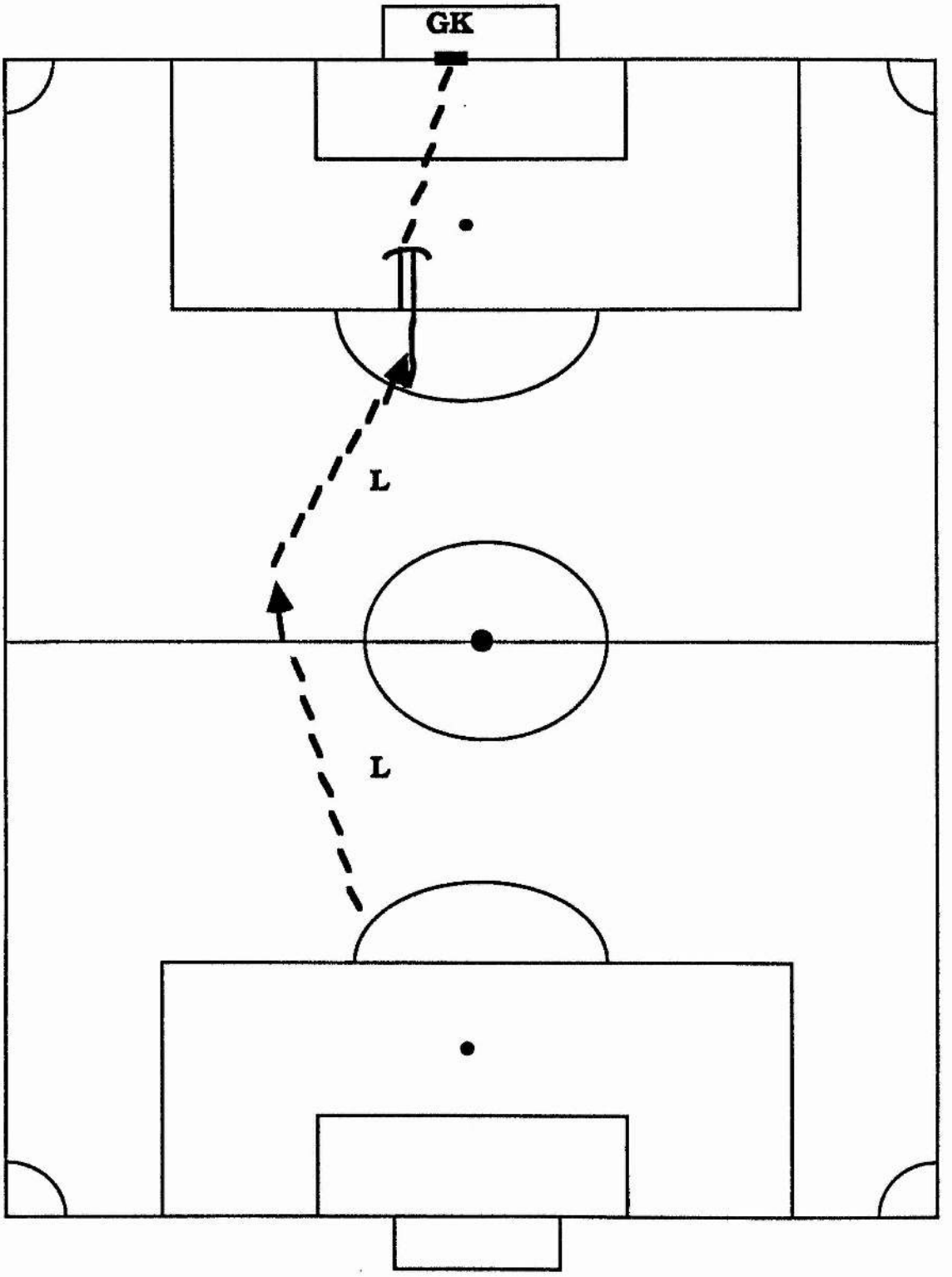


Path of ball

Route of player with ball

Shot off target

2. An attack typifying Pattern CA.2.

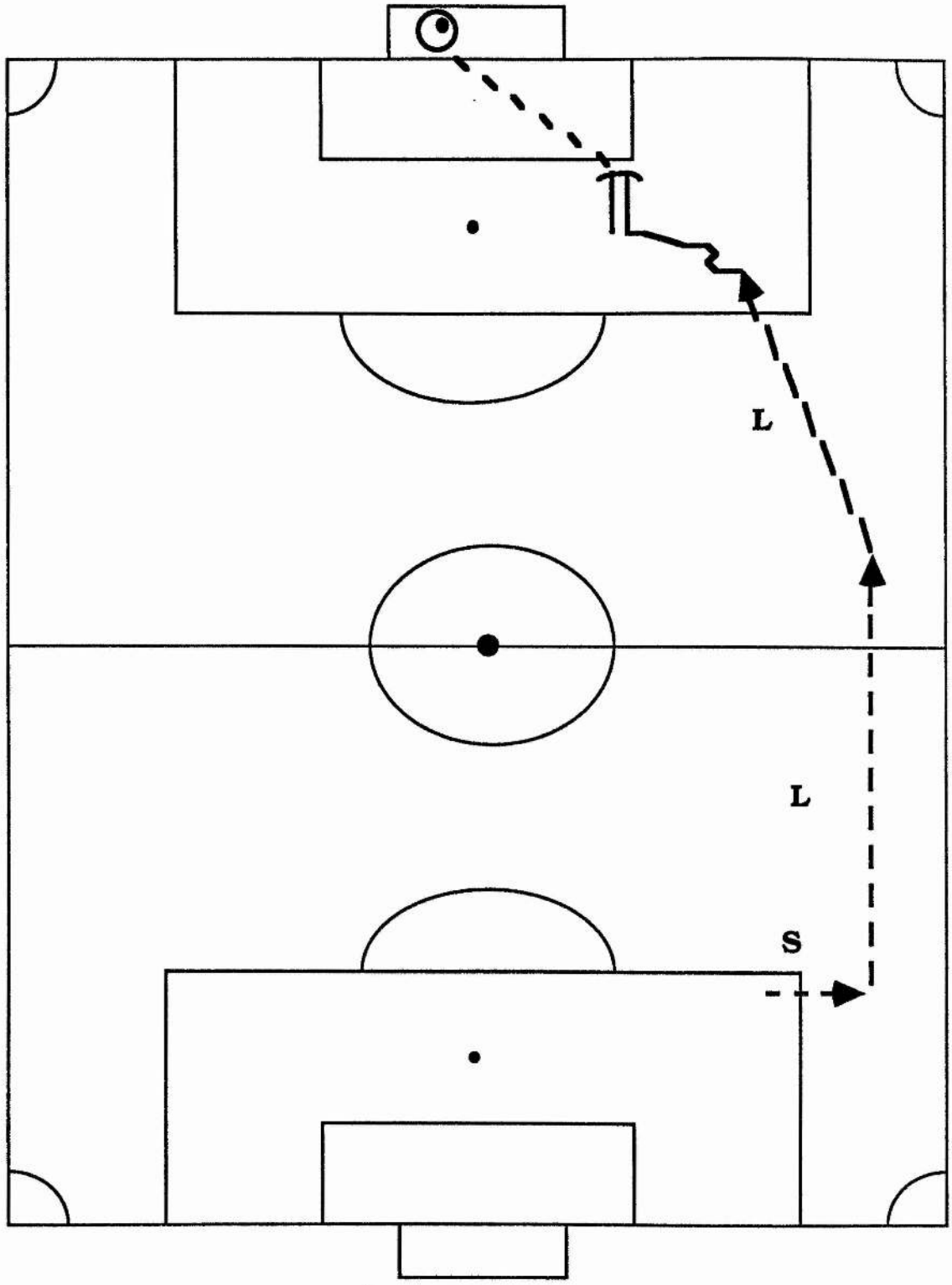


Path of ball

Route of player with ball

Shot on target

3. An attack typifying Pattern CA.3.

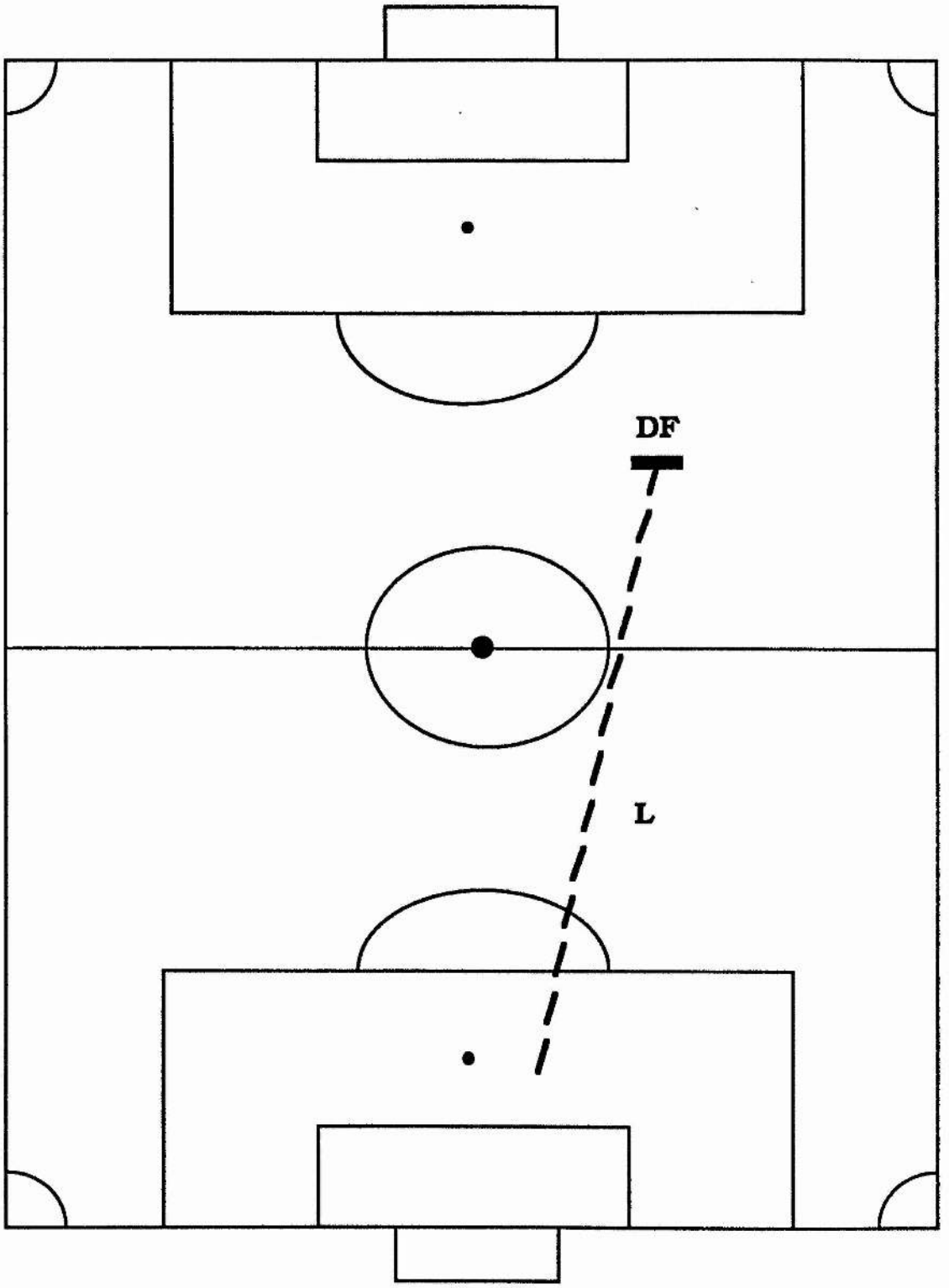


Path of ball

Route of player with ball

Shot on target

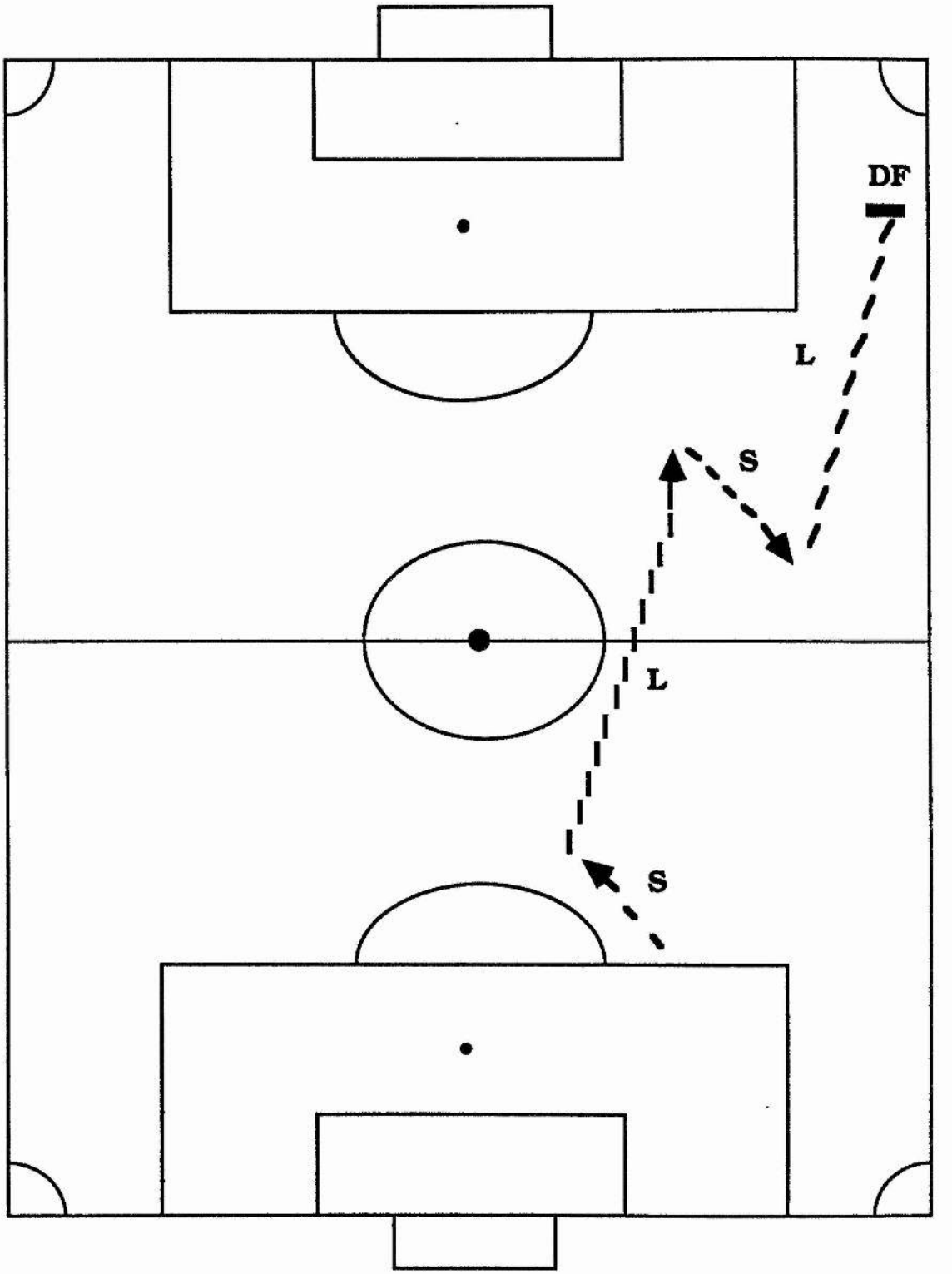
4. An attack typifying Pattern CA.4.



