The Athletic Shoe.
How do you know which shoe is correct for you???

Introduction

Athletic endeavour involving walking, running and jumping actions typically require the protection of footwear to aid comfort, minimise injury and assist performance. Historically, the fundamental function of footwear was foot protection from the environment (McPoil, 1988). In modern civilization, the athletic shoe has emerged both as a fashion accessory and as a means to pursue physical activity. Aligned with the running boom of the 1970's, the athletic shoe has undergone technological advances. The development of athletic shoes has seen footwear evolve from generic athletic shoes to highly specialised sport specific footwear (Kouchi and Mochimaru, 2003). For example, athletic shoes are generally lighter in weight and comprise materials that allow for foot aeration. Move-over, designs can be specific to over-pronators and supinators. The modern day athletic shoe aids different running styles, such as forefoot or heel strikers, as well as having a capacity to cater for a variety of foot widths. Athletic footwear can also be gender specific. As a consequence there have been many assertions that footwear typically improves performance and offers protection from injury (Barrett and Bilisko, 1995).

Therefore, for the health professional involved in the management of musculoskeletal lower limb injury, the shoe can be considered a powerful tool for manipulating human motion (Barnes and Smith, 1994), which can benefit the individual (Cavanagh, 1980; Johnson,1994; Maier and Pietrocarlo, 1991; Milburn and Barry, 1988) or conversely, may deleteriously alter lower extremity movement patterns culminating in injury (McPoil, 2000; Nigg and Segesser, 1992).

Athletic shoe ideals

In seeking to improve the technical performance of athletic footwear, manufacturers have used a variety of materials to improve the cushioning properties of shoes (air®, gel®, dual density, hydroflow®) and guide motion of the foot (density variations, heel stabilizers, rigid shanks, sole width). However, while many of the design features are

well considered, there is a lack of evidence to indicate the effectiveness of one shoe property over another.

In the pursuit of an ideal shoe, the use of human subjects or cadavers to examine properties of footwear has been superceded by the use of three dimensional finite element foot-shoe models (Oda et al., 2003). Despite technological developments the basic criteria of shoe components has remained the same for many years (Martin, 1997).

- Ideal footwear aims to protect the human foot from injury and to facilitate performance and therefore needs to match the dynamic changes in foot shape. Freychat and Bouche, (1999) Dynamic arch deformation and its consequence on shoe design.
- Biomechanical research shows that specific shoe construction features matched to foot-leg mechanics aid foot-leg kinematics and assist in reducing overuse injuries.

- From a medical & athletic perspective, the relationship between overuse injury and sport shoes are of both prophylactic and therapeutic interest.

For serious athletic participation, the following questions regarding footwear requires consideration:

1. to what extent do modern running shoes protect against running injuries?
2. are there differences between the different brands?
3. what makes a quality running shoe?
4. placed in the context of price are cheap shoes prone to lead to injury?
5. do shoes have certain characteristics that the consumer may or may not consider that do play a significant role?

The dichotomy of footwear

Many of the desirable qualities of running shoes have the peculiar property of being mutually exclusive. In the effort to construct the ideal shoe the industry is challenged by the need to meet all the demands despite contradictions.

For example:

- Features that promote stability add weight.
- Soles that provide good traction are often not durable.
- Reducing the weight of the shoe reduces stability and cushioning.
- Added cushioning promotes instability.
- Firmer midsoles are more stable but promote inflexibility.

Shoe & selection of footwear:

There are over 300 different styles of athletic footwear available for the consumer. A common myth is that a runner requires a specific running shoe or a tennis player a tennis shoe. Such categorisation is a very simplistic method of selecting footwear. Footwear should be prescribed to an individual much in the same way eye glasses and mouth guards are. The following criteria is useful:

1. Determine foot type (high, medium, low arch)
2. Foot shape: broad v narrow; male v female; toe position eg. bunions, clawed toes
3. Foot function: pronation (foot-ankle rolls inwards), supination (foot-ankle rolls outwards), rectus (neither pronation or supination), rigid foot structure v flexible foot structure.
4. Dynamic function: generally achieved by video gait analysis, computer motion analysis, pressure analysis.
5. Activity, level of participation, injury history, wearing orthotics or braces.

Once the kinematic foot-leg criteria is established, the style of shoe can be selected. Footwear is divided categories and sub categories:

- Cushioned Shoes + / -
- Stability Shoes + / -
- Motion Control Shoes + / -

- Running shoes
- Walking shoes

- X-trainers
- Racing flats
- Racing spikes
- Track and field
- Court sports—tennis, squash, basketball, volleyball
- Football boot

Shoes designed for shock absorption:

	Principle characteristics: ■SOFT MIDSOLE ■NO DUSL DENSITY	
The heel counter should be pliable, the construction of a stitched-slip last & should not resist a twisting force applied to the longitudinal shoe axis		The EVA, gel or other midsole components should compress easily under thumb pressure

Shoes designed for foot control:

Principle characteristics:

■FIRM MIDSOLE
■NO DUAL DENSITY

The heel counter must be firm, the construction of the last board or combination. The shoe should a twisting force applied to the longitudinal shoe axis

The midsole should contain dual density a trussic system and resist medial-valgus forces

Examples of foot-leg conditions and suitable shoe types

Other footwear facts

- If injured within 2-4 weeks of shoe purchase consider the likely cause of the injury.

Athletic shoe life ranges from 300km to 900kms dependent upon matched to weight, shoe material and activity

- As much as 50% of shock absorping capacity may be lost within the first 4 months of running

- Puncture wounds: air / gel / non EVA shoe systems.

Observe shoe integrity