A SCIENTIFIC ANALYSIS OF RUNNING LINES

CHAPTER 1

INTRODUCTION

1.1   THE DEVELOPMENT OF RUGBY FOOTBALL

The early history of rugby football has been researched by a South African teacher, writer and rugby administrator and is described in two books which show the history of rugby in South Africa and at a Cape Town private school for boys (Noakes & Du Plessis, 1996).

According to Dobson (1989), the origin of all ball games, being played between two teams on a field with two goal posts for example rugby, soccer and hockey, can be traced back to the Middle Ages in England. In these "games" the inhabitants of two neighbouring villages would meet halfway between the two villages on an open piece of ground. The goal of the game was to get a ball or a similar like object through the poles of the house owned by the opposition's town "chief".

There are many accounts of these games being very gruesome as the game Brigand was played with the heads of Danish Vikings, which was unceremoniously kicked through the streets by the local towns' people. The game began as soon as the ball was let loose in the middle of the two teams. Thereafter anything was acceptable as there were no rules concerning clothing, equipment, the number or the age of players taking part. These games were often so savage that Royal Proclamation banned them 30 times in three centuries (Noakes & Du Plessis, 1996).

Later in the 19th Century in the English Public Schools, especially Rugby, Westminster, Eton, Marlborough, Winchester, Charterhouse and Cheltenham a form of the game of rugby developed. The schools accepted these "manly" games as an opportunity for their pupils to relax and to prepare the "muscled Christians" physically, in order to take the British values to the far corners of the British Empire.

The football games that developed in these famous schools each had different characteristics and there were no fixed rules. The reason for this was that each school developed their own particular rules based on the facilities available to them. The playing area at Rugby School was much larger than the others, therefore it allowed for the ball to be able to be carried. Eton school had a much smaller area available and they therefore developed a form of "dribbling" game (Noakes & Du Plessis, 1996).

When these pupils left school to attend the University of Cambridge, the first rugby club in 1839 was founded by an old boy from Rugby School. The old boys from Eton got upset when in the middle of games the players from Rugby School picked up the ball instead of kicking it. Thereafter a new set of rules was set up in 1846 at a meeting of the University of Cambridge. There were more old boys from Eton, therefore the rules favoured the "dribbling' game. In 1863 these Cambridge rules formed the basis of the rules developed for football (soccer) (Noakes & Du Plessis, 1996).

It therefore happened that in 1863 the differences between rugby and soccer became more defined. Teams in these early days of rugby consisted of up to 300 players per side, obviously to ensure no goals were scored! The ball was kicked downfield towards the opposition's goal posts and players then moved by means of dribbling and scrums, which were called *hots*. Lineouts were formed if the ball landed outside the field of play. Handling of the ball was first allowed at Rugby School and only if the ball was cleanly caught. Out of a historical perspective William Webb Ellis was the first person to take a clean catch and then ran forwards with the ball in possession. Rugby School then introduced a rule that a player could only run forwards if he was trying to score a goal himself. At this stage he still wasn't able to pass the ball to another player (Noakes & Du Plessis, 1996).

On the 26 January 1871, a meeting was ordered for the 21 rugby-playing clubs in London and the surrounding areas in the Pall Mall Restaurant. At this meeting the Rugby Football Union was founded and 59 laws were set out for the playing of the game rugby (Noakes & Du Plessis, 1996).

In 1875 the number of players was limited to 15 a side for the match between Cambridge and Oxford and in 1877 international teams also had teams of 15 players.

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These 15 players consisted of 10 forwards, two attacking halves and three defending backline players. From here the play developed through changes in the scrum formations to what we see in modern day rugby, a 3-5-1 formation. The positions also became specialised and lately the laws have been adjusted in order to make the game more exciting so that viewer audiences can increase (Noakes & Du Plessis, 1996).

It is obvious that rugby has had to adapt to the needs of players and in so doing has developed into the spectacle that we are able to experience now two centuries later.

Today's Rugby Coaches are better prepared, better organised and more understanding of the needs of their athletes in their care. They are skilful, resourceful, confident and caring in their role as responsible coaches (Levy & Ponissi, 1993).

1.2   PROBLEM SETTING

This study is aimed at exploring aspects pertinent to the success of attacking play in rugby situations. The attacking situation will be looked at in isolation, so that the specifics of optimal, all encompassing running lines can be examined with the view of honing them to such an extent, that every possible advantage can be given to the attacking team, so that a linebreak can be nominated and then be executed successfully.