Path of ball

DF Ball intercepted by defender

5. An attack typifying Pattern CA.5.

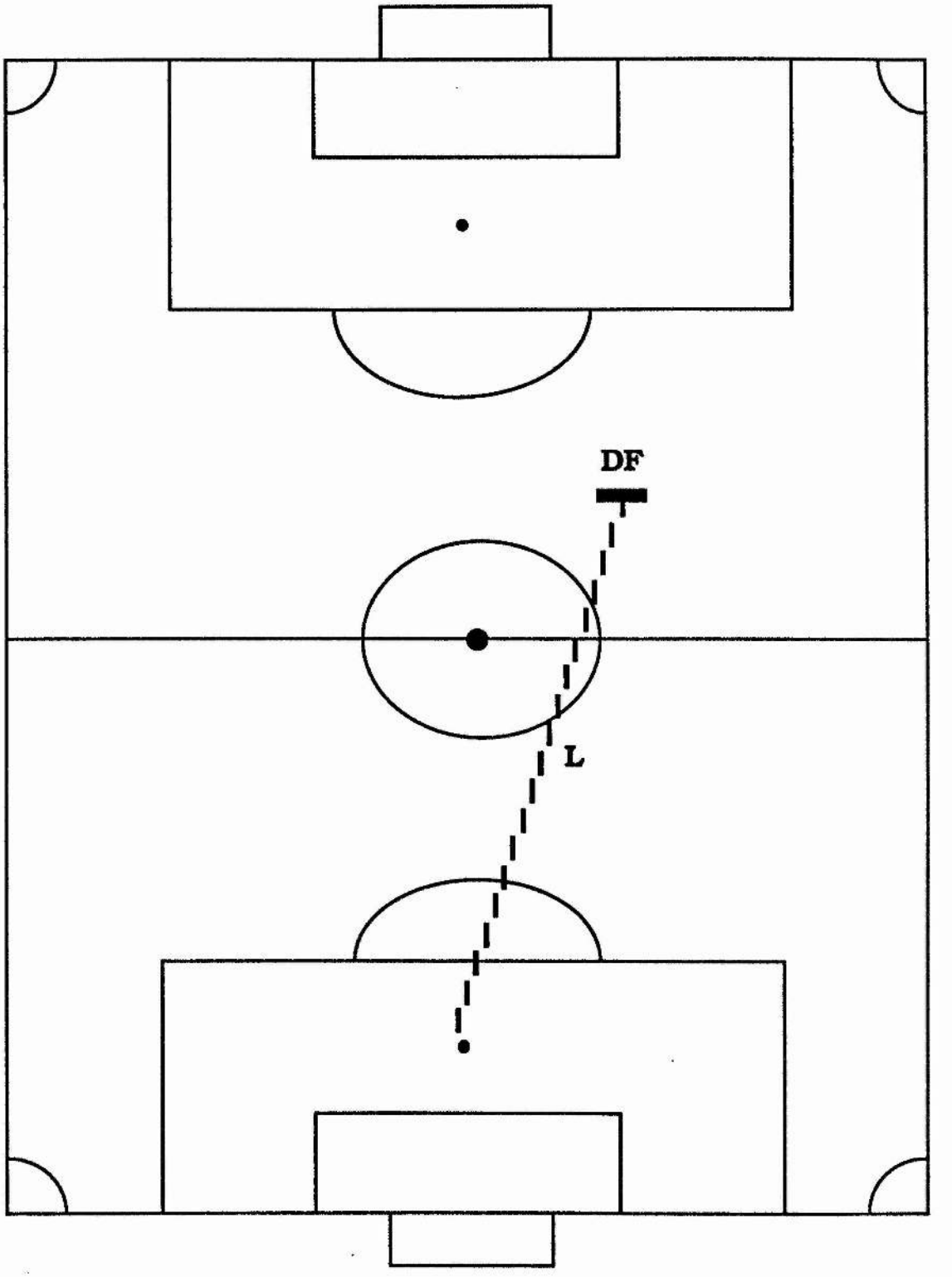


Path of ball

DF Ball intercepted by defender

Appendix A 2:4

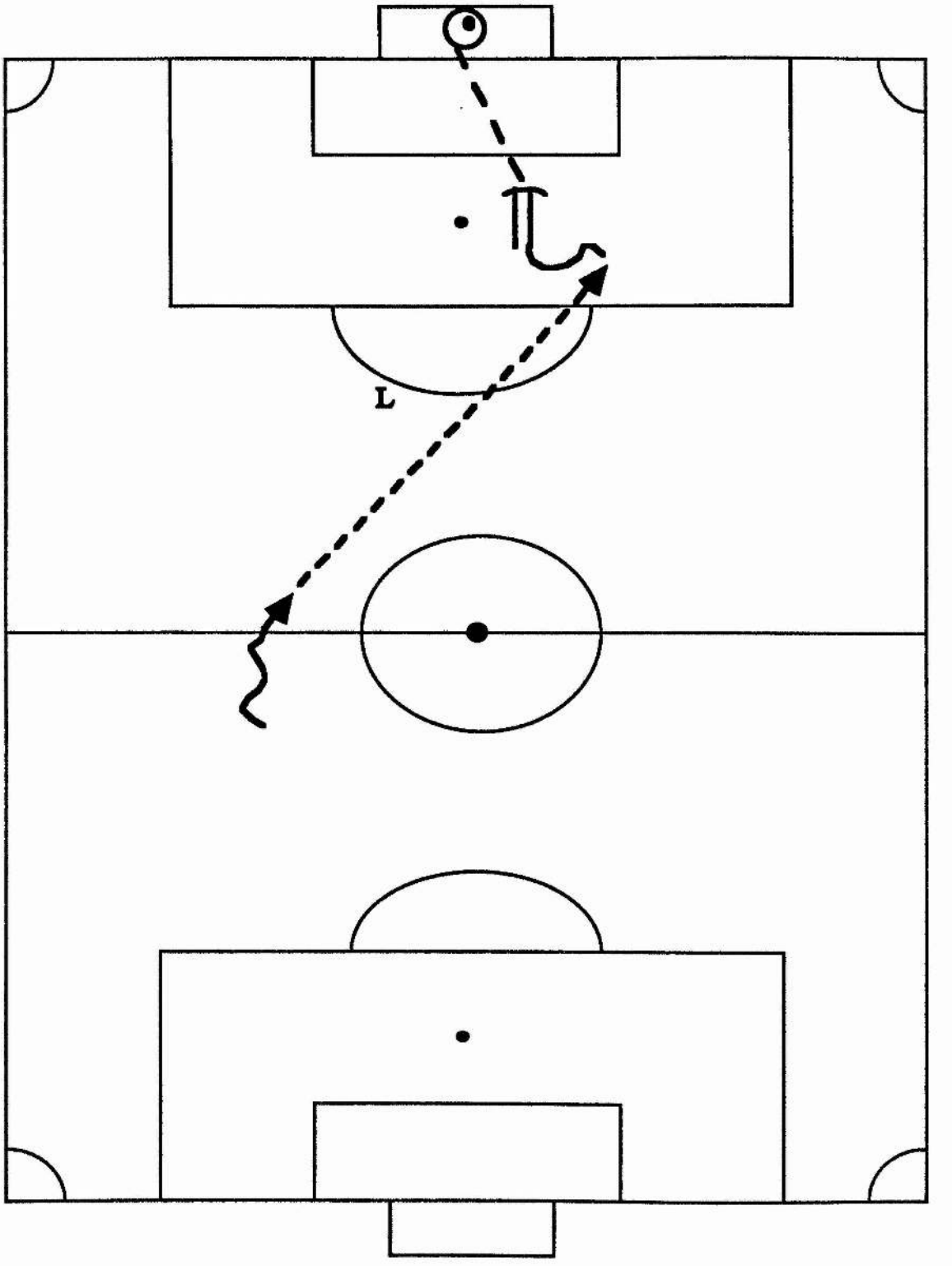
1. An attack typifying Pattern DH.1.



