

Running Techniques for Running Rugby

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Much of the information contained in this article is based on biomechanical research that has been conducted on elite rugby players by the author over the last five years (Sayers 1998). To date over 100 elite Australian and International rugby players have been analysed and these data have been presented at a number of Australian coaching conferences.

Introduction

Speed is the key to effective performance in many team games. The player who gets to the ball first, is agile and balanced in attack and mobile in defence, has a distinct advantage over others. In rugby a great deal of time is spent on speed development, with many clubs utilising the services of experienced track and field coaches as sprint specialists. But how is speed expressed in the game of rugby? Is this different to track sprinting?

There are measurable differences between the running techniques used by track athletes and those used by rugby players. A number of variables including time to top speed, running posture, balance and agility, arm action and pelvic stability have been used to demonstrate the differences between track and rugby running. Speed is expressed very differently in these two activities. This article is designed to describe some results from research on rugby sprinting and then provide coaches with some training drills designed to improve rugby sprinting ability.

What are the key differences between track and rugby sprinting?

Time to top speed

Ignoring indoor races, the shortest distance track athletes compete over is 100m (approximately the length of a normal rugby field). Temporal analyses of elite sprinters have shown that they usually attain maximum velocity at the 65-75 metre marks (Michiyoshi & Suzuki 1992). Performance / Notational analysts have shown that the majority of key moments in rugby occur over less than 10 metres and that players rarely sprint for more than 30 metres at a time (Lyons 1997 - personnel communication¹). This fact alone illustrates one of the key differences between the running styles of rugby players and track athletes – time to top speed. Simply stated, rugby players need to reach maximum velocity much earlier than track sprinters. Given that *time to top speed* is determined by the ability to accelerate rapidly, acceleration training should form a significant part of rugby running training.

¹ Dr. Keith Lyons is the Director for the Centre for Notational Analysis at the University of Wales Institute, Cardiff. Keith is the world expert in the performance analysis of rugby and has been employed as a consultant by the Welsh Rugby Union for many years.

This is a relatively controversial issue, as many coaches would see great speed as a highly valuable commodity in their players. Indeed, some of the most spectacular plays in rugby involve a player out pacing the opposition to score (during the 1998 Bledisloe Cup Christian Cullen scored a wonderful try by using his great pace to run around Matthew Burke to score). As exciting as these tries are, how often do they occur and how do they occur? When you consider the *Cullen try* it is important to remember that it was his ability to accelerate rapidly and change direction at speed that first put him into the clear. It was only then that he was able to use his exceptional pace.

It is important to note however that the author is not in any way suggesting that maximum velocity training is not important for rugby players. Many players would, and indeed have, benefited greatly from this sort of conditioning, but this type of sprint training must be kept in perspective. Some positions (eg. loose forwards, especially the open side flanker, wingers and the fullback) sprint for much longer distances than others and so are more likely to benefit from maximum velocity training. However there is little point in rugby players spending the majority of their sprint training practicing drills that are designed to develop maximum speed, if they rarely use this capacity in the game. The short, explosive nature of rugby means that acceleration drills are far more important for all players.

Running Posture

There is an enormous difference in the *ideal* running postures in these two sports (see Figure 1). Track athletes are encouraged to *stand tall* and run with an open chest and long trunk. Michael Johnson, Carl Lewis and Florence Griffith-Joyner are all excellent examples of the upright and rigid body positions that are ideal in their sport. This tall posture although ideal for the track, is completely impractical for the game of rugby in all but open field running situations as it leaves the player exposed and easier to tackle. It is interesting here to note that despite coaches promoting the *low body height* concept in their rugby technique drills (tackling, rucking, mauling, etc.), some then encourage players to adopt the exact opposite posture during sprint training.

Research at the University of Canberra has shown that elite rugby players tend to run with a closed, slightly slouched upper body posture with a significant forward lean. This is not poor technique (as has been suggested by some sprint coaches); this is a habit that has resulted from years of playing the game. It is the author's firm belief that this classic rugby posture should be encouraged and *not detrained* and that sprint training drills need to be modified accordingly. Gambetta (1996, 1997) supported these views in his articles on sport specific sprint training.

