Innovation in track and field ... onwards and upwards?

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The only way to discover the limits of the possible is to go beyond them into the impossible.

Arthur C. Clarke

Introduction

The impact of science, technology and innovation on the development of knowledge, of equipment, measurement technologies and of human performance in athletics is visible to all who have history and wisdom of the sport. There is no doubt that such evolving knowledge and its application has contributed to the progression we have seen across many events over the past half a century (see Figure 1).

However, it should be noted that in most cases it is not athletics, per se, that has been the driver behind many of the scientific and technological innovations now embedded in the sport. Athletes and coaches have merely been innovative at applying what we see emerge from other areas. Research and

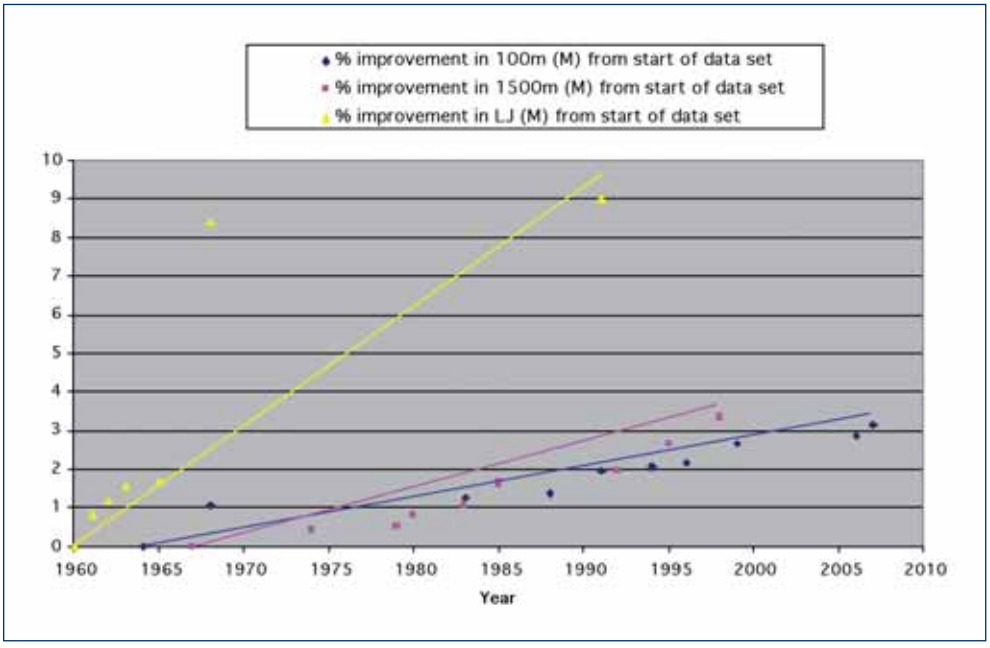

Figure 1a: World record progression in selected men's events since 1960

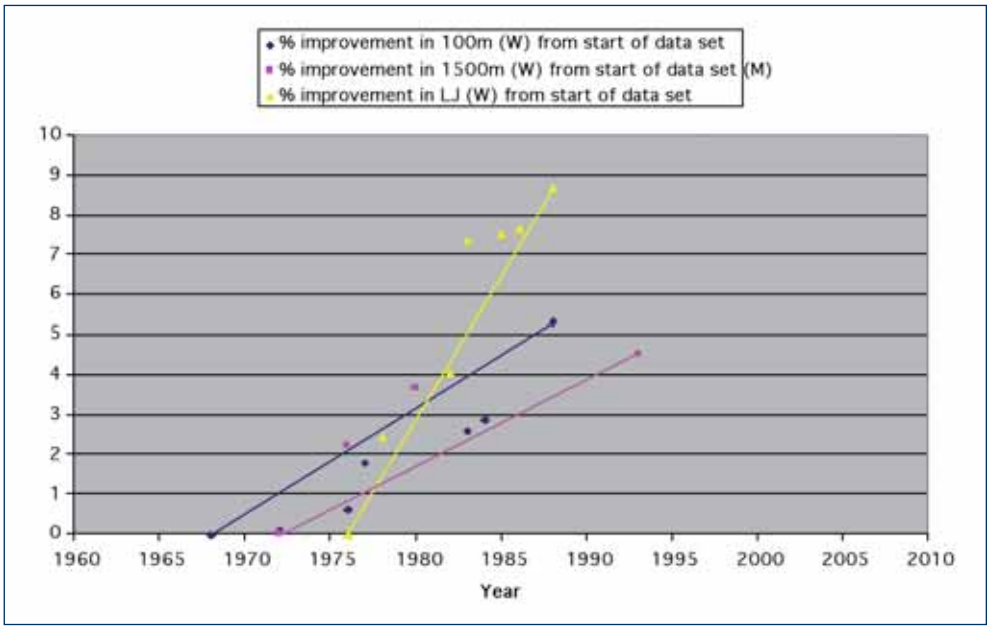

Figure 1b: World record progression in selected men's events since 1960

development in the aerospace, defense, medical, automotive, pharmaceuticals and IT industries are the real ground breakers and it is from these that we can trace the applications we see in track and field today.

For example, in the pole vault, the introduction of glass fibre composite materials in 1957 led to a redesign of the classic bamboo and steel poles and a rapid increase in jumping height during the 1960s. The introduction of these 'new' materials impacted in two main areas – the lighter pole enabled greater approach and take-off speed and provided a greater return of elastic energy, which led to a change in vaulting technique. Glass fibre composites were originally designed for the insulation industry.

Innovation in athletics