Path of ball

DF Ball intercepted by defender

2. An attack typifying pattern DH.2.

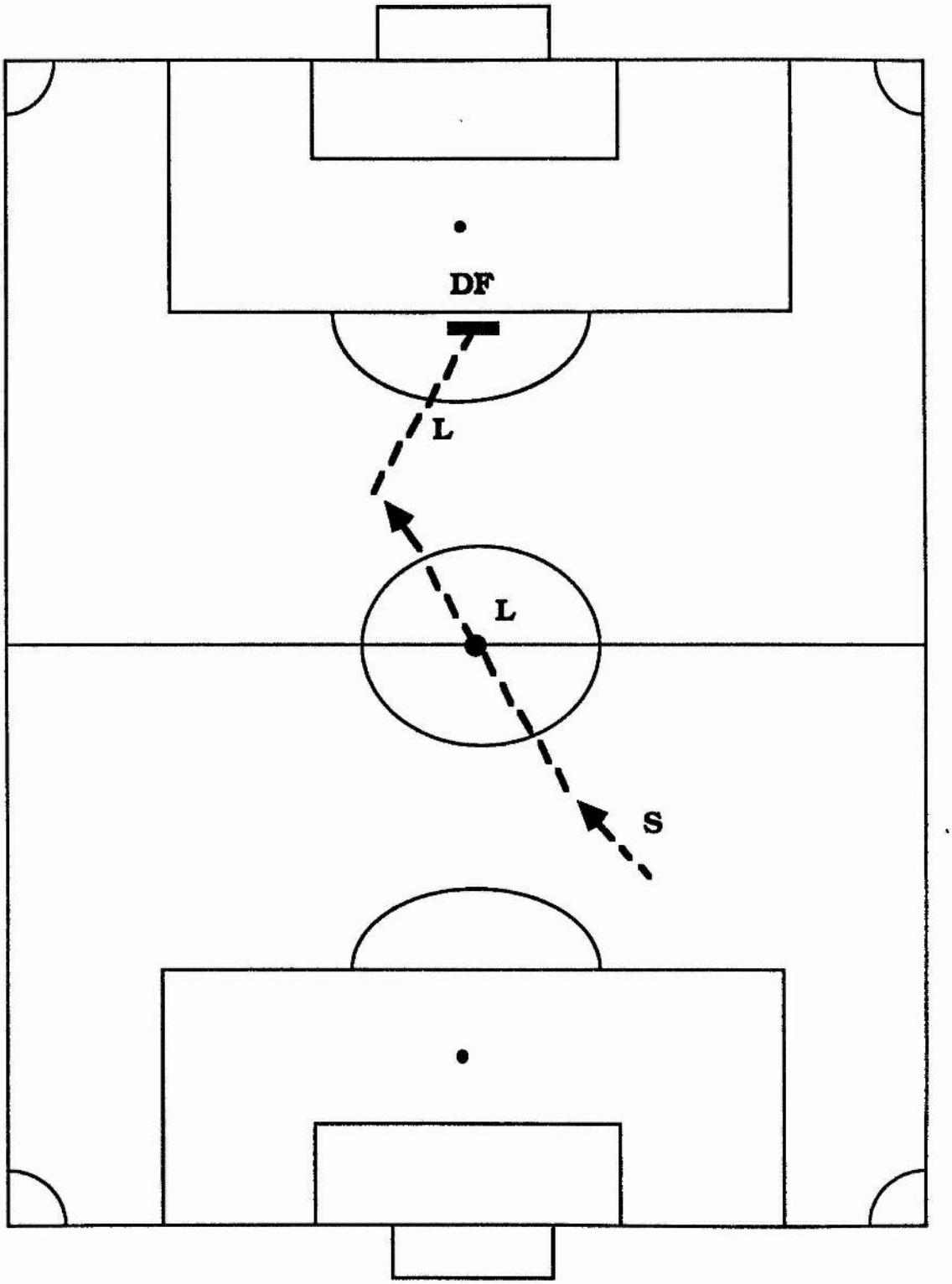


Path of ball

Route of player with ball

Shot on target

3. An attack typifying Pattern DH.3.

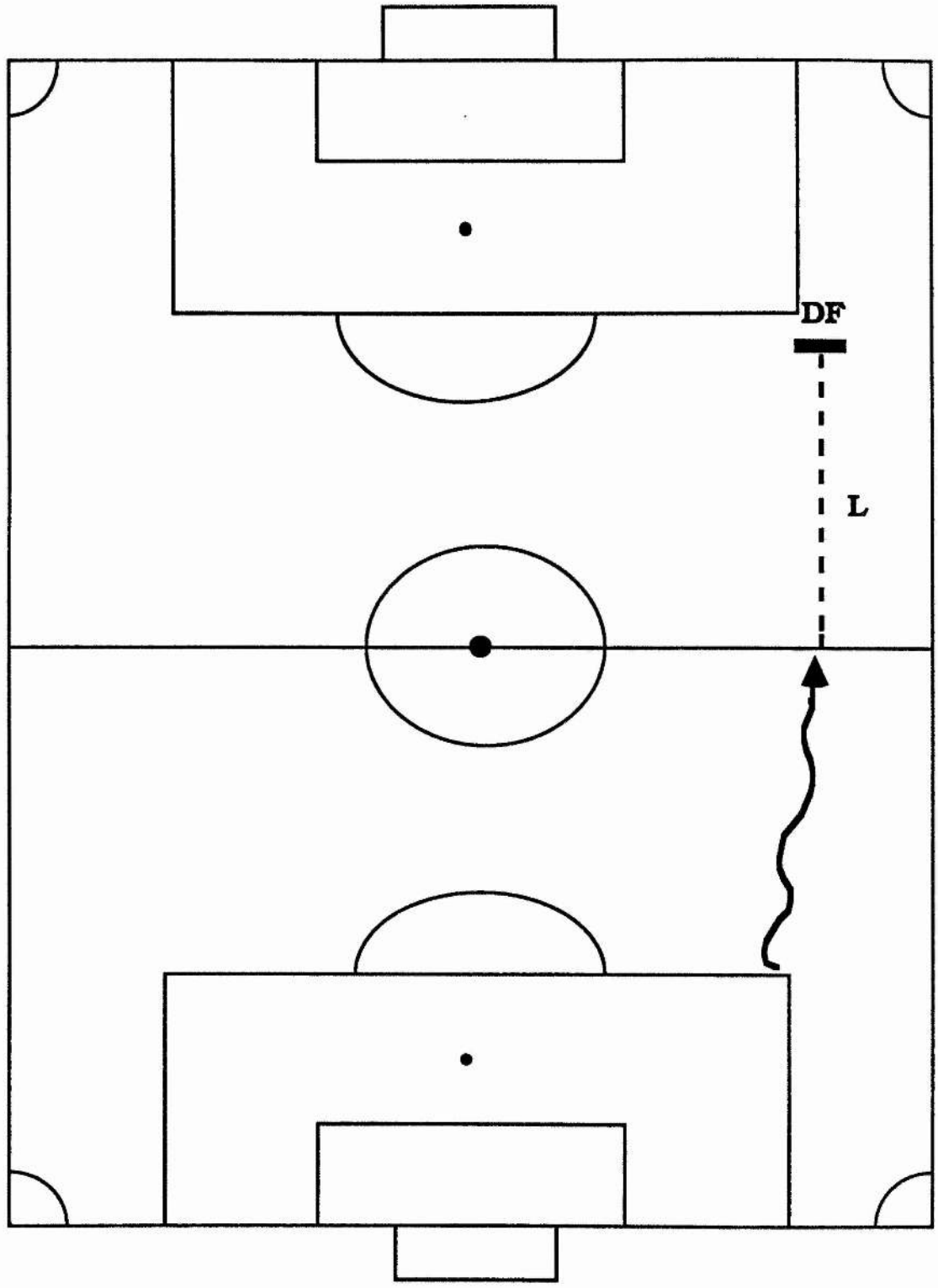


Path of ball

Route of player with ball

DF Path of ball

4. An attack typifying Pattern DH.4.



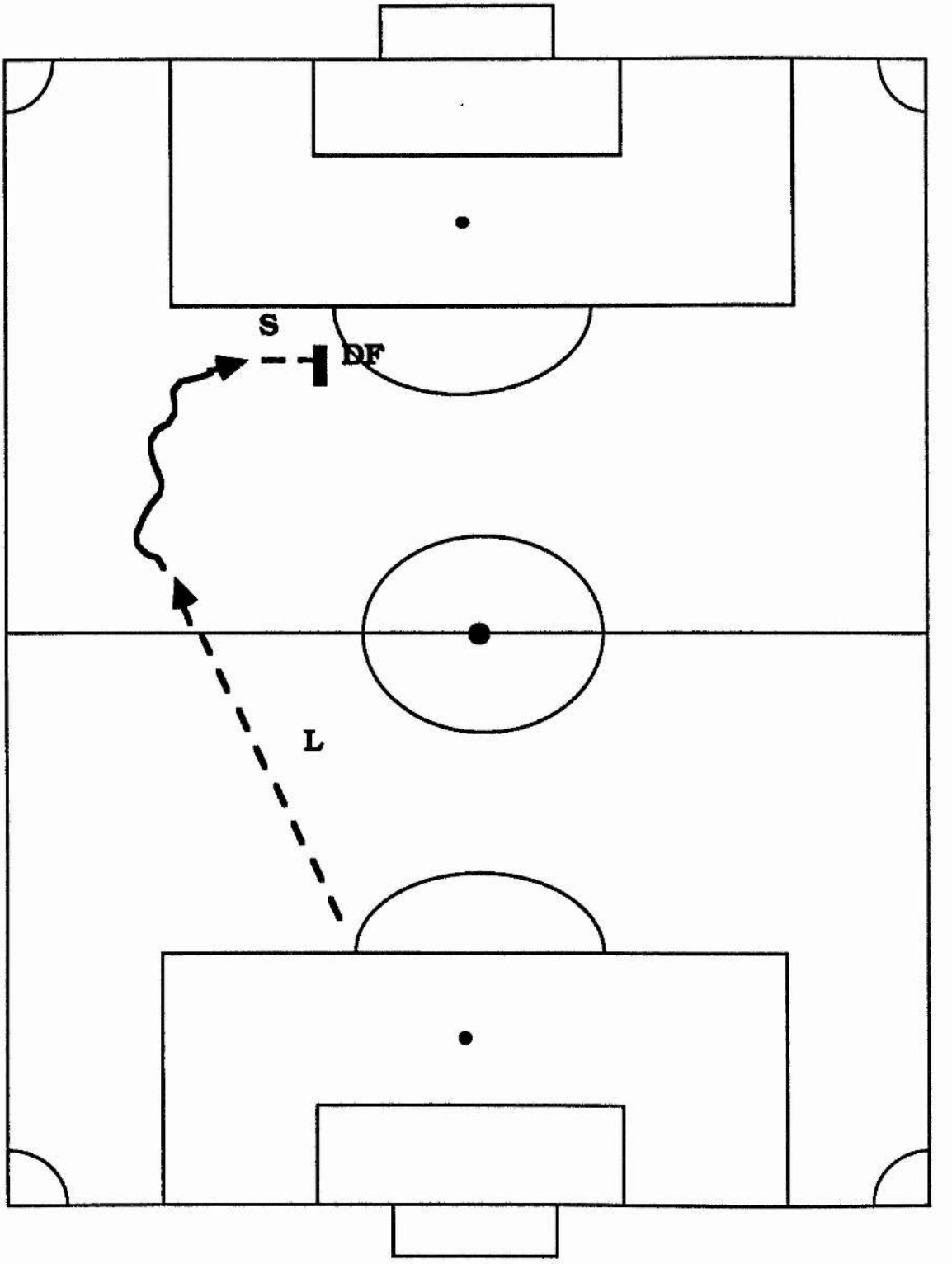
Path of ball

Route of player with ball

DF Ball intercepted by defender

Appendix A 2:4

1. An attack typifying Pattern DA.1.

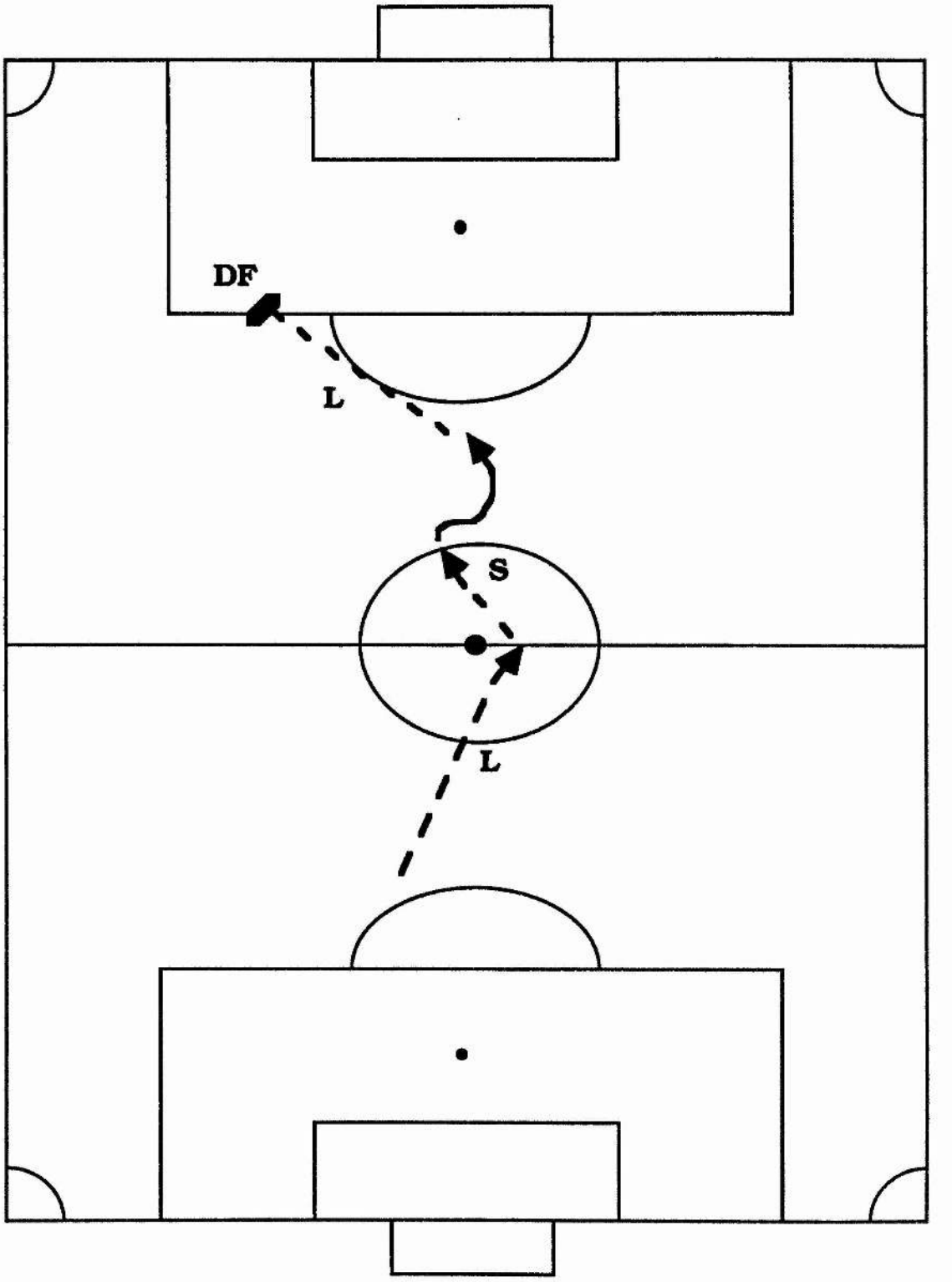


Path of ball