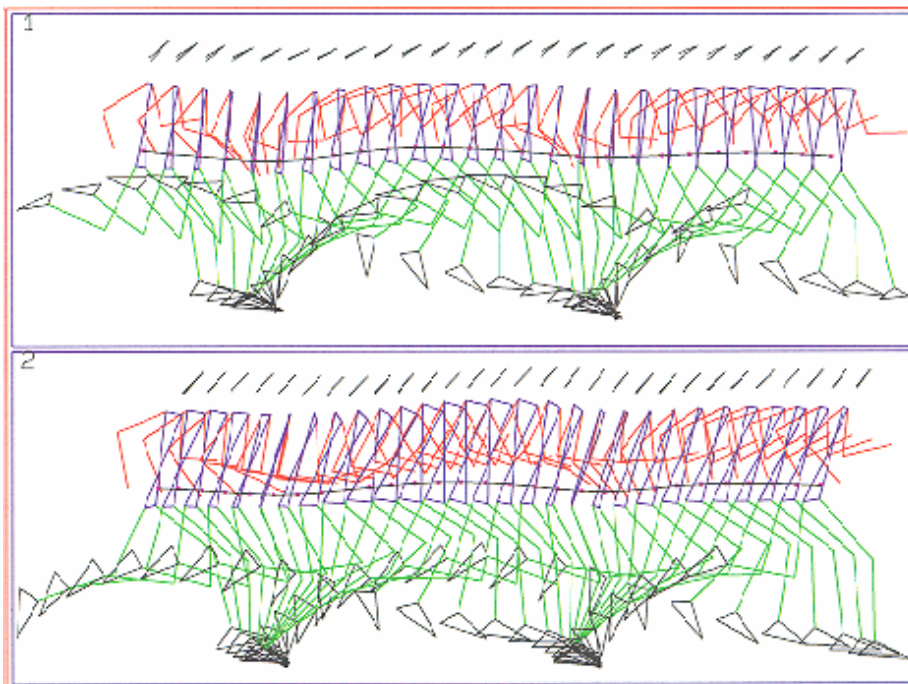


Figure 1: Stick figure diagrams showing an elite level track sprinter (top image) and an elite rugby player (bottom image). Note the differences in trunk lean and foot recovery height between the two.

Balance

No discussion on running posture can be done without considering the implications on balance. The game of rugby is about agility and players can not be agile, unless they have excellent dynamic balance. One of the key elements to consider when discussing balance is the height of the object's centre of gravity (CofG) in relation to its base of support. The tall track sprinting posture is characterised by a proportionally high position for the CofG and is therefore inherently unstable (the track sprinter is falling forward). Rugby players must be able to maintain balance, despite sudden direction changes and impacts. The rugby posture described in the previous section will certainly lower the height of the CofG and therefore increase the balance potential.

Most rugby coaches would agree that balance is a highly desirable ability in their players, yet how often do they actually undertake balance related training. In rugby for example there would be little point in developing a fast flanker if that player is slow to change directions and/or start, stop or prepare for impact. As a result some simple balance activities should be incorporated into most speed training sessions. These can range from simple static single leg balances to advanced dynamic movements (see Figure 2); the range of training balance drills is limited only by the coach's imagination.



Figure 2: Photo sequence of a player performing a lateral movement drill.

Drill Explanation - Player is performing a lateral movement drill where both technique (body and foot positioning, etc.) and lateral speed are encouraged. On a whistle blow the player is required to immediately perform a static balance on his outside leg. Not only does this drill promote lateral speed, it also teaches proper body positioning and reinforces the notion of *speed under control*.

There are a number of other factors that also influence the dynamic balance of the athlete. These are discussed below.

1) **Foot Speed:** Players can accelerate, decelerate, change directions, or maintain balance only when one foot or both feet are in contact with the ground. As a result the most crucial capacity that needs to be developed in rugby is foot speed. Drills that promote excessively long strides have no place in rugby training, as they are inefficient and usually result in a reduction in agility and balance.

