CHAPTER THREE

EMPIRICAL INVESTIGATION

In this chapter the methods and procedures followed in this study will be examined and discussed. It is necessary to evaluate and discuss the history behind talent identification. For information regarding this, a review of chapter two will be needed. In this discussion, two phases will be presented. Phase one is not primarily part of this study, but will be reported as it forms the basis of phase two.

As mentioned above, the history behind the process is essential as to understand why certain procedures are followed and to give the reader a basic understanding of the thought processes behind phase one, and ultimately an understanding as to why phase two is executed in the way that it is.

3.1) PHASE 1

3.1.1) Talent identification in rugby

The research started in 1994 by Pienaar & Spamer (1995) and Pienaar et al. (1998) with 11 year-old boys and the research conducted by Hare (1997, 1999) with 16 year-old boys will act as a basis for this discussion.

3.1.1.1) Talent identification in youth rugby players: a game analysis

After a thorough situation analysis of the requirements for the game of rugby with youth rugby players was done, it became apparent that the basic skills and abilities a player needs are handling (catch and pass), running, kicking, speed, agility, strength and endurance (Guy et al., 1991; De Ridder, 1993; Strand & Wilson, 1993; Pienaar & Spamer, 1995).

The only test-battery, which could be found in related literature and which tests most of these components is the AAHPER - rugby skills test (1966). This skills-test consists of three handling and running skills, two kicking skills and two motor skills that are related to rugby. To adapt these skills, which are devised mainly for American (Gridiron) Football, to rugby football, the carrying out of movement (throwing skills) and apparatus (rugby-ball) had to be adjusted. The method of throwing has been changed from throwing with one hand above the shoulder to a lateral passing with both hands.

Although the ball used in America is not very different from the ball used in South Africa, the standard number 4 and 5 ball is used with youth players in the carrying out of the test battery. The carrying out of the speed and agility tests have remained the same. The validity and reliability of these tests (standard and adapted) have been tested by the BMDP-6M statistical programme (Dixon, 1990). The test-re-test-correlations, which varied between $r = 0,86$ and $r = 0,94$, indicated that the changed tests are valid and dependable.

Because the correlations are so high, the American tests were removed from further test-batteries and only the adapted tests are used. The rugby- specific tests that are used for youth players are passing for distance, and kicking- off for distance. A speed endurance test (Hazeldine & MacNab, 1991) and a self-devised test for passing accuracy over 4 m (Pienaar & Spamer, 1995) have been included in the test-battery.

The situation-analysis indicated that physical abilities such as strength, endurance and suppleness are also important requirements for success in rugby. Tests of this nature have been included in the test-battery. They are the bent-arm hang test (static strength) the sit-and-reach test (suppleness) and the vertical jump test (explosive strength) (Johnson & Nelson, 1984).

Eighteen anthropometric components were also measured, viz. body-length, body-mass (weight), two skeletal cross-sections, two muscle circumferences and eight skin-folds. Somato-typing, fat percentage, correction of the arm (upper-arm circumference corrected) and the calf (calf circumference corrected) as well as the relationship between body-mass and body-length are also calculated. (Hahn, 1990; Malina & Bouchard, 1991; Bloomfield et al., 1994).

3.1.1.2) Methods of talent identification in youth rugby players

It is apparent from related literature and practice there are basically two methods that can be followed for the identification and development of talent. These two will be examined in more detail.

A. Selector selection

According to this method a number of promising talented players are identified by a group of selectors. This selection is done on aspects such as physical appearance, speed, skill and decision-making. After the group of players has been put together using this method, a thorough testing must be done.

The components that are tested according to this are game specific, motor-physical, anthropometric and psychological. For the purposes of this study, the psychological aspects were not taken into. The complete battery of tests containing the above aspects will be described later. When the selected group has been identified, the players must be placed in a rugby development-programme. Primary aspects that need attention are game specific skills, strength development (gymnasium work), plyometric strength and speed.

B. The use of prediction functions

This method has been developed from a large number of tests that were carried out on rugby-players. According to these tests it was determined which variables distinguish between players who are successful (talented) and players who are less successful (less talented players).

Discriminant analysis was used as a statistical processing method. This method means that instead of using a large number of tests a smaller number is used and that concentration is focused on those variables that primarily distinguish between achievers and those who are lesser achievers.