Previous research in respect of the Tri-nations series of 2000 was used in order to collect data so that assumptions could be made regarding the influence of the level of attack and possession on the outcome of a rugby match. (Evert, 2001b)

The conclusion was made that the quality of attacking play resulted in greater success than what the quantity of attack was able to achieve (Evert, 2001b).

The results looked as follows:

Table 1:   Results of hypothesis testing regarding the mean values of various indicators of attack and possession in the Tri-Nations rugby series of 2000.

	Ho: $\mu1 > \mu2$	
Variable	**Calculated T – value**	**Result**
Total passes	1.558279	Accepted
Phases	1.210856	Accepted
Tries	-1.18517	Accepted
Rucks	1.924835	Rejected
Mauls	1.924835	Rejected
Final score	-1.56195	Accepted
Attacking ratios	0.940582	Accepted
Mean values of attacking variables **(Table T – value = 1.86)**	0.240805	Accepted

$\mu1$ = Average of losing team

$\mu2$ = Average of winning team

α = 0.05

t-Table value = 1.782

(Evert, 2001b).

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From the results of the hypothesis testing it is noticeable that the values of the losing team in the following categories; total passes, phases, tries and the final score, is significantly higher than that of the winning team at a 5% level of significance. The mean values of rucks and mauls on the other hand are not significantly higher than that of the winning team at a 5% level of significance.

The attacking ratio of the losing team is also significantly higher than that of the winning team.

Looking at the mean values of the attacking and possession variables, the mean value of the losing team is significantly higher than that of the winning team at a 5% level of significance. It can thus be assumed that the losing team on average has a significantly higher level of attacking play and possession than that of the winning team.

When evaluating the difference between the mean values of performance amongst the individual teams it should be noted that it was only possible to work with the values of the New Zealand team's variables. This was due to the fact that this team was the only team who had won and lost sufficient matches in order to be able to perform statistical tests on the values.

The following situations arose after evaluation of the competition:
 When Australia played against New Zealand
        $\rightarrow$ The team with the fewest passes and phases won.
When South Africa played against New Zealand
        $\rightarrow$ The team with the fewest passes and phases won.
When Australia played against South Africa
        $\rightarrow$ The team with the most passes and phases won.

This information creates confusion as a team can only score tries if they have the ball in their possession. The important aspect is that it is not merely the quantity of attack that will result in success, but more likely the quality of the attack.

By passing the ball and setting up phases, the attacking team is trying to breakdown the opposition's defensive lines in order to create opportunities to play through (McIntosh, 2000; Tuynman, 2000).

The aim of a team should therefore be to be highly skilled at first phase attacks in order to break the defensive line of the opposition. The object of pursuing success from first phase attacks is that the opposition is immediately placed on the back foot and thus liable to create more "spaces" through which the attackers can play through (Evert, 2001a).
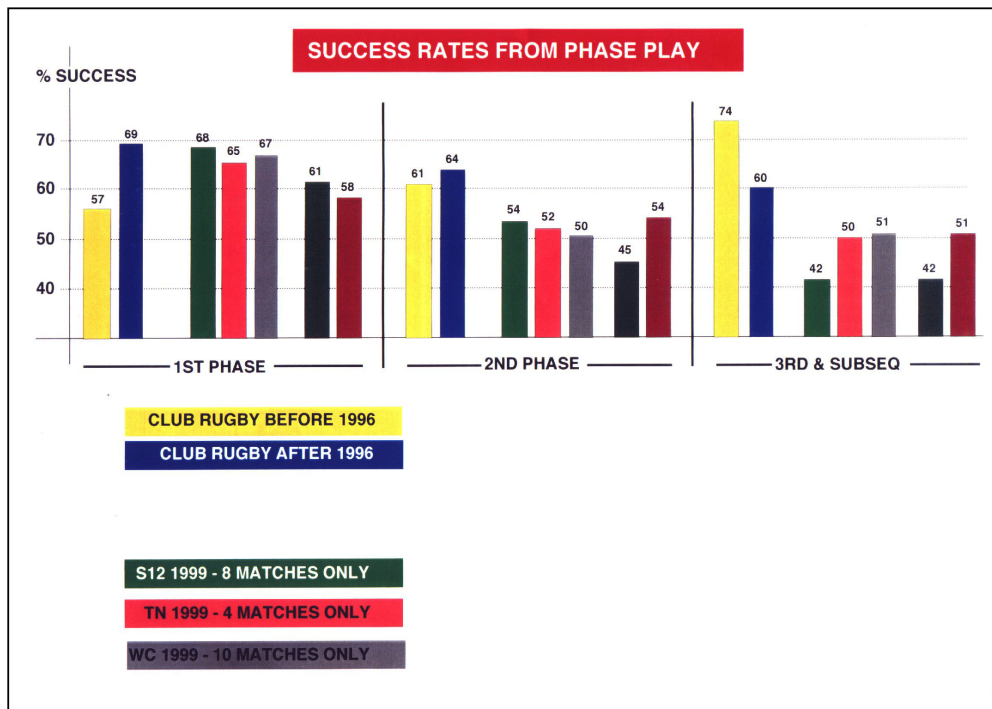