2) **Height of the Foot During Recovery:** A simple truism in sprinting is that once the foot leaves the ground it is relatively useless until the athlete gets it into a position where it can be driven into the ground again. As a result, all sprinters need to use very efficient leg recovery techniques regardless of the sport they play. The most efficient method of returning the leg from the hip extended toe-off position (see Figure 3) to the pre-foot strike position is to flex the leg deeply at the knee prior to hip flexion. By deeply flexing the knee joint the length of the lever is effectively shortened, resulting in a more efficient and potentially faster leg recovery.

In track sprinting the hip flexion continues until the recovery thigh is approximately parallel with the ground. This high knee lift enables the foot to be accelerated rapidly down and back prior to ground contact and as a result potentially increases the impact (propulsive) forces at foot strike (Mero, Komi & Gregor, 1992). Unfortunately the high knee lift position also significantly raises the athlete's CofG and therefore promotes instability. It is therefore not surprising that elite rugby players tend to run with much lower feet during recovery (a *trade-off* exists between the capacity to reach

a high maximum speed and balance). Research conducted by the author has shown that elite rugby players never achieve the thigh parallel position, with most players being about 25 to 30 degrees below parallel.

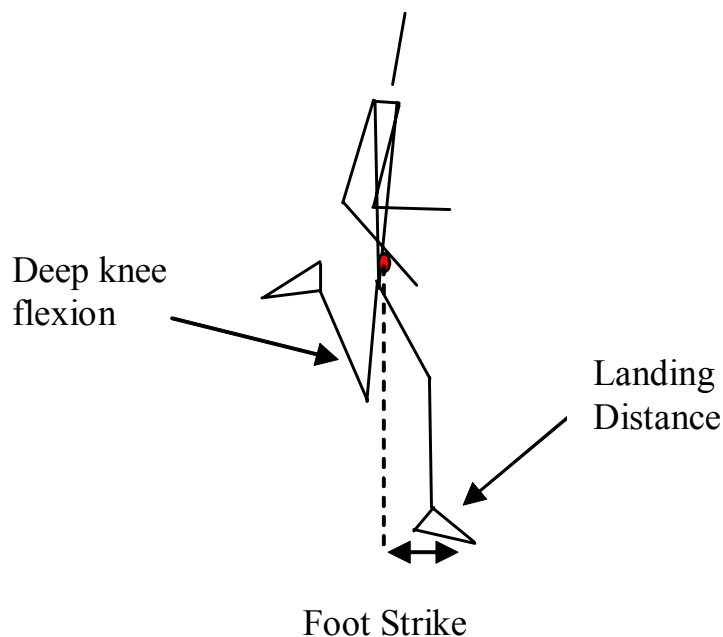


Figure 3: Diagram showing foot strike position in sprinting.

It has become fairly common practice for small hurdles (approximately 20-40cm high) to be used in sprint training to develop knee lift. While the author accepts that some of this sort of training will be beneficial for players who have inordinately low knee lifts, he questions its wholesale use. Why encourage players to lift their knees higher if this has possible detrimental effects on performance? These hurdle drills do not need to be significantly changed to become more rugby specific - simply take the hurdles away. Instead of using hurdles try using lines on the oval, ropes (a speed ladder if you have one) or simply do without, but always encourage your players to *move their feet rapidly*.

3) Foot Landing Distance: Foot landing distance refers to the horizontal displacement of the foot relative to the CofG (see Figure 3). In sprinting this distance should be minimised, as large landing distances tend to increase the braking forces (forces that retard the runner's forward velocity) that occur at foot strike. However, when attempting to change direction at speed the landing distance must increase slightly to enable the foot to exert some lateral force against the ground and to increase balance (something that is not possible when the distance is very small). This may explain why rugby players often tend towards slightly longer landing distances than track sprinters (heels about 15 cm forward of the CofG instead of about 5 cm). It is important to note that the author is not promoting overstriding (landing distances greater than 20 cm), but is simply suggesting that successful rugby players tend to have slightly larger landing distances than track sprinters.