The advantage of this is the time factor, and the fact that time is not wasted on a number of factors that need not be taken into consideration. This method of selection is aimed at selecting potential players from the masses. The fact that there are fewer tests provides time to test the masses that, as mentioned above, is an advantage, especially in the field.   The results as obtained from the moderated test-battery (prediction function) can be read into the formula.

The scores are processed by a computer and are compared. The highest value (talented or not talented) determines where the player will be placed. In this way it can be decided to use the 40 best scores of talented rugby-players to put together a group of players who can follow a further developmental programme.

As a result of factors such as late development, being unfit etc. it can happen that talented players are wrongly predicted by the statistical function. As a result of the same factors, it can also happen that some players are identified as talented to only later become drop-outs. It is also always advisable, on the recommendation of the coaches to add players who were initially not identified by a prediction function, to the group.

When the players have been identified they must follow a developmental programme based on rugby skill. It is important that these players are regularly monitored according to the full test-battery in order to determine development and to adapt the content of the programme should weaknesses arise.

The reasoning behind this study is as follows: as seen above, it is historically significant that discriminant analysis is generally used as a statistical basis of interpretation of the results obtained. The need became apparent, therefore, to ascertain whether these same results can be obtained through the implementation of logistical regression as a method of interpretation, an equally time saving method, regarded in some parts of the world as a better predictor than discriminant analysis.

It is logical then, that should there be a more accurate predictor than the method currently in use that it should be seriously considered and possibly even be adopted. While the above description of discriminant analysis is a basic exposé of the method's advantages, a more thorough review of both methods' advantages and disadvantages be examined by the reader in the chapters preceding and following this one.

For the sake of expediency there will now be a review of phase 2 with a full description of the test-battery followed in this study.

3.2) PHASE 2

3.2.1) A brief description of the full test battery

After phase 1 was completed, phase 2 then commenced. What follows is a brief overview of the different components tested after which a more in-depth discussion will follow. The components include rugby specific, physical-motor and anthropometrical components. These are components that were identified in phase 1 as being of importance to achieve success in the game of rugby. The components are the following:

A) Rugby specific components
- Passing for distance
- Passing for accuracy over 4 metres and 7 metres
- Kicking for distance
- Kick-off for distance
- Running and catching

B) Physical-motor components
- Vertical jump
- Speed endurance
- Agility run
- Speed
- Flexed arm hang

C) Anthropometric components

- Body mass
- Skin fold measurements: triceps, sub-scapular, medial calf and supraspinal
- Circumferences: upper-arm girth and calf girth.
- Cross-section measurements: humerus and femur breadth.

3.2.2) In-depth description of the full test battery

A) Rugby-specific components

A full description of the tests carried out, as well as the apparatus needed to determine the rugby-specific components follows:

1) Passing for accuracy over 4m

Apparatus: A metal circle with a diameter of 50cm that has been mounted on a vertical base 50 cm from the ground that acts as the target. One rugby-ball. *Method:* While the player runs in a line parallel to the circle target he must pass the ball through the metal circle which is 4m away. A pass through the circle is regarded as correct. The respondent has five chances to pass the ball through the circle from the right and five from the left. The respondent's total success-rate (1 point per successful pass) is noted (Pienaar & Spamer, 1995).

2) Passing for accuracy over 7m

Apparatus: A metal circle with three different circle-sizes within it, viz. a diameter of 60cm, 120 cm and 180 cm; a metal measuring-tape and a rugby-ball. *Method:* The respondent stands 7 m away from the circle and gives an ordinary or a scrumhalf pass to the target. The point-value of the different circles is as follows:

- Inner-circle-60cm-3pts
- Middle-circle-120cm-2pts
- Outer-circle-180cm-1pts

A pass that touches the circle receives a higher points allocation. Ten attempts are allowed and the total of all the attempts is recorded. A maximum of 30 points can be achieved (AAHPER, 1966).

3) Kicking for distance

Apparatus: 50 m measuring-tape and a rugby-ball.

Method: The respondent takes the rugby-ball with both hands and, using their foot of preference, tries to kick it forward as far as possible. The respondent may make use of a run-up. Three attempts are allowed. The best of the three is recorded (AAHPER, 1966).