Route of player with ball

DF Ball intercepted by defender

2. An attack typifying Pattern DA.2.

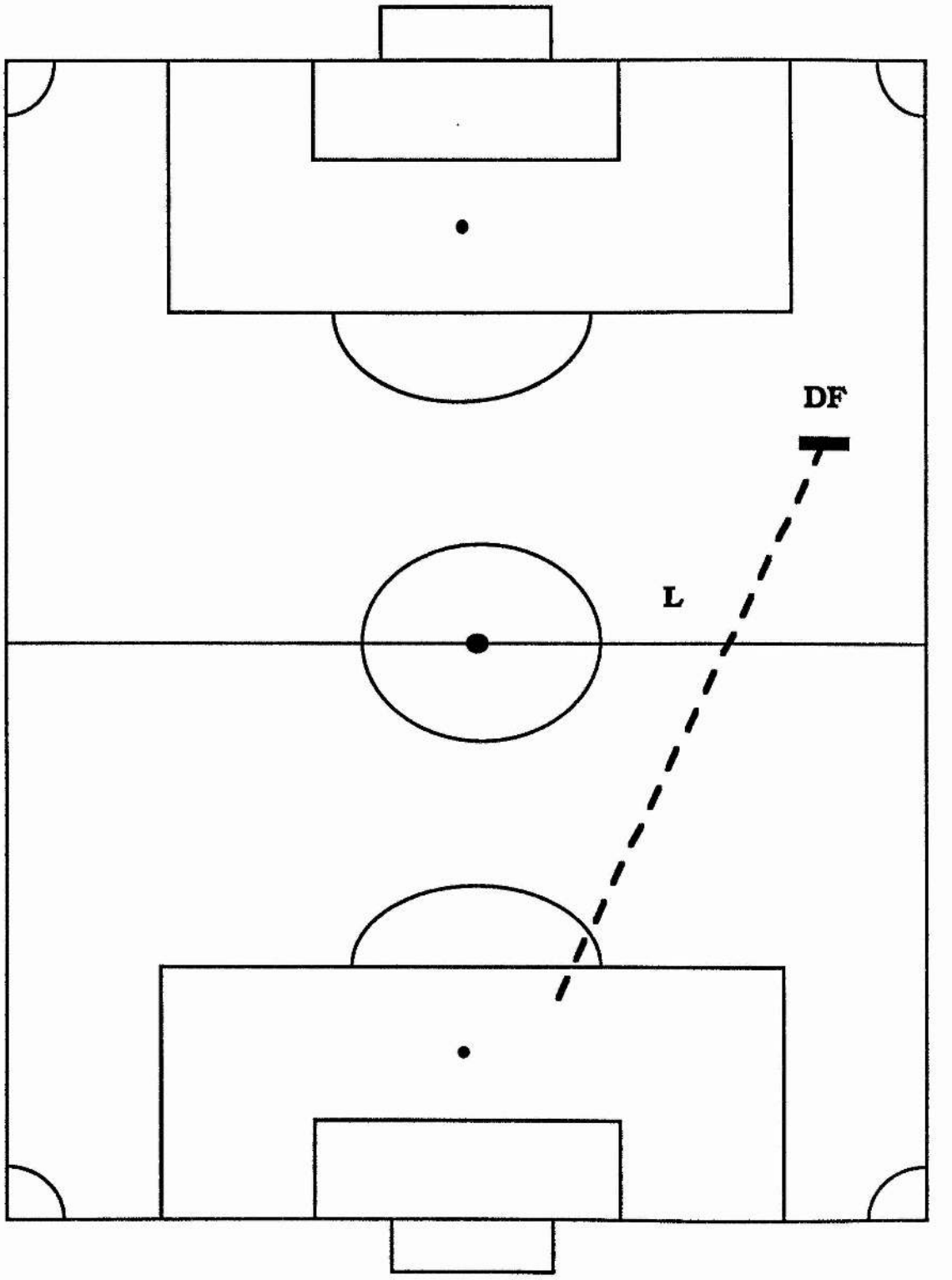


Path of ball

Route of player with ball

DF Ball intercepted by defender

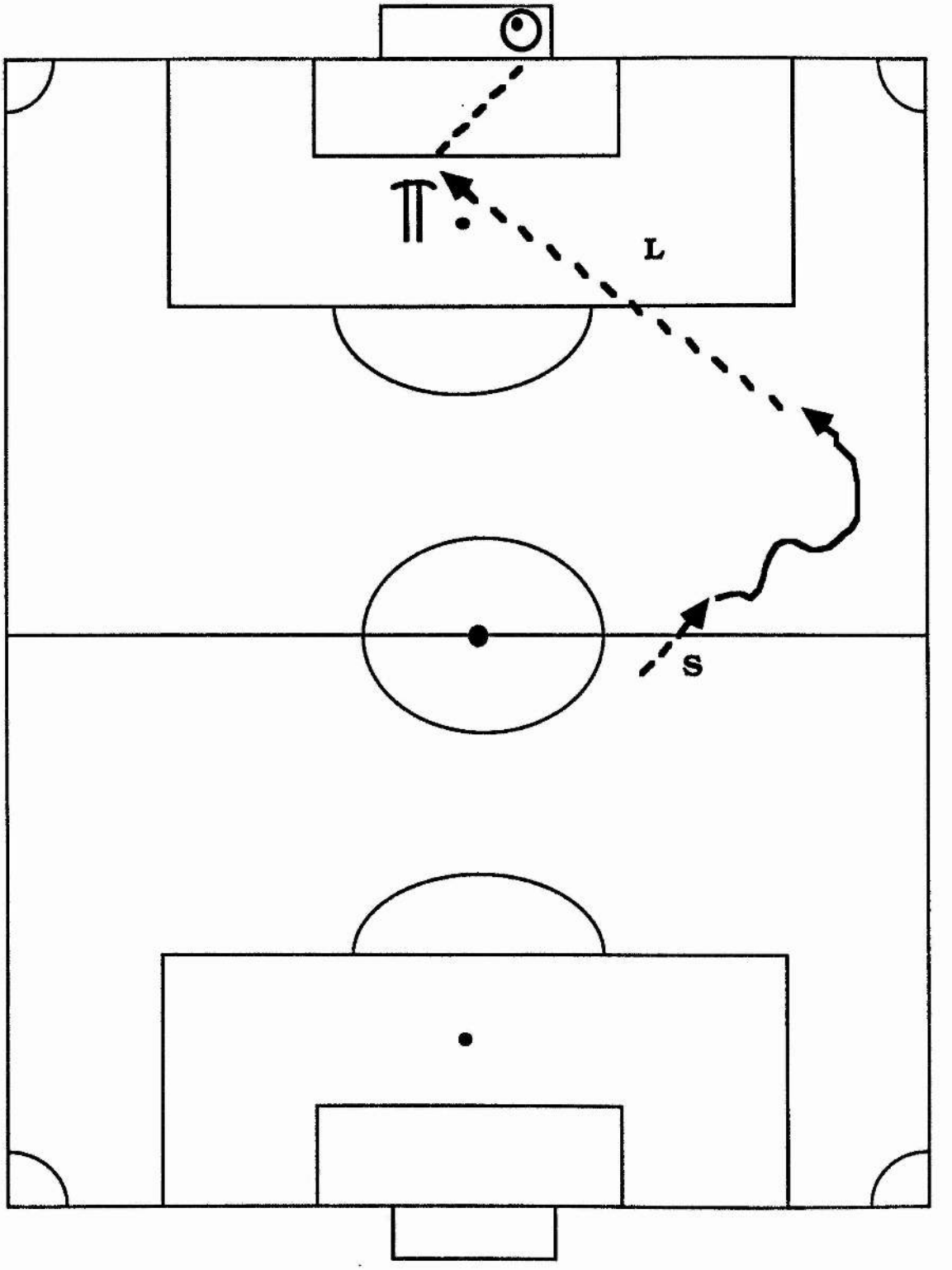
3. An attack typifying Pattern DA.3.



Path of ball

DF Ball intercepted by defender

4. An attack typifying Pattern DA.4.



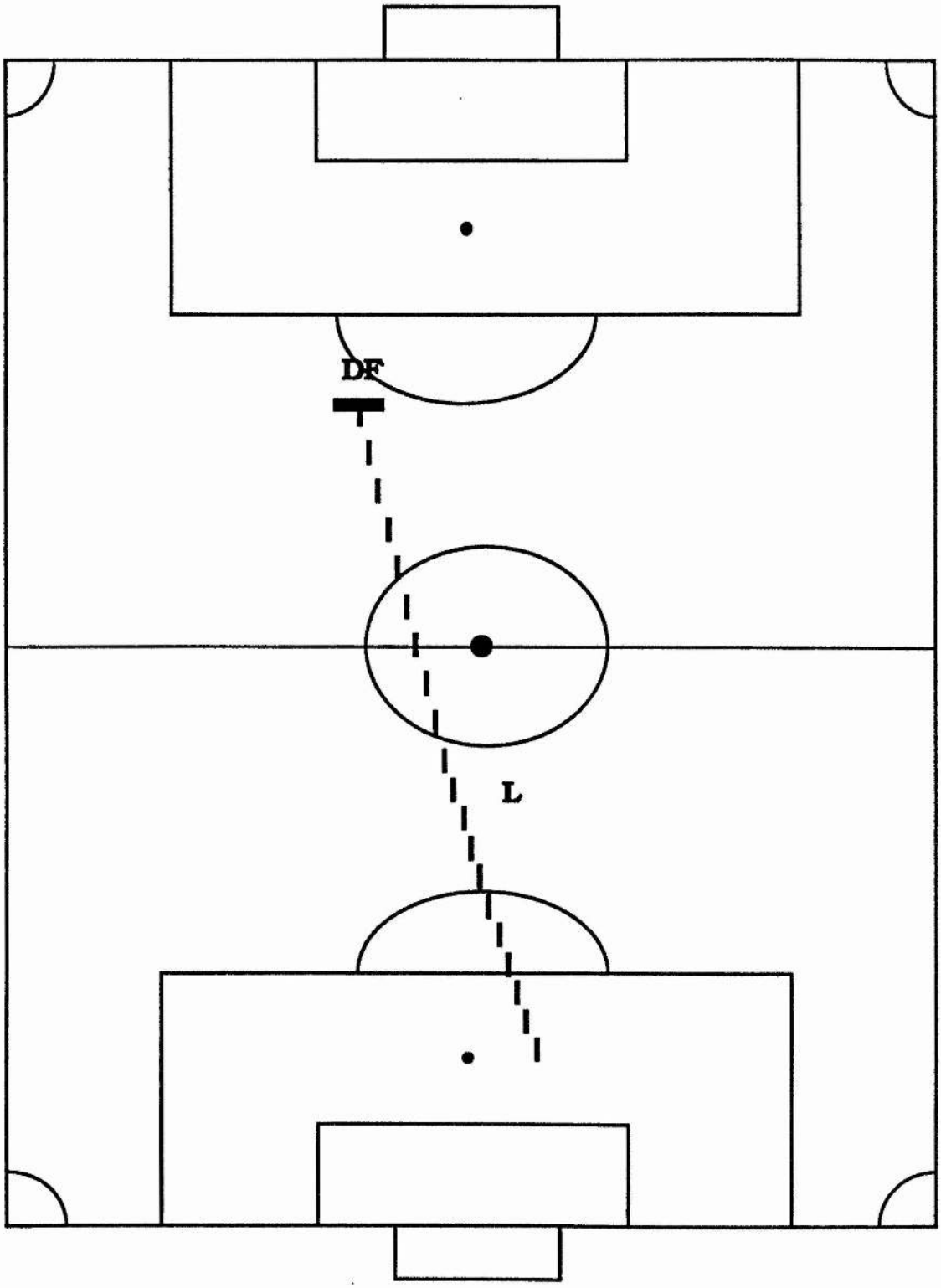
Path of ball

Route of player with ball

Shot on target

Appendix A 2:4

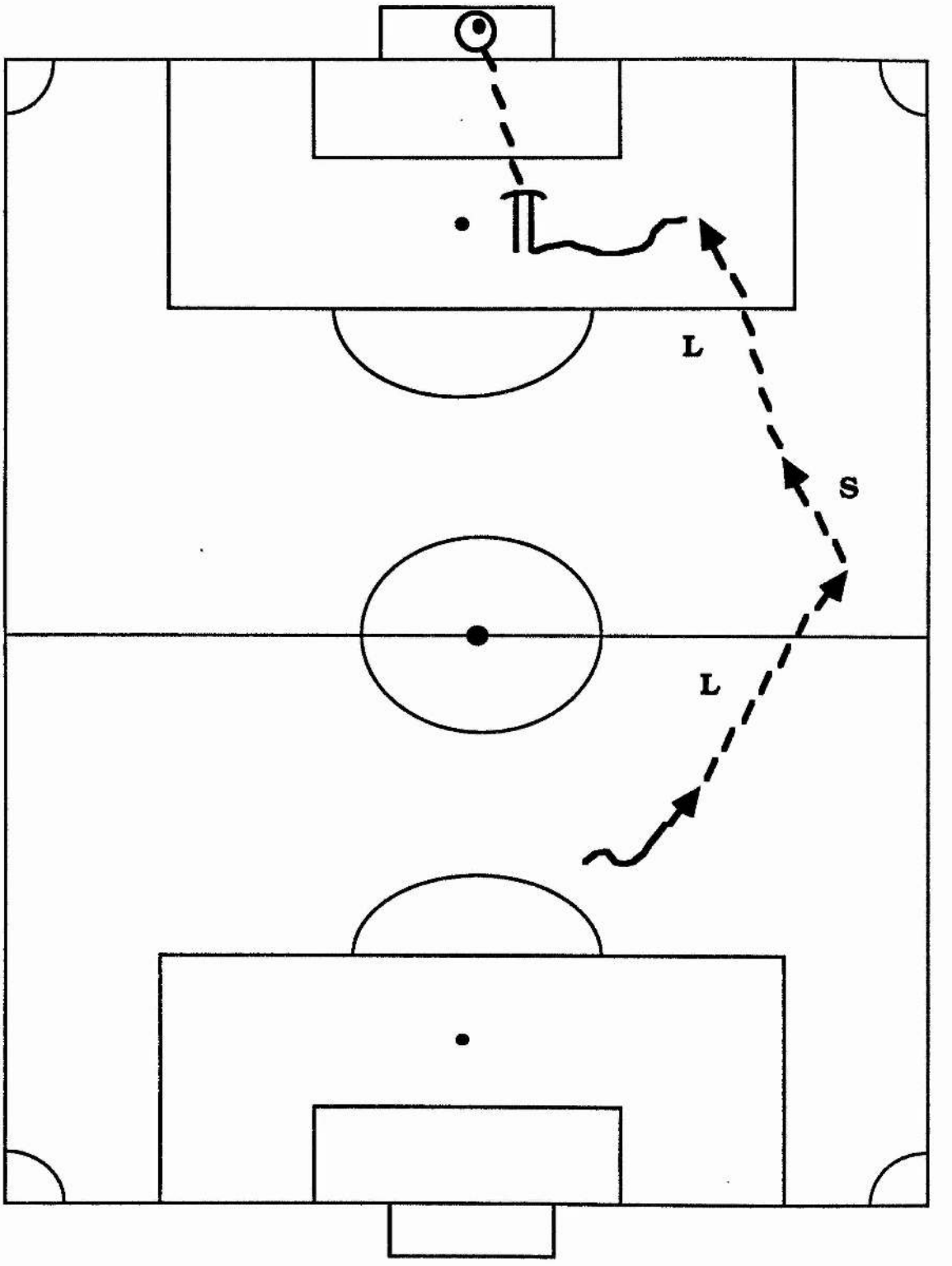
1. An attack typifying Pattern EH.1.