It is critical to understand the implication of having larger landing distances. The larger the landing distance the greater the retarding forces at foot strike. Rugby players who tend to have larger landing distances also have a significant deceleration in their running velocity at foot strike (see Figure 4). Research has shown that the size of this deceleration can be minimised if the foot is moving slightly backward prior to foot strike (Mann, et al. 1984). Ideally the foot should be driven down and backwards into the ground as this reduces the load on the hamstrings and increases the involvement of the powerful gluteals. It is important that the player should not attempt to *claw the ground* in an attempt to pull the foot under the body (see Figure 5). This *clawing* action places a massive load on the hamstrings and puts them in a position of mechanical disadvantage for force production. The difference between these two actions is only subtle, but unless this movement is well executed the pressure on the hamstrings is likely to cause them to tear (anecdotal evidence has suggested that the likelihood of injury increases if the player has an especially large landing distance²).

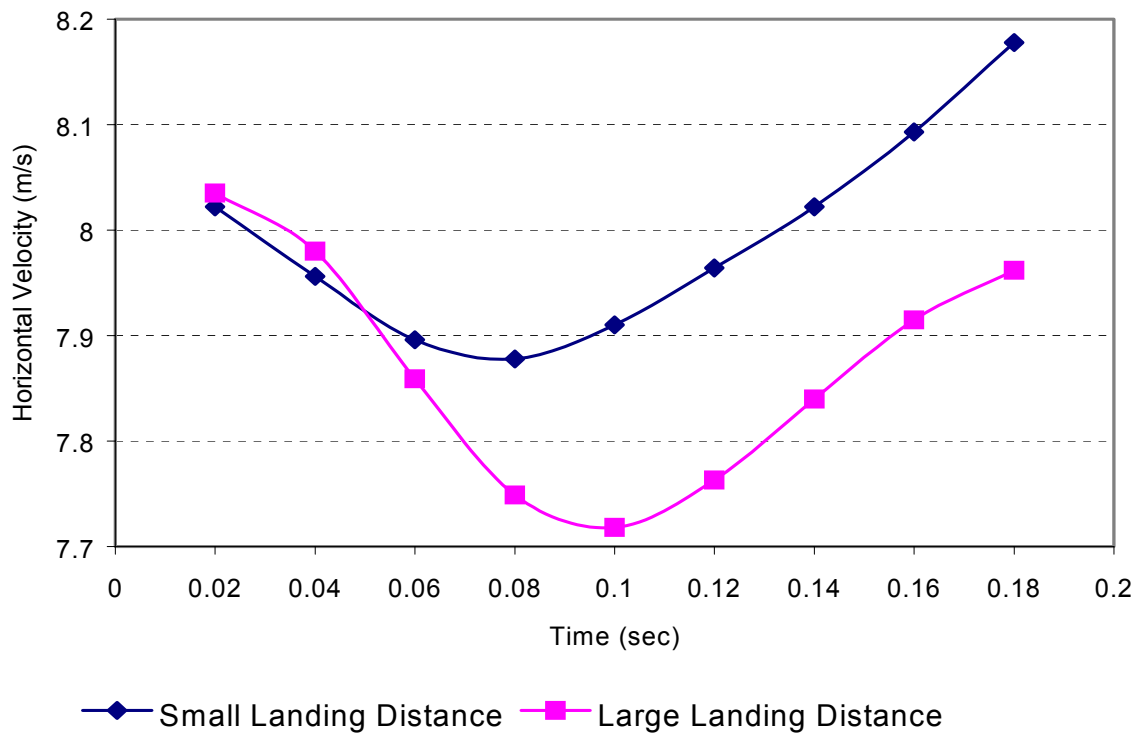


Figure 4: Graph showing the running velocity two rugby players from left foot strike to left toe-off. One player has a large landing distance the other has a short landing distance (NB: The player with the largest landing distance has the greatest deceleration at foot strike).

² In his role as a biomechanics consultant for several Super 12 teams, the author has found that players who both *claw the ground* and have a large landing distance usually have a history of hamstring injury.