4) Kick-off for distance

Apparatus: 50 m measuring-tape, a tee and a senior rugby-ball.

Method: The respondent places the ball on the kick-off tee and, using an unlimited run-up and the foot of preference, kicks the ball as far as possible. Three attempts are allowed and the longest distance is recorded (AAHPER, 1966).

5) Running and catching

Apparatus: Measuring-tape, markers and a rugby-ball.

Method: At the command "Go" the respondent runs from marker B (see figure 1) to marker D where he makes a 90° turn towards marker A. Between markers A and D a rugby-ball, using a lob-pass; is passed to him. It must be caught while in forward motion. He runs around marker A and back to B and throws the ball back to the thrower. The action is repeated to the right. Ten attempts are made to the right and ten to the left. If the respondent catches the ball he gets one point (AAHPER, 1966).

The highest score will thus be 20 points (ten to the right and ten to the left).

Turning point

Passing
point
|: A
15 m
D
|: Passing
point
15 m
C |
15 m

15 m

15 m

Middle

Scrum line

Starting point

5m
|: B

Passer

Figure 1: Running and catching

B) Motor-physical abilities

In the following section the physical and motor-skills variables that measured, as well as the techniques and apparatus used in the measurements are discussed.

1) The vertical jump (explosive strength)

Apparatus: Magnesium powder and measuring-tape.

Method: The respondent stands sideways to a wall and stretches the arm nearest to the wall above his head. A mark is made where the respondent's middle finger touches the wall.

The respondent adopts a semi-crouched position and jumps upward as high as possible and touches the wall with his hand. Three attempts are allowed and the biggest difference is noted (Thomas & Nelson, 1985).

2) Speed - endurance

Apparatus: Measuring-tape, markers and 2 examiners.

Method: Three markers are placed 10 metres from one another in a straight line. The test begins when the respondent stands by the middle marker. At the signal he runs all-out to the marker in front of him, runs around the marker to the furthest marker and then back to the middle marker.

As soon as the respondent begins running, the examiner starts his stopwatch and determines the number of seconds it takes the respondent to reach his starting-point (the middle marker). The time is noted.

The second examiner starts the stopwatch as soon as the respondent reaches the middle marker. After 20 seconds the respondent must repeat the exercise as described above. The respondent repeats the procedure six times (Hazeldine & MacNab, 1991).

All six attempts are recorded and the speed-endurance is calculated as follows:

1. $\dfrac{(Y_1+Y_2)}{2} - \dfrac{(X_1+X_2)}{2} = Z$

2. $Z \div \dfrac{(Y_1+Y_2)}{2} \times 100 = X\%$ where

- $(X_1 + X_2) \div 2$ = average X (where X_1 and X_2 are the two slowest times).
- $(Y_1 + Y_2) \div 2$ = average Y (where X_1 and Y_2 are the two fastest times).
- Average Y - average X = Z.
- $Z \div$ average Y x 100 = % decrease in speed endurance.

This percentage indicates the percentage decrease in speed endurance in the respondent. The smaller the percentage, the better the speed endurance.