The development of elite sporting institutes employing full time scientists across the world in the past 50 years has led to a more systematic scientific support service for coaches and athletes. This, together with the advent of full time coaches and access to suitable resources to pursue new ideas, has laid the foundation for investigating new ideas and innovations to support performance development in athletics.

It is through this development that performance support service has grown from a highly controlled laboratory based process, in some circumstances, to the 'real time, field based, science' of modern day. This direction, often driven by the demands and desires of coaches to make the scientific process more meaningful to the real world, also provided advances in the provision of rapid, meaningful technical feedback (compared to previous experiences of days and weeks); and, the opportunity to measure more aspects of performance during competition. Solutions have only been possible with the advent of the electronics and IT industries through miniature, portable, wireless and non-invasive measurement devices.

The commercial potential of the elite and amateur sporting market is clear and has appealed to those with a sound understanding of the sport and the ability to exploit the

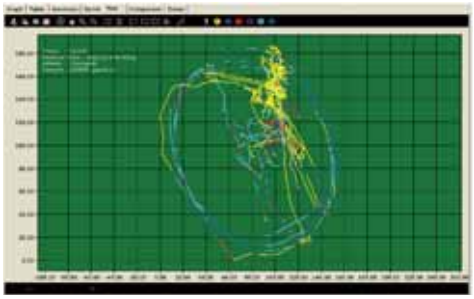

Figure 2a: A snail trail map illustrating data captured from a GPS unit of an athletes path during a training run

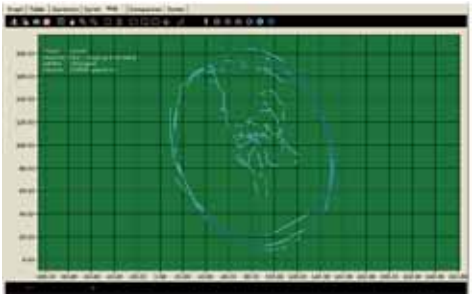

Figure 2b: A snail trail map that only illustrates the points in time from figure 2 where the athlete was moving at ≥ 18 km/h

opportunity. The potential for application into the broadcasting world, through provision of more analytical information to the viewing public to enhance the appeal of athletics, is also becoming a real possibility.

GPS and hypoxic devices

A good example of the growth of measurement technology is that of global positioning systems (GPS). Originally developed through military applications, GPS systems are now widespread, e.g. in car systems, and have since embedded themselves into sport. GPS systems measure and derive a number of key performance variables related to gross movements. These include altitude, position, distance covered, speed and acceleration.