Figure 1: Success rates from phase play

(Honan, 1999b).

1.3   HYPOTHESIS

With this information available, an empirical method of research will be used whereby the author will be calling on his personal experience as well as information

collected from available literature in order to fully investigate the contributing factors to successful linebreaks and attacking play.

Due to there being vast amounts of information regarding coaching aspects, yet minimal regarding such specific and isolated situations such as the moments leading up to the contact area, this study will rely on his interpretation of the information available and thereby set up concepts and guidelines in order to define the factors necessary for this specific field of study.

According to Thomas & Nelson (1996), a danger of such a study is that relying too much on personal experience may be a pitfall as one's own experience may be limited, furthermore, one's retention depends substantially on how the events agree with one's past experiences and beliefs, on whether things "make sense," and on the state of one's motivation to remember.

This is most certainly a valid statement as the "player's mix" of a team ultimately influences the team's attacking capabilities. The key function of a coach is to identify the player's individual as well as the team's collective strong points, and then to combine that into the successful attacking play situations.

For this reason, the research will be primarily philosophical in nature. The aim is to establish a hypothesis, to examine and then analyse the existing facts and to finally synthesize the information into a workable theoretical modal (Thomas & Nelson, 1996).

Due to the dynamic and complex nature of the sport, it will not be possible to lay down any specific rules. The key aspect involved is that each attacking situation involves a complex event where prediction and control is difficult to pinpoint as this prediction involves a thinking human being under extreme mental and physical pressure, being influenced by other variable factors, all taking place in a dynamic environment rather than an isolated physiological system in a controlled laboratory setting.

For this reason, the object of this study is to identify specific principles that have been identified in the literature research and to attempt to apply these principles to the pre – contact and contact situations. In order to achieve this there will be an incorporation of Newton's scientific laws of movement, as well as aspects associated with momentum, impulses and collisions as the basis for formulating and testing the research hypothesis.

Biomechanical analysis will form the reference point of the study as its importance in elite level coaching has been evident in all sporting codes and rugby union is no exception. Biomechanics is a comprehensive science that includes every system in the body. Biomechanics and practical coaching science work together to assist the coach in accomplishing assignments during competition. Biomechanical analysis of gross and fine movements also provides sound guidelines for the coach to follow in skill training sessions. Using this science greatly increases the chances that you will achieve your highest levels of performance in the most energy-efficient manner (Dintiman et al, 1998).

Once possible links have been identified, there will be a reflection on movement, ideas, ideals, lived experiences, logical relationships, and reasons in order to shed more light on the success of running lines in the sport (Thomas & Nelson, 1996).

1.4 METHOD

The goal of this study is to examine running lines metaphysically, i.e., trying to explain reality including the nature of knowledge, reality, and the universe and its laws (Thomas & Nelson, 1996), by using reflective procedures and not the empirical tools of science.

The research problem will be analysed using inductive reasoning. This implies that the line of thought will move from a limited number of specific observations to general conclusions about the thing or class of thing that was observed. The power of reason to identify common elements or similarities will be relied on at an abstract level (Thomas & Nelson, 1996).

This implies that the running lines will be discussed in the light of attacking principles as well as the most common defensive lines used. Each running line will then be evaluated in the light of these previously mentioned factors in order to establish its effectivity and in which circumstances it will be most effective. This form of reasoning is a procedure that is not mystical as the data to be used is readily available and everyone can reflect upon it (Thomas & Nelson, 1996).