3) Agility run

Apparatus: 1 marker, 5 posts/persons, a stopwatch and a rugby-ball

Method: See figure 2 for the description. The respondent lies on his/her back with the heels towards marker A. On the command "Go!" the respondent does a shoulder-roll. At marker E there is a rugby-ball that is picked up by the respondent who runs around markers F and G. The respondent runs in a zigzag fashion through the markers H, I, J, K and L to the finishing-line. The respondents have two chances and the best effort is noted. The time is measured to the nearest 0,1 (one tenth) of a second (Bloomfield et al., 1994).
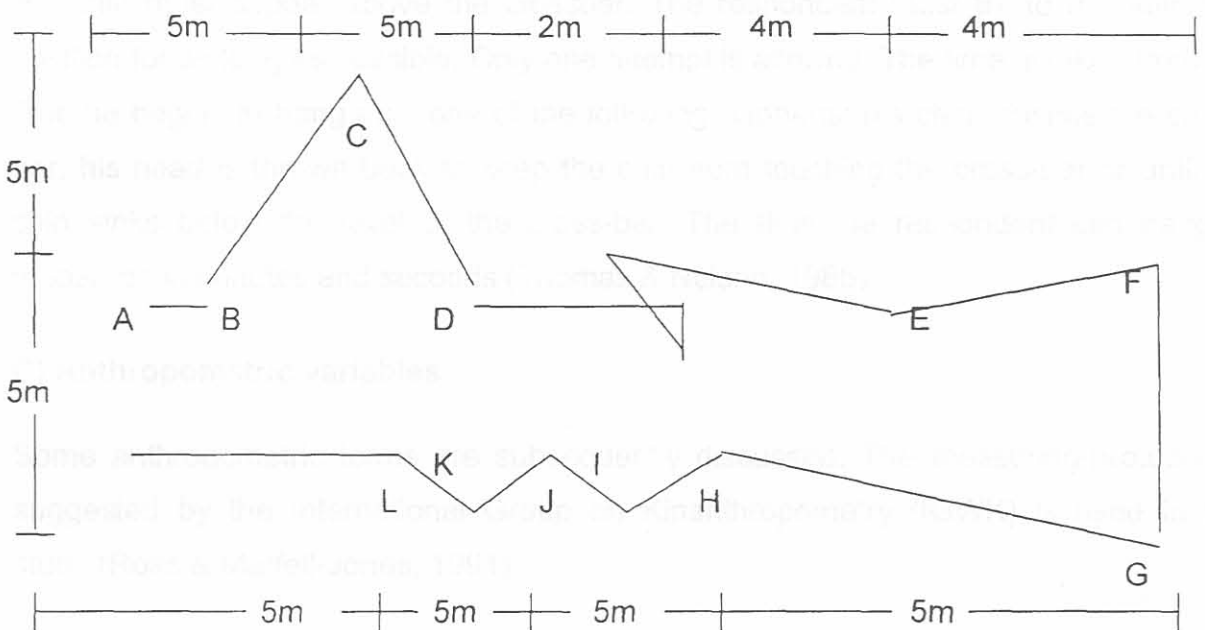

Figure 2: Agility run

4) Speed-test

Apparatus: 50m measuring-tape, a stopwatch and a rugby-ball.

Method: Two attempts over 45,70 m are allowed and the best time to the nearest 0,1 (one tenth) of a second is recorded. The respondent runs with the ball under his arm (AAHPER, 1966).

5) Flexed-arm hang

Apparatus: A crossbar high enough off the ground so that the respondent's feet do not touch the ground during the test, a stop-watch to determine the respondent's "hanging" time.

Method: The respondent is lifted by two helpers so that he can take hold of the bar with the palms of his hands outwards.

His chin must appear above the crossbar. The respondent must try to maintain this position for as long as possible. Only one attempt is allowed. The time is taken from the time he begins to hang until one of the following happens: his chin touches the cross-bar, his head is thrown back to keep the chin from touching the cross-bar or until his chin sinks below the level of the cross-bar. The time the respondent can hang is measured in minutes and seconds (Thomas & Nelson, 1985).

C) Anthropometric variables

Some anthropometric terms are subsequently discussed. The measuring-protocol as suggested by the International Group on Kinanthropometry (IGWK) is used in this study (Ross & Marfell-Jones, 1991)

1) Kinanthropometric terminology

1.1) The anatomical position

This is when the respondent stands up straight, arms by the side, palms and feet facing the front (Ross & Marfell-Jones, 1991).

1.2) The frankfort-level

When measuring the length of the body the head is held at the Frankfort level. The head is at the Frankfort level when there is a horizontal line from the orbital to the trachea. The orbital is the inferior edge of the eye-socket while the trachea is the indentation above the trachea of the ear (Ross & Marfell - Jones, 1991).

1.3) Vertex

When the head is held at the Frankfort level the vertex is the most superior point on the skull.

1.4) Acromial mark

When a person stands up straight with the arms relaxed by the sides, the acromial mark is the point on the superior lateral edge of the acromial.

1.5) Ilio-spinal mark

This mark is level with the inferior surface of the point of the anterior-superior spine of the ilium.

2) Variables, measuring- techniques and apparatus.

Subsequently the variables that are measured are discussed as well as the techniques and apparatus that are used. It is accepted that the kinanthropometrist is right-handed. The measuring protocol used is that prescribed by the IWGK (Ross & Marfell - Jones, 1991).