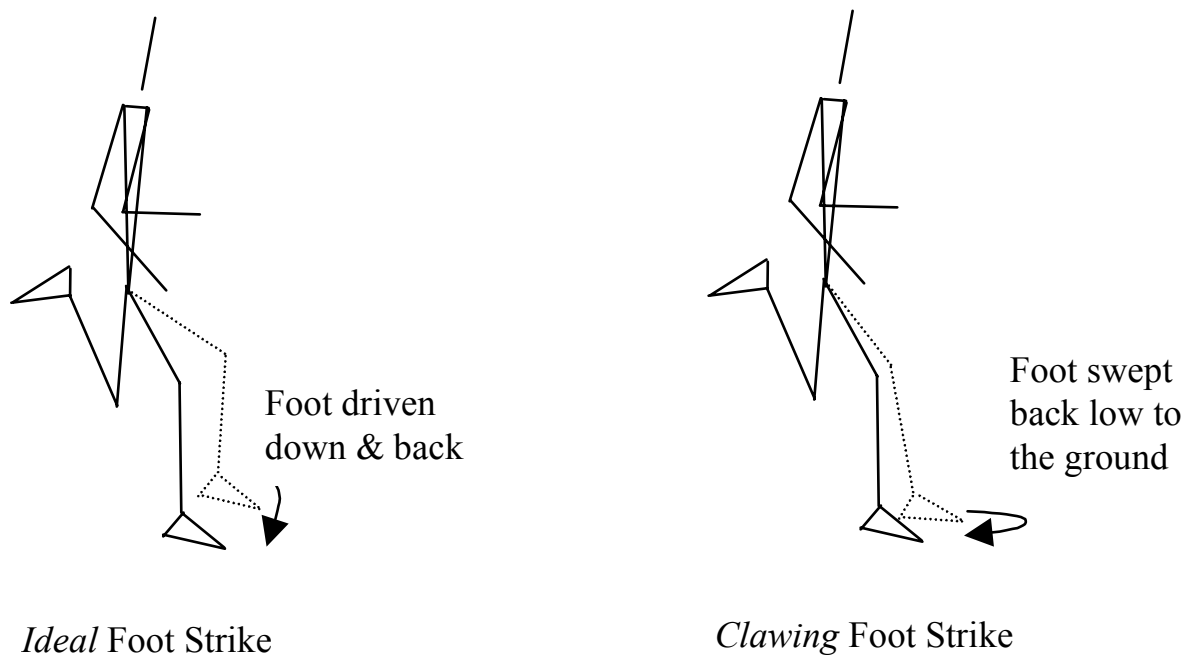


Figure 5: In the *ideal* foot strike the hip and knee extend at approximately the same time. In the *clawing* action the knee extends too early resulting in a marked increase in the load placed on the hip extensors.

Regardless of how the foot is placed on the ground the increased size of the landing distance in rugby means that the hamstrings will have a much greater role to play than in track sprinting. Coaches need to be aware of the dynamic nature of the hamstring contraction and train these muscles accordingly. Apart from the eccentric exercises proposed by Stanton (1986), coaches should implement a number of drills that promote dynamic hamstring conditioning as part of their normal sprint training. For example, backward running drills significantly increase the load of the hamstrings and are useful conditioning and rehabilitation exercises.

The Effect of Ball Carrying

The arm drive has two main purposes in sprinting. First, if done efficiently, it can significantly increase both stride rate and the ground contact forces. Second, it is designed to counter the body rotation initiated by the pelvis, thereby increasing balance. Carrying a ball under one arm reduces the effectiveness of the arm action on that side. As a result players who habitually carry the ball on one side, tend to have compensated for this in their running action by reducing one side's stride length, having an asymmetrical pelvic rotation, and/or changing their landing distance. All these compensatory responses result in inefficiencies in the running action and should be discouraged. If unrecognised the impact of this can have a marked effect on players (eg. it is possible to identify which side of the field a winger plays on by analysing the posture and running action of the player).

The implications of these findings are relatively obvious. Not only should players perform sprint training both with and without a ball, but they should also *learn* to carry the ball with both arms. The two handed ball carrying technique favoured by

many inside backs requires excellent pelvic control to maintain balance, and encourage efficient lower leg mechanics.