Path of ball

DF Ball intercepted by defender

2. An attack typifying pattern EH.2.

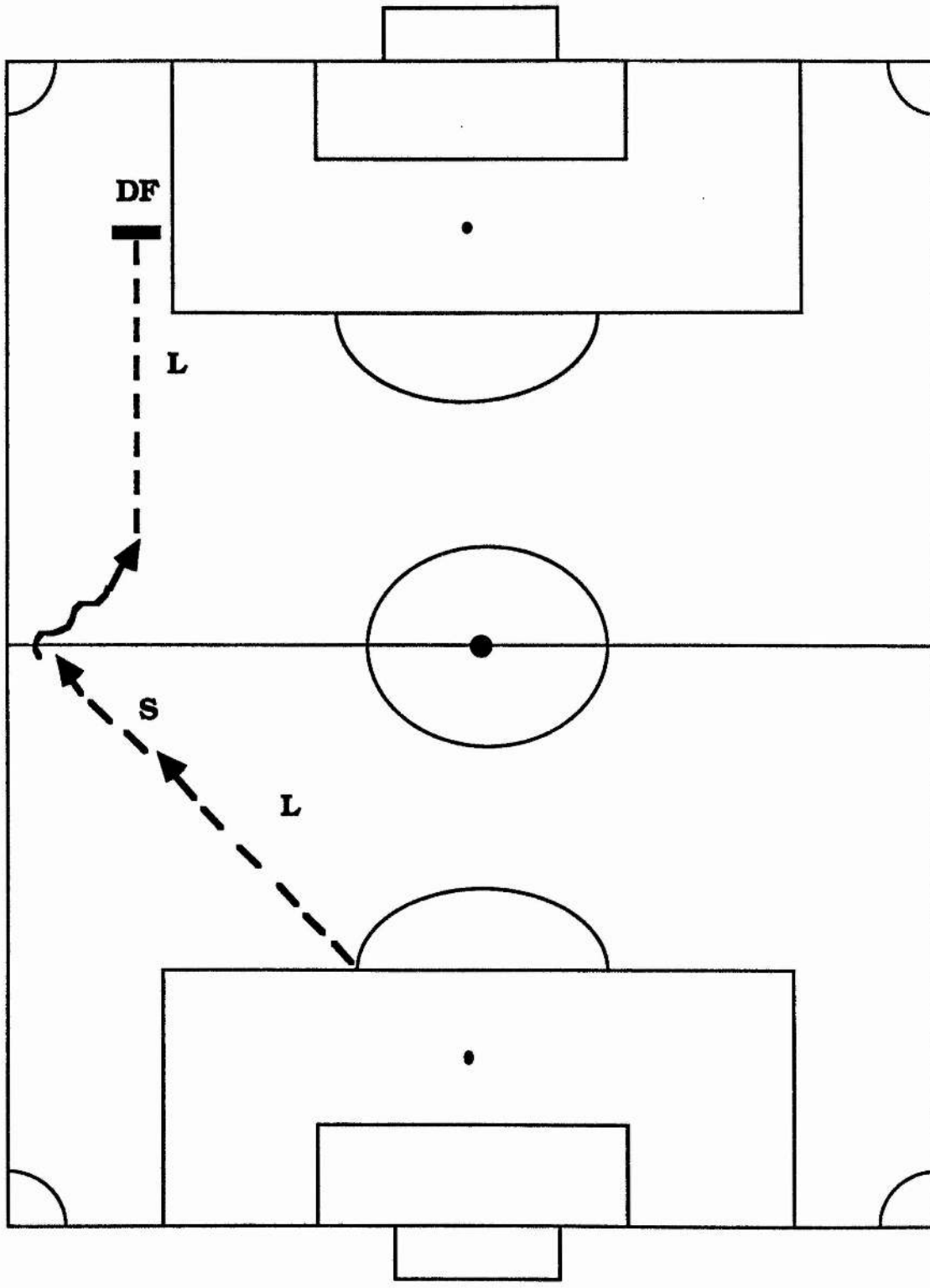


Path of ball

Route of player with ball

Shot on target

3. An attack typifying Pattern EH.3.

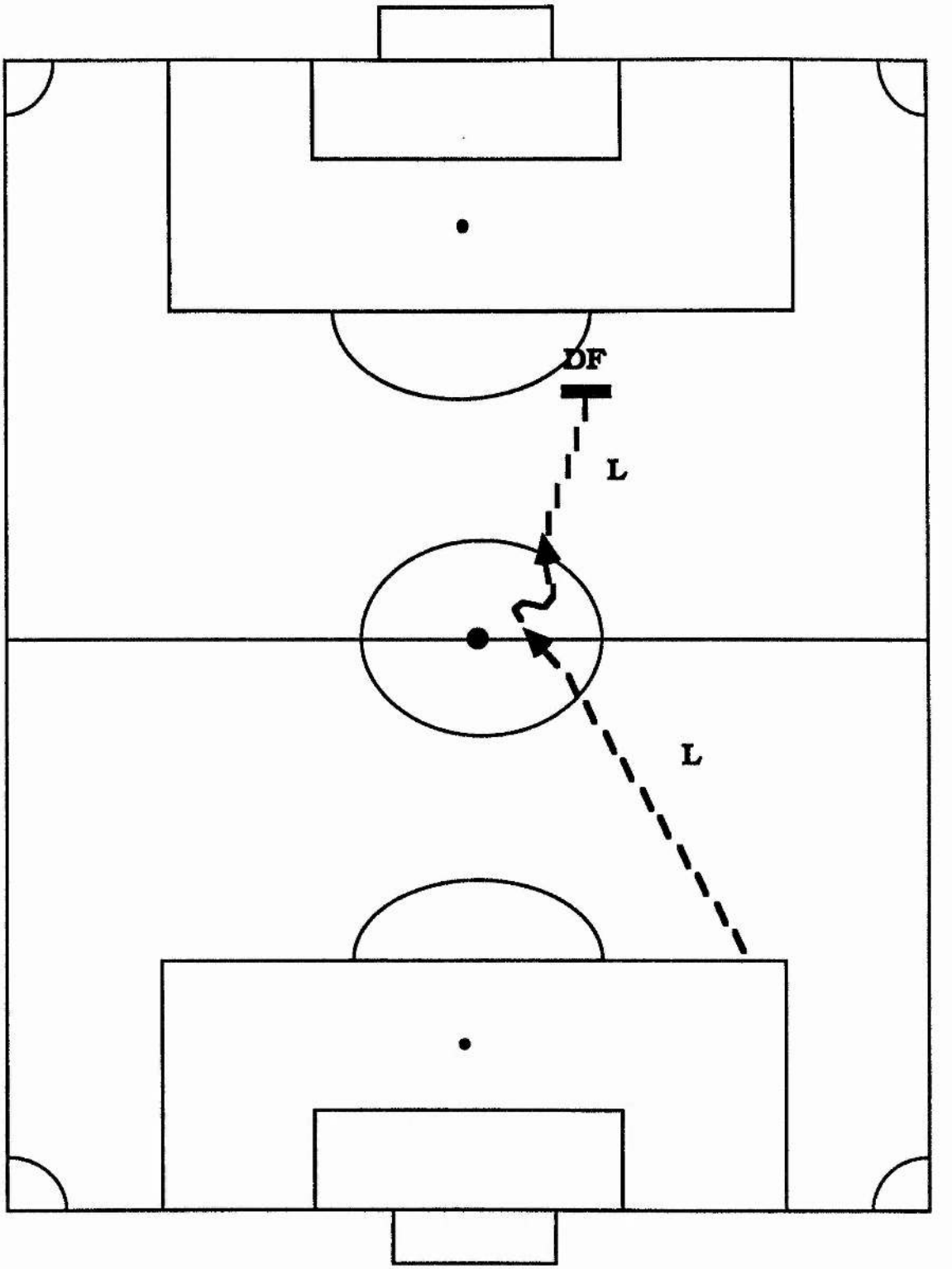


Path of ball

Route of player with ball

DF Ball intercepted by defender

4. An attack typifying Pattern EH.4.

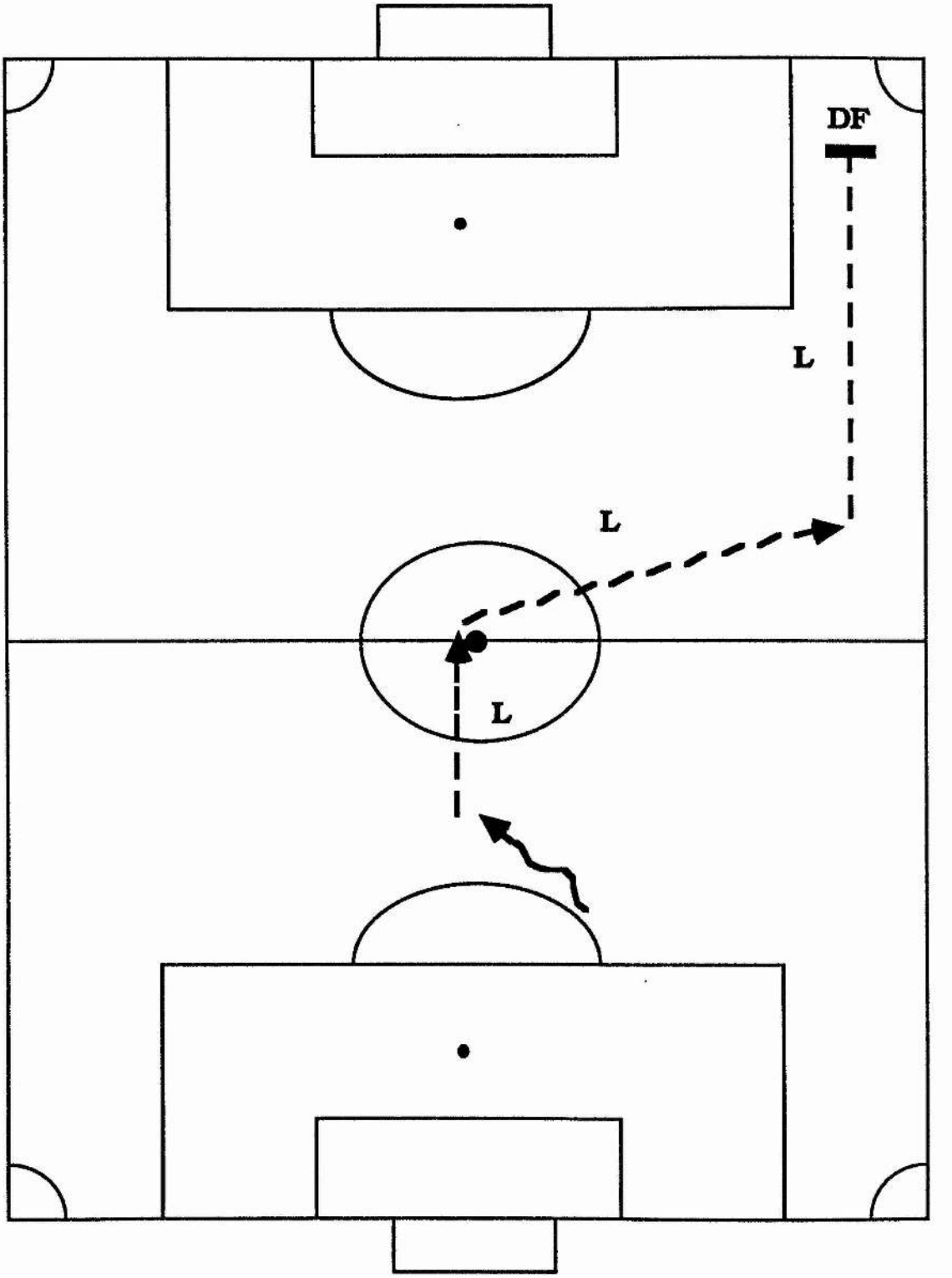


Path of ball

Route of player with ball

DF Ball intercepted by defender

5. An attack typifying Pattern EH.5.



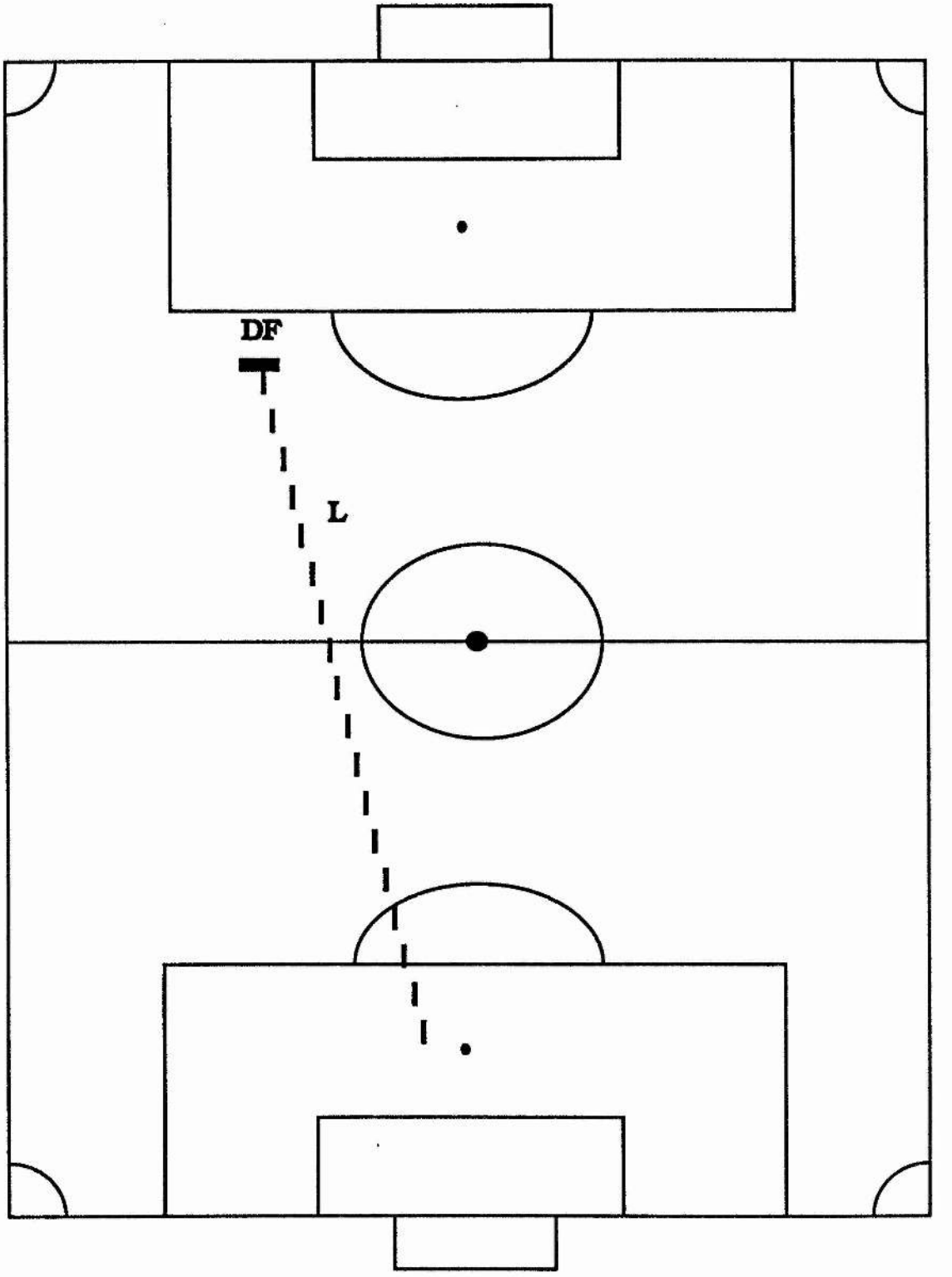
Path of ball

Route of player with ball

DF Ball intercepted by defender

Appendix A 2:4

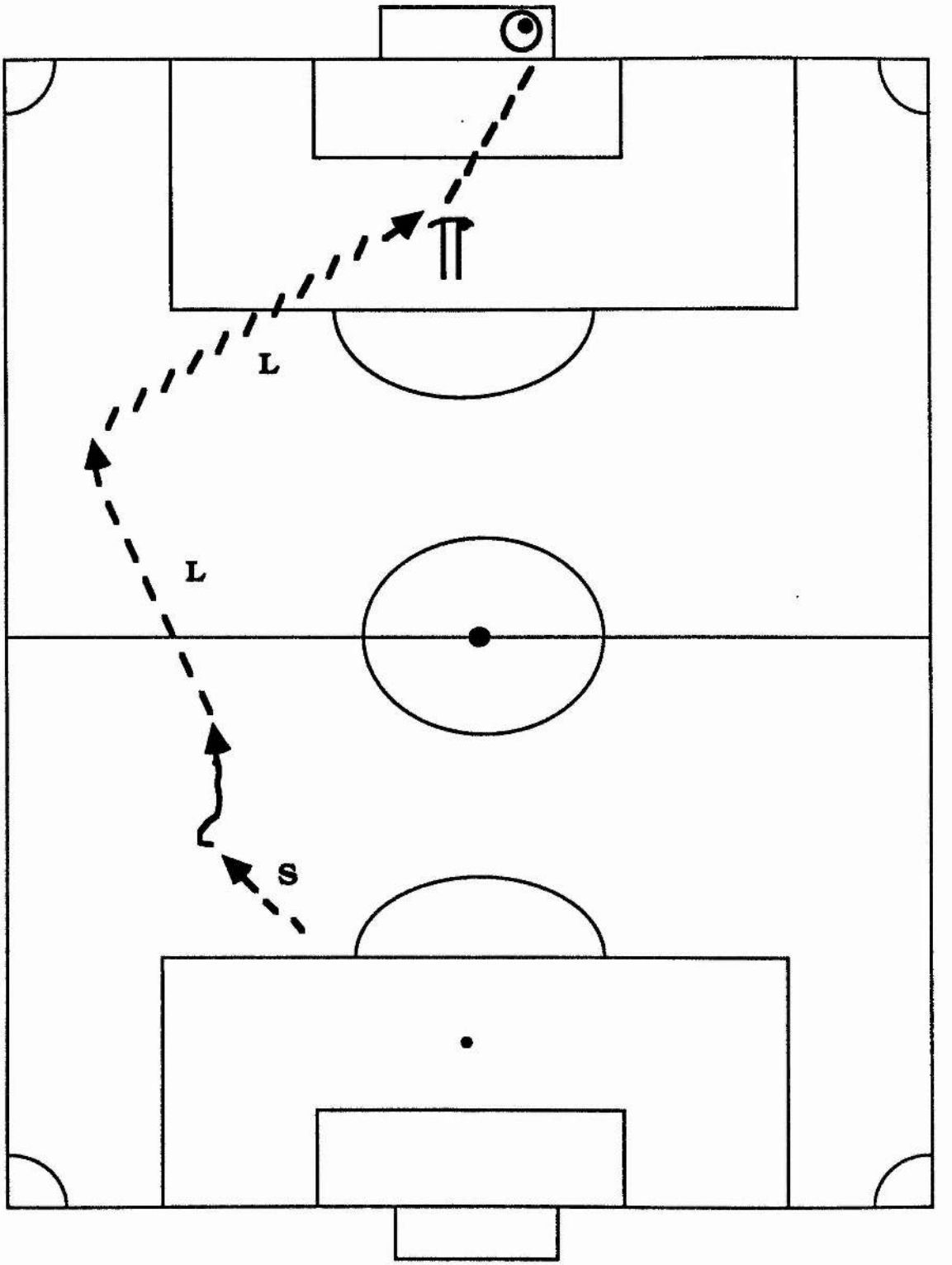
1. An attack typifying Pattern EA.1.



Path of ball

DF Ball intercepted by defender

2. An attack typifying Pattern EA.2.

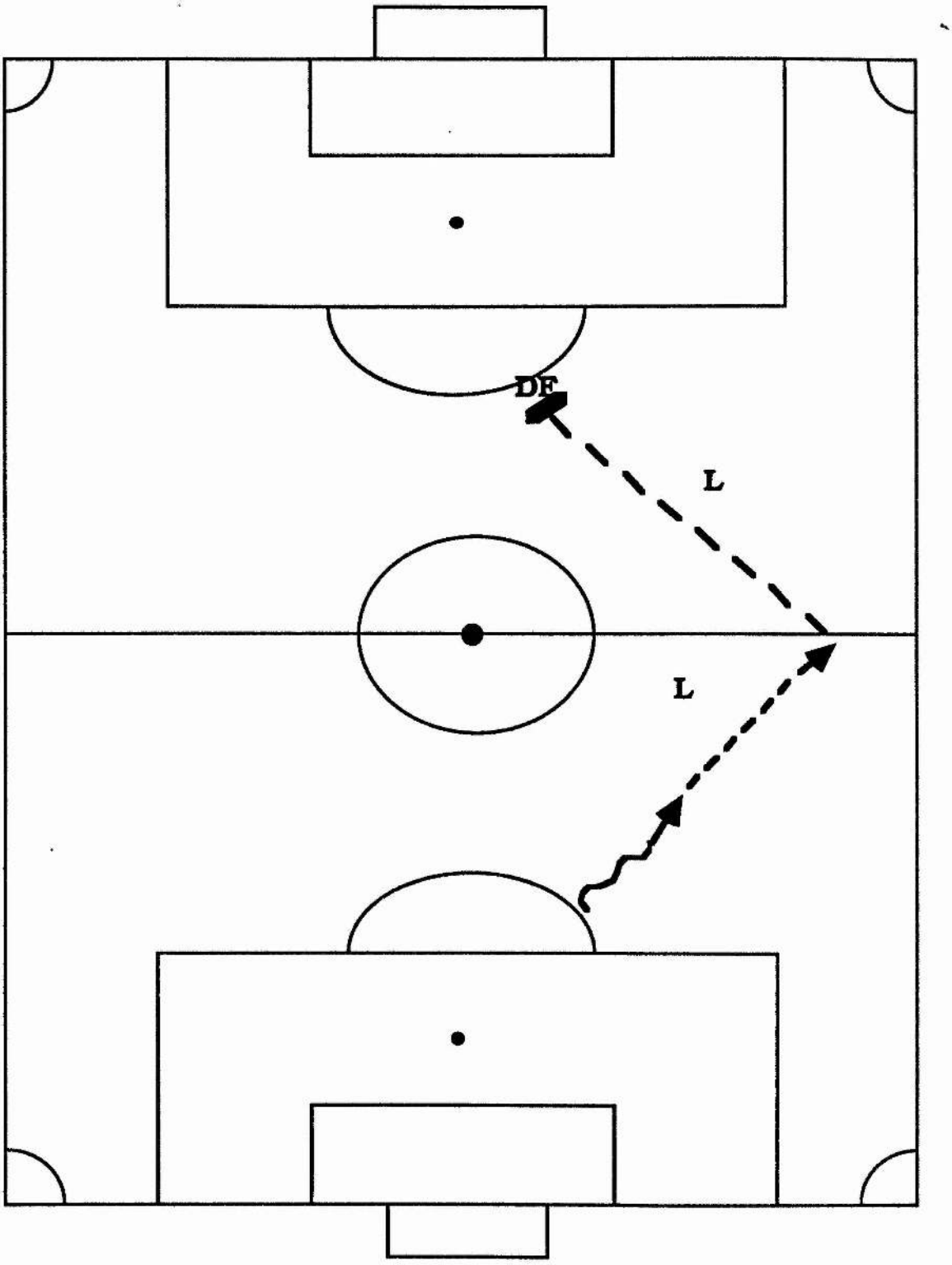


Path of ball

Route of player with ball

Shot on target

3. An attack typifying Pattern EA.3.

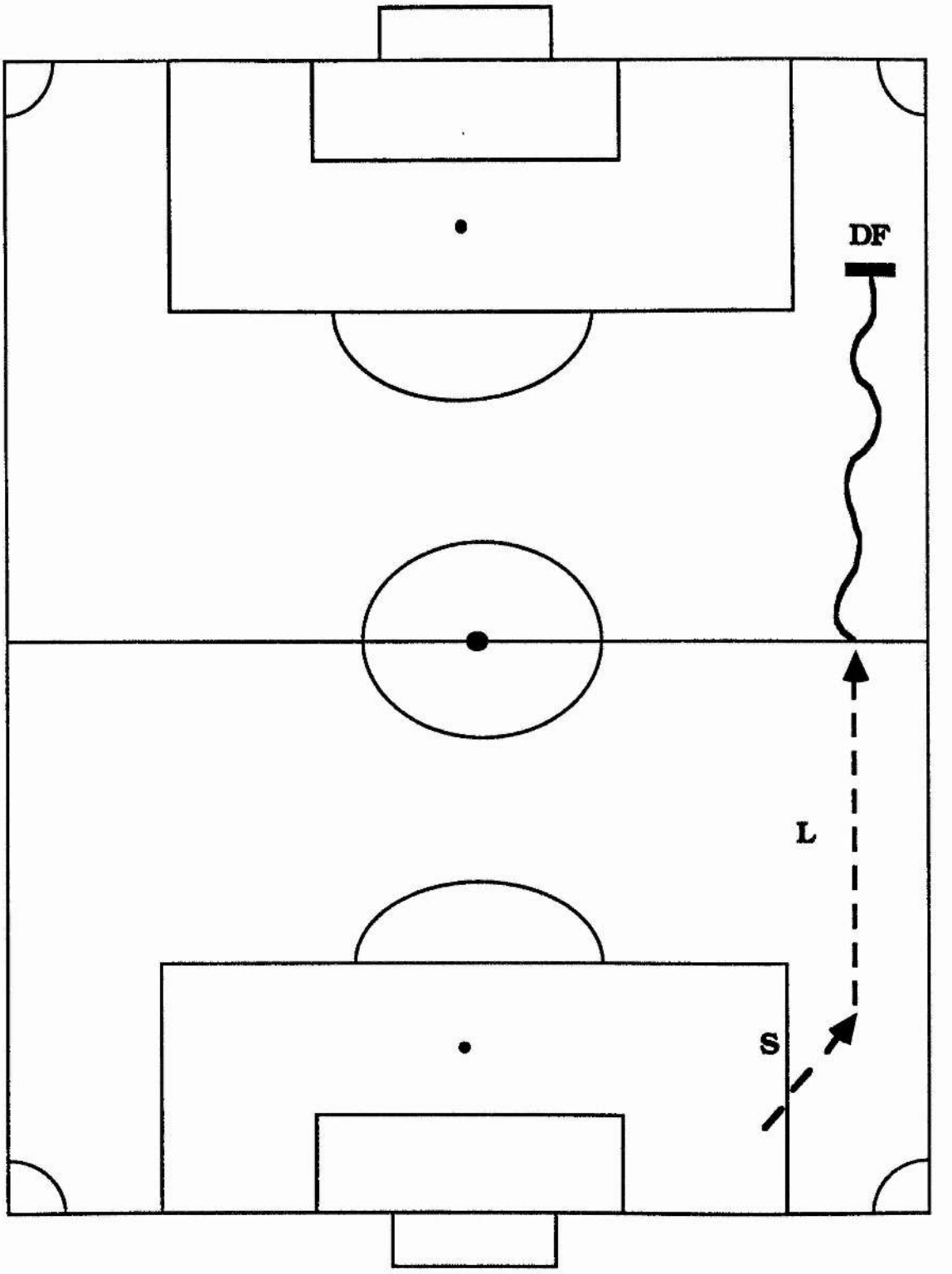


Path of ball

Route of player with ball

DF Ball intercepted by defender

4. An attack typifying Pattern EA.4.



Path of ball

Route of player with ball

Shot off target

APPENDIX A 2:5

Tables of set plays for all the teams.

1 Tables of set plays for team A.

2 Tables of set plays for team B.

3 Tables of set plays for team C.

4 Tables of set plays for team D.

5 Tables of set plays for team E.

Appendix A 2:5

A. Summary of the relationships between long corner-kicks and short corner-kicks with shots off or on target for team A.