The core aspect of the study will involve the explanation of how the "playing mix", which will be explained making use of references from renowned coaches and students of the game, will be used to measure the outcomes of the strikes that occurred, and the specific running line that was used to execute it.

Finally this technique is useful as it will distinguish what are the essential elements involved in the execution of successful running lines and which aspects bare no bearing on their success.

1.5   FORMULATING THE RESEARCH PROBLEM

1.5.1   The Unit of Analysis

The research will follow a structure, which will set the boundaries of the study. The discussion will take place in an ordered fashion beginning with the introduction to the finer insights of the defensive systems used from organised phases of play, and then proceeding on to 2nd, 3rd and subsequent phase defensive play. There will also be a discussion concerning defensive concepts, which serve as guidelines to the optimal defensive capabilities of a team.

Thereafter, an introduction to the attacking principles associated with rugby will be explored. This will give a thorough background to the concepts involved in all attacking plays as well as the objectives that are sought after in these attacks.

This will lead to a discussion taking place exploring certain scientific laws of movement, as well as aspects associated with momentum, impulses and collisions

as the basis for formulating and testing the research hypotheses. There will be correlations drawn between these concepts and rugby situations in attempt to give further understanding into the reason why running lines should be successful or not.

Finally, a thorough description, explanation and evaluation of the types of running lines will be done. They will be evaluated in the light of alignment, angle, speed and penetration. This will also include an all-encompassing description of all the players involved in each attack. The value of a running line is only realised once the subsidiary players {i.e., the ball carrier, decoy runners and trailers (strikers, supporters and cleaners)}, have played their part in order to either add attackers or subtract defenders within the striking area.

Included in this section will be an explanation of the supportive lines to be used once the strike has been executed.

1.5.2   The Research Goal

The research goal is to gain a better understanding of the factors that play a part in the successful strikes that take place during contact situations in rugby. The hypothesis is that if a team is able to make use of effective running lines, combined with specific decoy runners, and a striker who is able to either play through a hole created by these running lines, or to play in behind a defender who is not in a suitable position to make the tackle, then the quality of attack of that particular team will be increased through achieving more and easier linebreaks.

There will be an in depth look taken at the analysis of the running angles of the players involved in each attack. The hypothesis is that depending on where the defender's centre of mass is, will affect the defender's ability to make the tackle in the first place or to realign and get back into a position to be able to defend effectively.

The mechanical strong and weak points will then be understood and thus will a hypothesis be able to be formed which will indicate what must be achieved in each attacking situation to be able to give a striker a "mechanical advantage", and what will result in a defender having a "mechanical disadvantage".

1.5.3   The Research Strategy

In order to fully give value to this study, the specific running lines will be taught, according to the principles laid out in the discussion. In the coaching of the Blue Bulls U21 team, the author will be using these above-mentioned principles as the basis for his coaching of attacking play. The key aspect of this study is that this form of research does not fit clearly into one of the true experimental designs. This implies that the control of the research design is difficult (Thomas & Nelson, 1996).

For this reason a quasi-experimental design will be used. The purpose of this experimental design is to apply it to settings more like the real world while still controlling as many threats to internal validity as possible (Thomas & Nelson, 1996).

A time series design will be used over the course of two rugby seasons. This will be achieved by making use of notational information gathered during the Blue Bulls U21 teams statistics from the 2001 season, and information that will be gathered from the 2002 season, after the treatment (T), has been administered.

Due to the experiment being a time series design, it implies that the design will only use one group and the author will try to show that the change, i.e., an increase or decrease in the number of linebreaks, that occurred when the treatment was interjected differs from when it was not.

i.e., $\mathbf{O}_{2001}$ T $\mathbf{O}_{2002}$

The basis for claiming that the treatment causes the effect is that a rate of change varies between O_{2001} and O_{2002} where T has been administered (Thomas & Nelson, 1996).

The next step in the research process will be to analyse and discuss the implications of the findings on the research question that was stated earlier.

In order to cover a full spectrum of data collection in order to understand the findings, there will also be interviews with some of the coaches involved at the Blue Bulls for 2002. Thereafter a philosophical comparison and discussion will take place.

The key of the study is to follow the discussion in an ordered fashion in order to ultimately be able to make one's own deductions at the end of the study. The hope is that basic principles can be identified and is able to be used in a broad and general manner in all coaching environments.