Pelvic Stability

One of the real buzz concepts in modern athletic conditioning is pelvic stability. The pelvis, with its connections to the lower spine forms the important link between the action of the lower limbs and those in the upper body. The increased role of the upper body in rugby (through tackling, palming, ball carrying, etc.) places a greater load on these stabilisers than in conventional track sprinting. As a result it is now relatively common for rugby players to undertake pelvic stability training as a part of their normal conditioning. However, it is very important that these stability skills are reinforced consistently during regular rugby training. This is because many players despite extensive pelvic stability training in the weight room are still failing to transfer these skills into their game play. The transfer of conditioning exercises to on field performance is an area of great concern and needs to be addressed.

Although many pelvic stability drills have been devised, all aim to develop the ability to maintain a strong neutral pelvic and trunk position. Many coaches have started to use *Swiss Balls* (sometimes called *Physio Balls*) as a training tool to help develop pelvic stability although many exercises can be performed without the use of equipment. The *Swiss Ball* drills use the inherent instability of the ball to promote pelvic control by increasing the involvement of a number of core stabilising muscles (see Figure 6 for some example exercises).

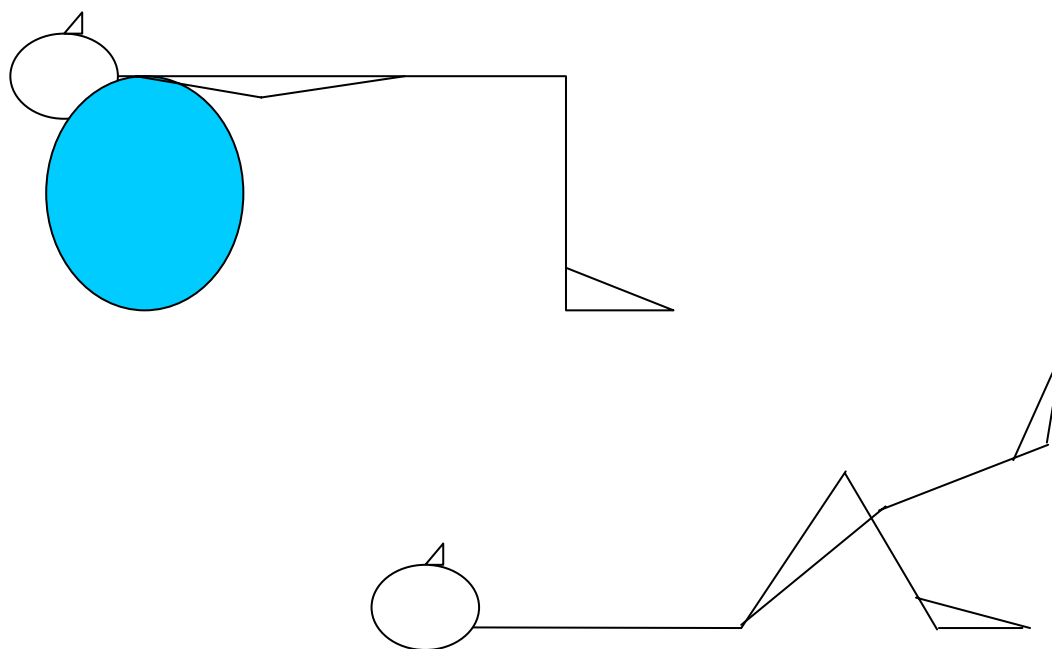


Figure 6: Diagram showing some sample pelvic stability drills.

The aim of each drill is to maintain a stable position (straight trunk and neutral pelvis) while balancing on the ball (top) or lying on the ground (bottom). To encourage the use of the pelvic stabilisers, the athlete needs to concentrate on maintaining a normal curve in their lower back, while avoiding excessive use of Rectus Abdominus (the

six-pack muscle in the middle of the abdomen). Coaches can monitor the later by placing their hand on the athlete's abdomen during the exercise – if the abdomen presses against the hand the athlete needs to concentrate on “*pulling their navel towards their spine*”.

Summary

While similarities exist between the running techniques used by track sprinters and rugby players, coaches need to be aware to the critical differences between track and rugby sprinting. The ideal rugby sprinting technique is reflected in the player who has excellent acceleration, reaches top speed early, has outstanding balance and agility, shields the player from injury during impact, and is not unduly affected by carrying a ball. The ideal track sprinting technique has a completely different set of requirements.

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