	Long Corner-kicks	Short Corner-kicks
Goal	1	3
Shot on target	11	24
Shot off target	14	10
No resultant shot	62	7
Total	88	44

Appendix A 2:5

B. Summary of the relationships between long throw-ins and short throw-ins with shots off or on target for team A.

	Long Throw-ins	Short Throw-ins
Goal	0	2
Shot on target	3	28
Shot off target	5	24
No resultant shot	3	149
Total	11	203

Appendix A 2:5

C. Summary of the relative effectiveness of free-kicks taken as a direct shot on goal in relation to free-kicks taken as a lay-off to another player, as measured by the number of shots on or off target for team A.

	Free-kicks taken as direct shot on goal	**Free-kicks taken as a lay-off to another player**
Goal	3	0
Shot on target	25	15
Shot off target	11	23
Shot blocked	4	128
Total	43	166

Appendix A 2:5

A. Summary of the relationships between long corner-kicks and short corner-kicks with shots off or on target for team B.

	Long Corner-kicks	Short Corner-kicks
Goal	0	3
Shot on target	8	14
Shot off target	9	13
No resultant shot	48	9
Total	65	39

Appendix A 2:5

B. Summary of the relationships between long throw-ins and short throw-ins with shots off or on target for team B.

	Long Throw-ins	short Throw-ins
Goal	0	0
Shot on target	2	21
Shot off target	4	26
No resultant shot	3	129
Total	9	176

Appendix A 2:5

C. Summary of the relative effectiveness of free-kicks taken as a direct shot on goal in relation to free-kicks taken as a lay-off to another player, as measured by the number of shots on or off target for team B.