Such measurement parameters have been used to help profile race strategies, capture accurate data from training runs, and model race courses for simulation runs. Devices allow you to upload captured data into proprietary software, e.g. Google Earth, to overlay a training or course pre-run and provide a visu-

Figure 2c: Tracking the changes in athlete speed and heart rate in relation to course profile of a cross country event

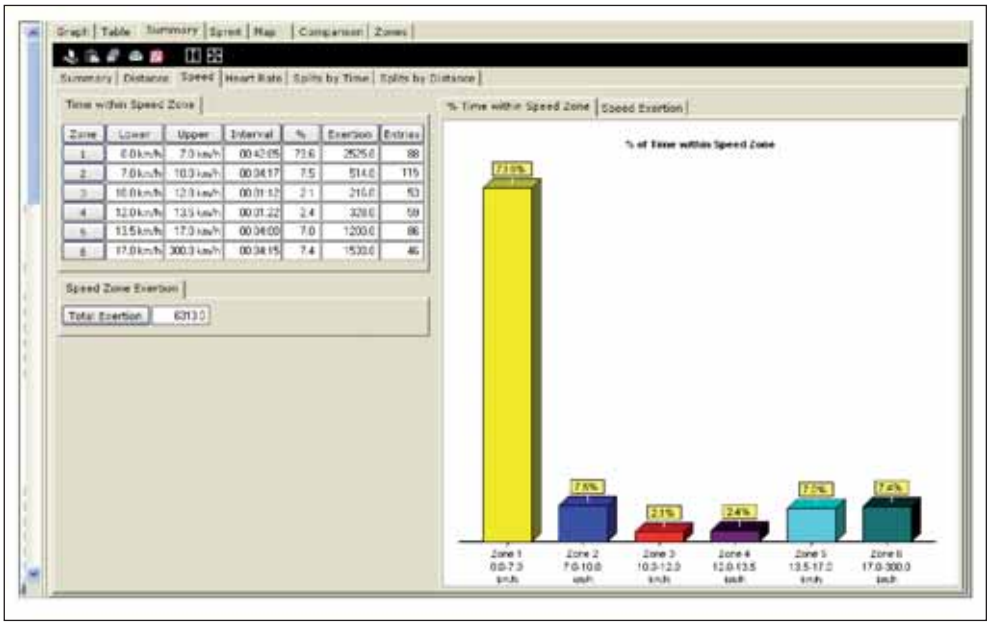

Figure 2d: GPS data illustrating the total time spent and frequency of entries in various speed zones during a training run

al representation of an event course. This is particularly useful for cross country and road races. Some examples of screen shots, data images etc are shown in Figure 2 to help give an insight into current capabilities.

There are numerous commercial products on the market – all have different technical and functional specifications and capabilities, are different sizes and weights, and therefore provide different practical considerations. Not all have been scientifically assessed for their accuracy, precision, reliability and repeatability. Therefore, the selection of an appropriate device if appropriate and relevant to your event requires careful evaluation beforehand.

Another example is illustrated in the article on hypoxic devices by Bermon (2007) in this edition of NSA (see page 27). Although not new, the use of portable hypoxic devices has only emerged due to industrial developments in sensors, materials and electronics. Such devices provide a more portable and practical method of applying an established and well research ergogenic aid.

Summary

The application of GPS and hypoxic device technologies are just a small flavour of how an evolving industrial age has begun to infiltrate and support the development of athletic performance. In future issues of NSA, we will attempt to present new possibilities where advances in science and technology provide opportunities for advances in knowledge through their application in athletics. Such developments will cover the range of events from the sprints and hurdles, to endurance to the jumps and throws.

Acknowledgements

The screen shots used are taken from a commercial sports device from GP Sports (www.gpsports.com)

Scott Drawer, Ph.D, is a consultant to the Research & Innovation Unit at UK Sport in Great Britain. He can be contacted at scott.drawer@uksport.gov.uk