2.1) Body-mass

Apparatus: A verified electronic scale.

Method: The respondent is dressed in lightweight shorts. During the measuring, the respondent stands up straight with the weight spread over both feet. The respondent must stand still with the eyes ahead and the arms relaxed at the sides. The body weight is measured to the nearest 0,1 (one tenth) of a kilogram.

2.2) Skin-fold measurements

Apparatus: Harpenden skin-fold caliper with a constant pressure of 10 g/mm^2.

Method: The place where the skin-fold is to be measured is clearly identified and marked. A double layer of skin together with the subcutaneous fat in between is taken hold of firmly between the thumb and index-finger. This is exactly on the mark made. The skin fold is pulled away from the underlying muscle-tissue.

The mouth of the caliper is placed about 1 centimetre under the fingers and about one centimetre over the skin-fold. The caliper is held at the right angle and the trigger is released during the measurement. The skin-fold is held firmly during the measuring. During the measuring enough time is allowed for the skin-fold caliper to press firmly.

The reading is taken about 2-3 seconds after the caliper has been placed over the skin-fold because there is the possibility that the water contained in the sub cutaneous fat-tissue can be forced out. Two measurements are done per skin-fold and should there be a difference of more than 1 mm a third reading is taken.

The different measurements are taken in rotation to the other skin-fold measurements. All skin-fold measurements are taken to the nearest 0,2 (two-tenths) of a millimetre.

The various skin-folds measured are:

2.2.1) The triceps skinfold

A vertical skin-fold on the halfway mark between the acromional and radial marks on the posterior surface of the upper-arm.

2.2.2) Sub-scapular skin-fold

This skin-fold is measured directly under the inferior angle of the scapula in a lateral downward direction at an angle of 45° to the horizontal.

2.2.3) Supraspinal skin-fold

This skin-fold is measured about 7cm above the ilio-spinal mark on an imaginary line with the anterior edge of the armpit. The measurement is taken in a medial downwards direction at an angle of 45° to the horizontal.

2.2.4) Medial calf skin-fold

A vertical skin-fold on the medial part of the calf at the greatest circumference. The respondent bends the leg at a 90° angle and places the foot on a bench.

2.3) Circumference measurements

Apparatus: A flexible Holtain measuring-tape

Method: In the measurement of circumferences the measuring-tape is held in the right hand. The left hand is used to draw out the measuring-tape. The part of the body to be measured is encircled using the "hands-crossed" method where the left-hand crosses the right-hand during the placing of the tape. The measuring-tape is pulled tight but not so that it cuts into the skin. All circumferences are measured to the nearest 0,1 (one tenth) of a centimetre.

Subsequently, the circumferences measured are mentioned:

2.3.1) Upper-arm girth

The maximum girth of the upper-arm is measured while the arm is lifted in a horizontal position. The elbow-joint is brought to full function so that the upper-arm is maximally flexed. The respondent must make a fist.

2.3.2) Calf girth

The maximum circumference is measured while the respondent is standing upright. The legs are slightly apart and the weight is evenly spread over both feet.

2.4) Cross-section measurements

Apparatus: A Holtain-Anthropometer and leg caliper.

Method: The moving head of the stylus is held in the right hand while the stylus of the fixed end is held in the left hand. The styli are held by the thumb and the forefinger while the base of the anthropometer or leg-calliper rests on the arms. The middle-fingers are used to find the marks.

During measuring firm pressure against the bone is maintained. Flat styli are used for the cross-section measurements and are done to the nearest 0,1 (one tenth) of a centimetre. A discussion of cross-section measurements follows.

2.4.1) Humerus breadth

The greatest distance between the medial and lateral epicondyles of the humerus, while the arm is lifted at an angle of 90°, is measured. A leg-caliper is used with styli that point upwards. The marks are found with the middle finger and firm pressure is applied to the humerus.

2.4.2) Femur breadth

The greatest distance between the medial and lateral epicondyles of the femur are measured while the respondent sets down and the leg is bent at an angle of 90°. The leg-caliper is used with the styli pointing downwards. The marks are found with the middle finger and firm pressure is applied to the femur while measuring takes place.