Introduction

Sprinting velocity is the product of two factors: stride length and stride frequency. Both of these are influenced by a number of physical, physiological and mechanical factors.

Measuring the length, frequency and other aspects of an athlete’s stride in training provides the coach with important information about the effectiveness of the running technique and it can give an indication of the success, or otherwise, of the training programme.

Measuring stride length and stride frequency

In the pre-synthetic track era, coaches could measure the marks left by a runner’s spikes in the cinders of the track to get the stride length and they could calculate the stride frequency by counting the number of strides in a timed run. These measures provided rough indications but they were subject to significant margins of error and could not give accurate information about more minute aspects of the stride such as contact or flight times.

More recently, the gold standard method of assessment would have been through a costly three-dimensional kinematic analysis process requiring an extended period before any feedback could be obtained. In addition, the capture of such data was limited to a short section of the track and therefore could only give the coach a snapshot of a race or training activity.

The advent of miniaturised hardware with robust and reliable electronics, data logging and packaging matched with high computing process power for signal analysis and data display has resulted in a range of measurement systems with various degrees of improvement in time efficiency and cost effectiveness. These include the two systems outlined here: a currently available commercial option, Optojump, and system now in development by Imperial College, London.

Optojump (www.optojump.com)

Optojump is an optical measurement system consisting of transmitting and receiving lights (see Figures 1 and 2). The system detects any interruptions in communication between the bars and calculates their duration. This makes it possible to measure flight and contact times during the performance of a series of jumps with an accuracy of 1/1000 of a second from anything to 2m to 100m. There are numerous applications for the

Figure 1: An individual transmitting bar
device but for this purpose the following measures are all possible:
- Stride length
- Exact and average acceleration
- Exact and average speed
- Time taken (calculable also with the help of external sensors such as photocells)

The software supporting the system provides a simple visual and graphical display to assess changes in results over time or comparative for a particular group of individuals (see Figure 3).
Figure 4: The e-AR sensor

**e-AR (www.sensixa.com)**

The e-AR sensor is a miniature ear-worn accelerometer based sensor (see Figure 4). One of the UK’s Research Councils (www.epsrc.ac.uk) funded a small technology transfer project with Imperial College, London, and UK Sport to apply the technology to the development of a low cost, real time system to look at measurements of stride length and stride frequency from distances ranging from 60m to 400m. The sensor is secured over the ear, which is as close to the body’s central balance point as is feasibly possible.

Supported by laser based sensors at nominated known distances, the system has the capability of providing alternatives to many other current methods with distinct advantages in cost, portability, availability, and the number of athletes that can be tracked at any one time.

Although some work is still required to confirm the accuracy and use of the system, the future potential for more effective measurement and monitoring of sprint speed could assist coaching and athlete development.

**Summary**

The measurement of stride length and stride frequency in sprint events can provide an important and practical marker in the development of those key factors of athlete development in sprint speed. Current technology has reduced cost, eased the technical requirements and improved feedback times for more rapid and objective coaching decisions.

Please note: The author has no involvement with any of the commercial companies or commercial products mentioned in this article. The e-Ar sensor is not currently commercially available.

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**NOTES**

For examples and further information see:
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www.quintic.com
http://www.siliconcoach.com/
http://www.motionprosoftware.com/
http://www.elitesportsanalysis.com/fx3home.htm