	Free-kicks taken as direct shot on goal	**Free-kicks taken as a lay-off to another player**
Goal	0	0
Shot on target	8	22
Shot off target	9	24
Shot blocked	21	121
Total	38	167

Appendix A 2:5

A. Summary of the relationships between long corner-kicks and short corner-kicks with shots off or on target for team C.

	Long Corner-kicks	Short Corner-kicks
Goal	0	2
Shot on target	10	17
Shot off target	20	5
No resultant shot	61	4
Total	91	28

Appendix A 2:5

B. Summary of the relationships between long throw-ins and short throw-ins with shots off or on target for team C.

	Long Throw-ins	Short Throw-ins
Goal	0	5
Shot on target	2	22
Shot off target	4	21
No resultant shot	5	124
Total	11	172

Appendix A 2:5

C. Summary of the relative effectiveness of free-kicks taken as a direct shot on goal in relation to free-kicks taken as a lay-off to another player, as measured by the number of shots on or off target for team C.

	Free-kicks taken as direct shot on goal	Free-kicks taken as a lay-off to another player
Goal	1	3
Shot on target	5	25
Shot off target	6	27
Shot blocked	4	144
Total	16	199

Appendix A 2:5

A. Summary of the relationships between long corner-kicks and short corner-kicks with shots off or on target for team D.

	Long Corner-kicks	Short Corner-kicks
Goal	0	1
Shot on target	1	2
Shot off target	4	3
No resultant shot	65	5
Total	70	11

Appendix A 2:5

B. Summary of the relationships between long throw-ins and short throw-ins with shots off or on target for team D.

	Long Throw-ins	Short Throw-ins
Goal	0	0
Shot on target	0	3
Shot off target	1	8
No resultant shot	3	158
Total	4	169

Appendix A 2:5

C. **Summary of the relative effectiveness of free-kicks taken as a direct shot on goal in relation to free-kicks taken as a lay-off to another player, as measured by the number of shots on or off target for team D.**

	Free-kicks taken as direct shot on goal	**Free-kicks taken as a lay-off to another player**
Goal	3	0
Shot on target	8	4
Shot off target	10	2
Shot blocked	11	169
Total	32	175

Appendix A 2:5

A. Summary of the relationships between long corner-kicks and short corner-kicks with shots off or on target for team E.

	Long Corner-kicks	Short Corner-kicks
Goal	2	0
Shot on target	8	2
Shot off target	13	2
No resultant shot	41	2
Total	64	6

Appendix A 2:5

B. Summary of the relationships between long throw-ins and short throw-ins with shots off or on target for team E.

	Long Throw-ins	Short Throw-ins
Goal	0	2
Shot on target	0	9
Shot off target	1	15
No resultant shot	6	147
Total	7	173

Appendix A 2:5

C. Summary of the relative effectiveness of free-kicks taken as a direct shot on goal in relation to free-kicks taken as a lay-off to another player, as measured by the number of shots on or off target for team E.

	Free-kicks taken as direct shot on goal	Free-kicks taken as a lay-off to another player
Goal	0	1
Shot on target	2	13
Shot off target	5	28
Shot blocked	9	164
Total	16	206

APPENDIX A3

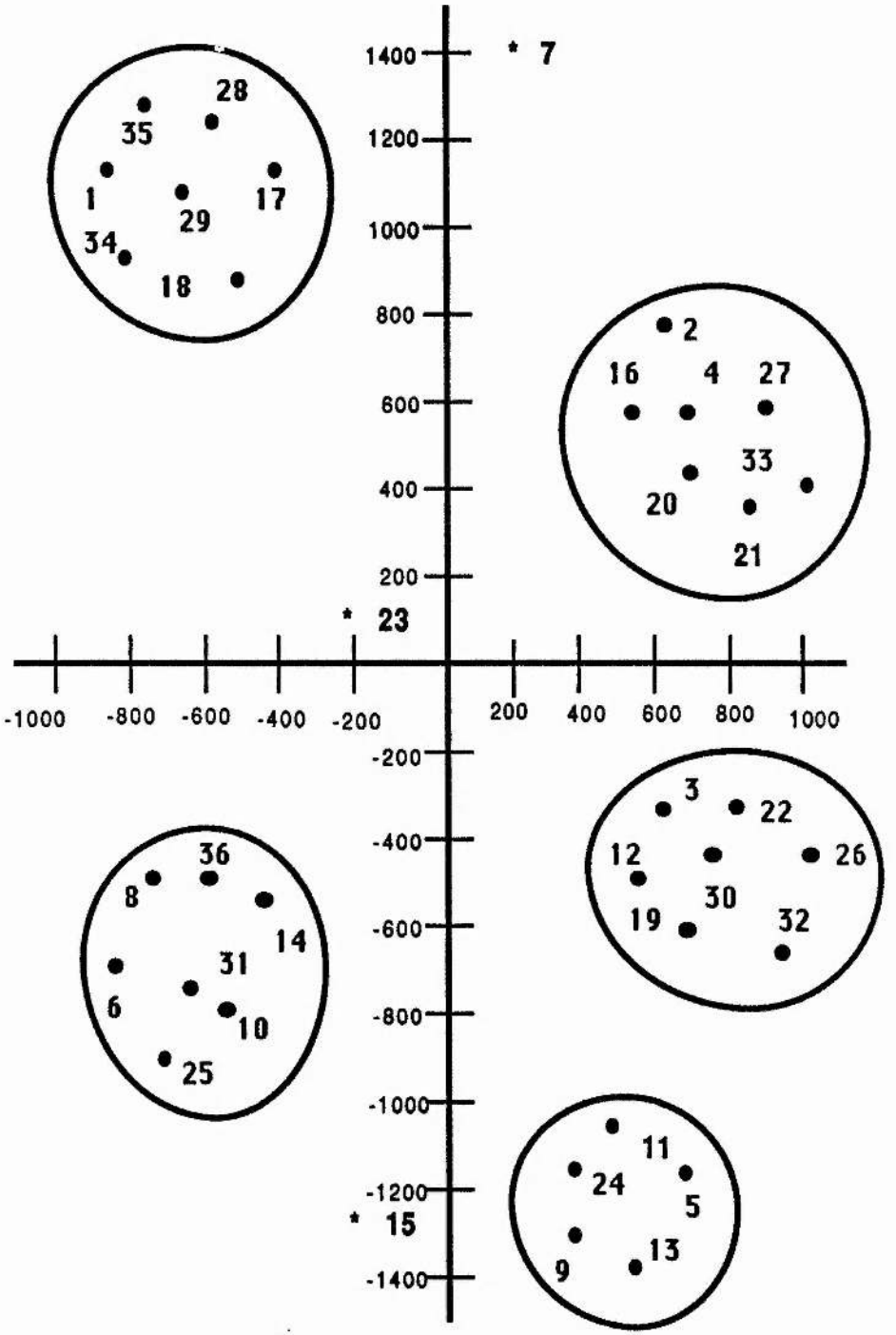
A 3:1 Graph of patterns of play for team I in home matches.

A 3:2 Patterns of play for team I in home matches.

A 3:3 Tables of set plays for team I in home matches.

Appendix A 3:1

Graph showing attacking movements. The five clusters represent similar movement patterns of play. The few unique attacking moves have little in common with other moves.



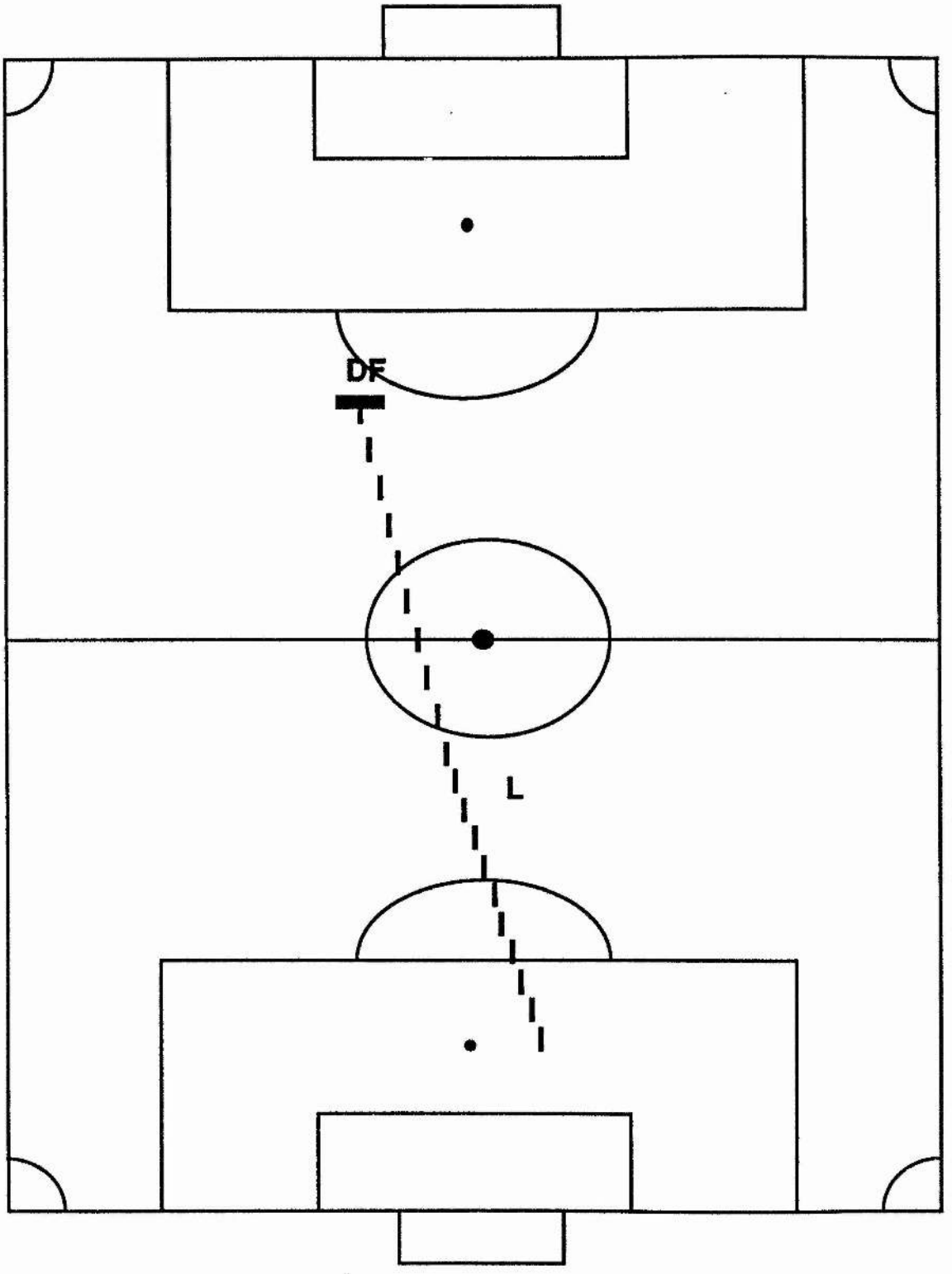
Note :

- Moves within a cluster demonstrating a pattern of play.

* Moves which are unique have little in common with other moves. (i.e. moves 7, 15 & 23)

Appendix A 3:2

1. An attack typifying Pattern IH.1.

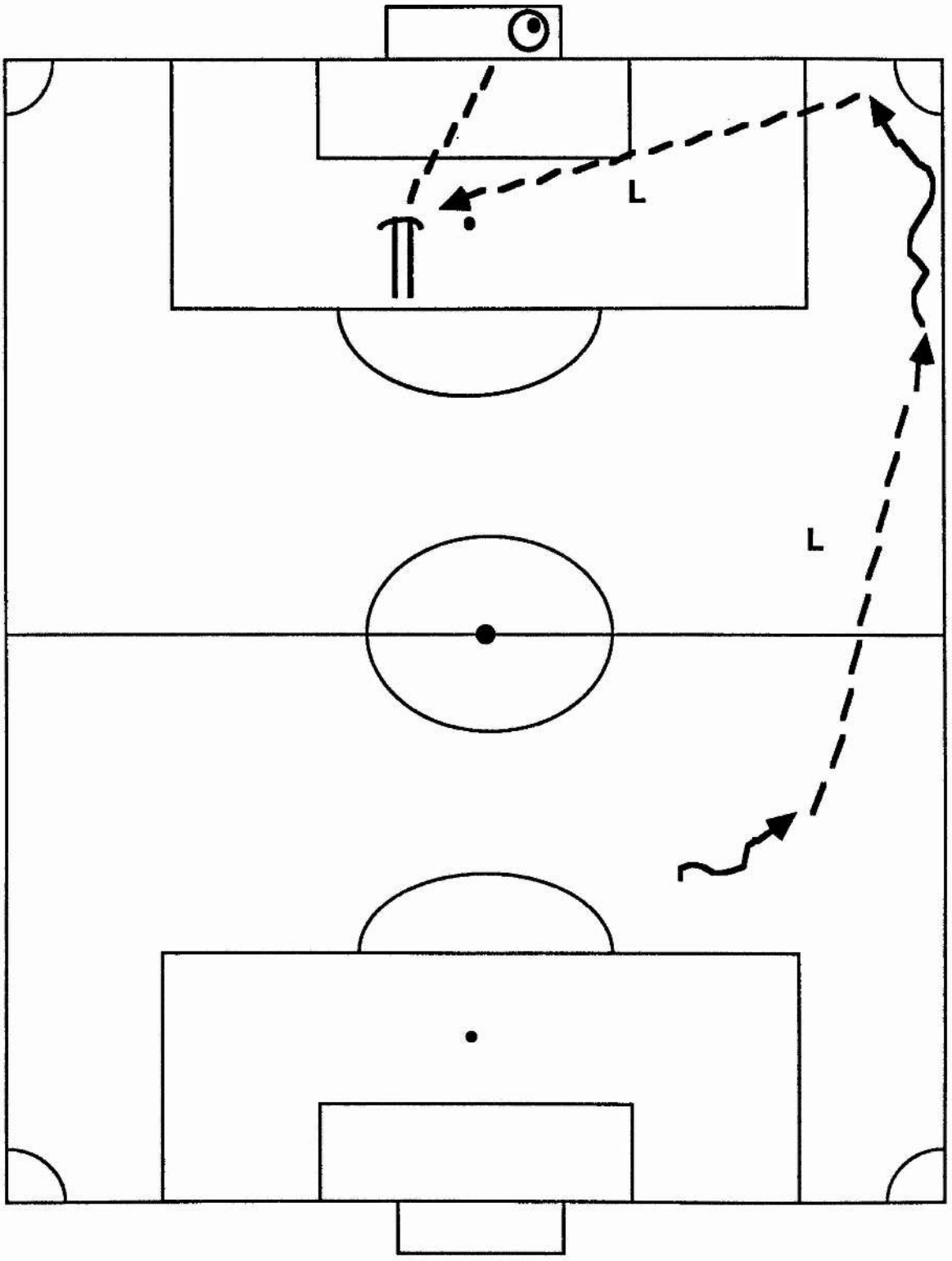


Path of ball

DF Ball intercepted by defender

Pattern IH.1 Pattern one at home for the international team.

2. An attack typifying Pattern IH.2.

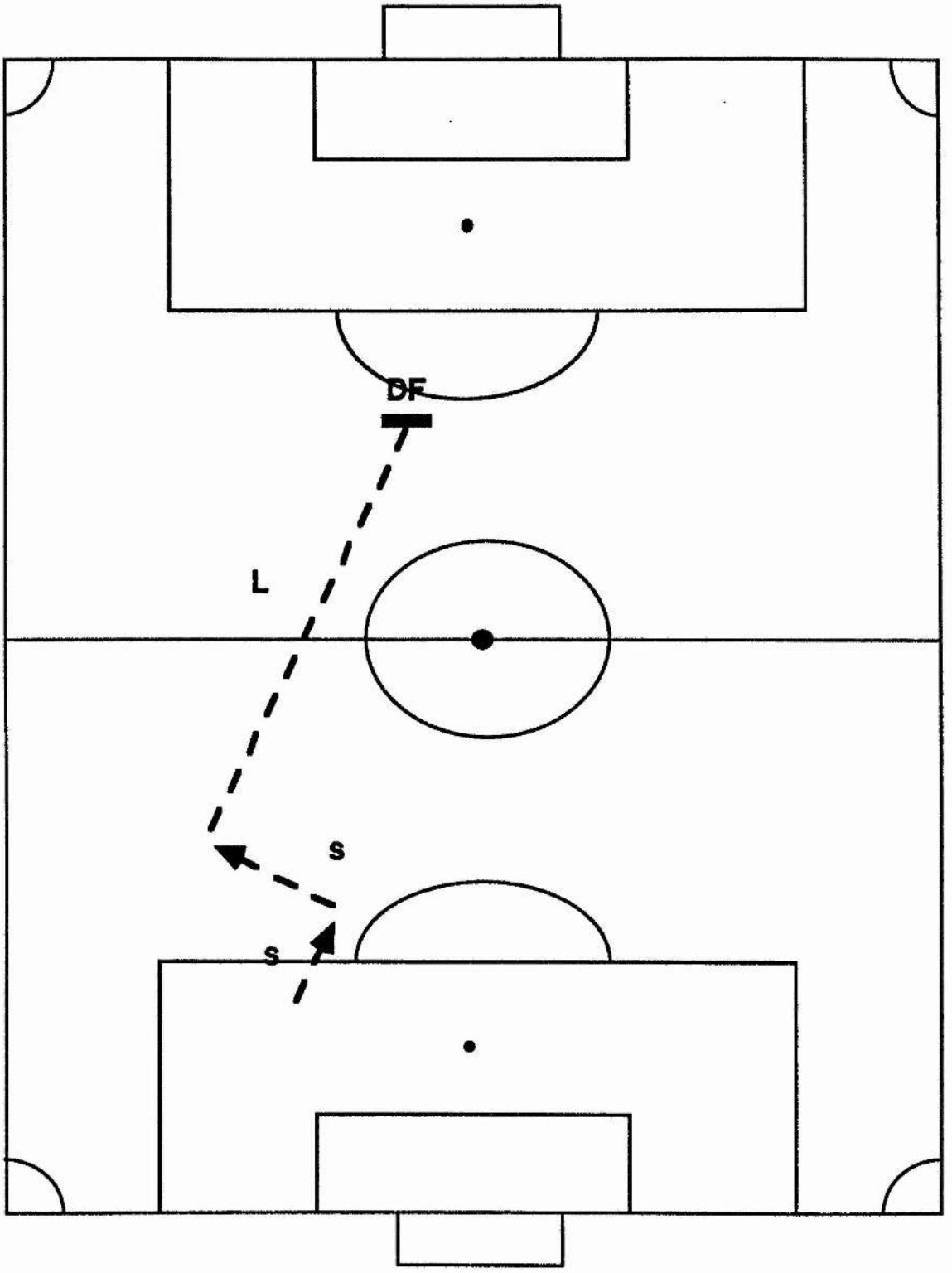


Path of ball

Route of player with ball

Shot on target

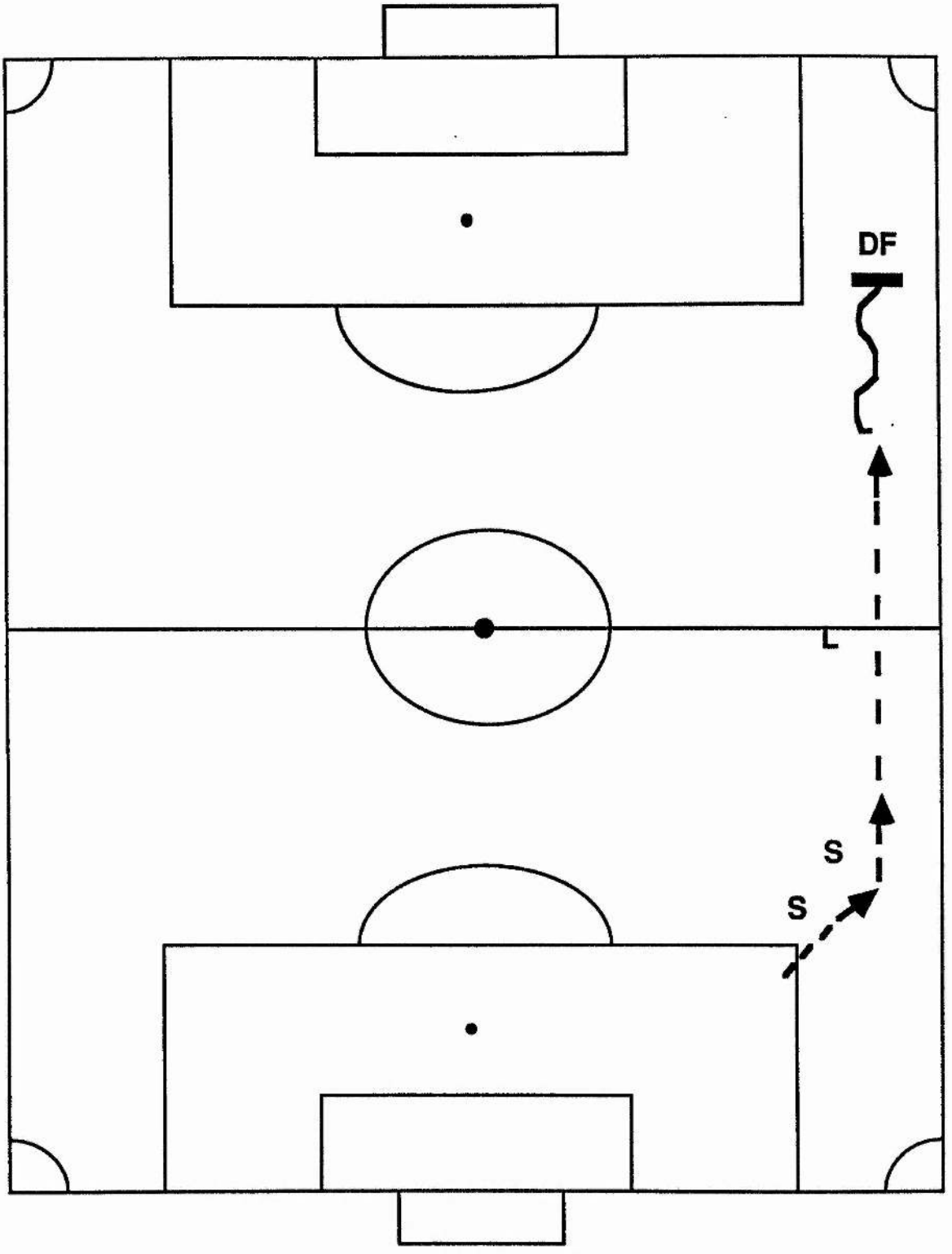
3. An attack typifying Pattern IH.3.



Path of ball

DF Ball intercepted by defender

4. An attack typifying pattern IH.4.

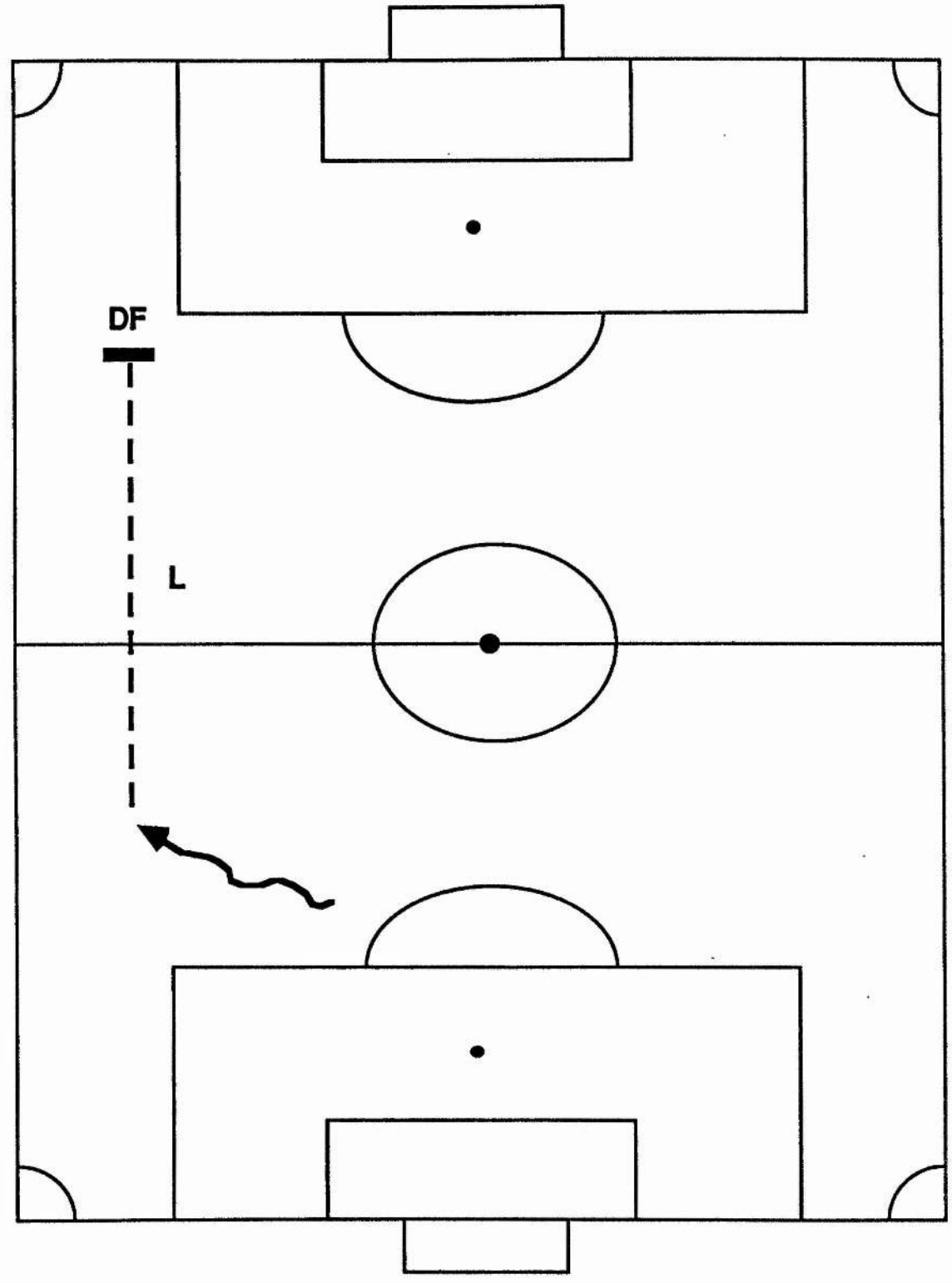


Path of ball

Route of player with ball

DF Ball intercepted by defender

5. An attack typifying pattern IH.5.



Path of ball

Route of player with ball

DF Ball intercepted by defender

Appendix A 3:3

A. Summary of the relationships between long corner-kicks and short corner-kicks with shots off or on target for the international team.

	Long Corner-kicks	Short Corner-kicks
Goal	0	1
Shot on target	2	4
Shot off target	5	2
No resultant shot	13	4
Total	20	11

Appendix A 3:3

B. Summary of the relationships between long throw-ins and short throw-ins with shots off or on target for the international team.

	Long Throw-ins	Short Throw-ins
Goal	0	0
Shot on target	1	6
Shot off target	3	5
No resultant shot	5	35
Total	9	46

Appendix A 3:3

C. **Summary of the relative effectiveness of free-kicks taken as a direct shot on goal in relation to free-kicks taken as a lay-off to another player, as meaured by the number of shots on/off target for the international team.**

	Free-kicks taken as direct shot on goal	**Free-kicks taken as a lay-off to another player**
Goal	0	0
Shot on target	5	3
Shot off target	4	8
Shot blocked	4	28
Total	13	39