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"Past, Present and Future Direction of Running Shoes"



Presented by: **DAVID FERGUSON** - DipApSc(Podiatry), MPodA

Will commence LIVE from Sydney, Australia at 7:30pm AEDT

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Andrew Ellis

BSc (Ex. Sci), M. Phyt

- World Health Webinars CEO
- World Health Webinars (Australia/NZ) Host

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David Ferguson



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Podiatrist

- Director of Advanced Gait Dynamics
- 20 years exclusive clinical gait analysis
- Working and lectured widely in South Africa, the United Kingdom and Australia on clinical gait analysis
- Columnist for Australian Doctor Magazine
- Consultancy with the NSW Waratahs and the Chelsea Football Club

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In This Discussion



- ④ The 'Science of Running Shoe Design'
 - Where we've been and where we are going
- ④ Injury Prevention or Performance Enhancing
 - Different shoes for different situations
- ④ Transitional Running Shoes: The middle ground in the minimalistic debate
- ④ A guide to Clinical Footwear Prescription

The Past

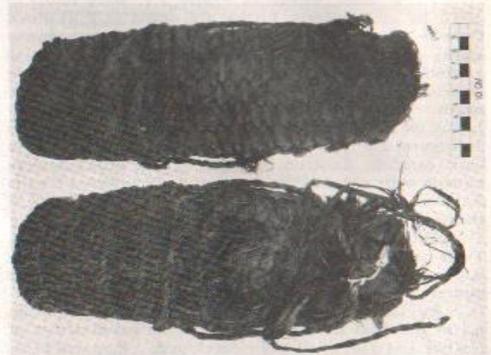


Fig. 2.1 The earliest shoes in existence. A pair of sandals made of crushed sagebrush bark that belonged to an Oregon cave dweller over 10,000 years ago. (Courtesy of Luther Cressman, Ph.D.)

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Fig. 2.7 The Spencer Shoe, Possibly the first pair of specialized running shoes ever made. (Courtesy of the Northampton Museum, England)

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The 70's and the Running Boom



- USA's Frank Shorter wins the Munich Olympic marathon in 1972



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The 80's and the Marketing Boom

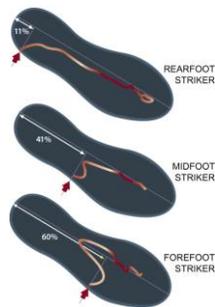


- Footwear companies reinvent the wheel
- Greater emphasis on shock absorption (especially in the forefoot) and stability (rear foot)
- Development of new light weight synthetics such as EVA (ethylene vinyl acetate)
- Duo density mid soles introduced

Force Plate Technology



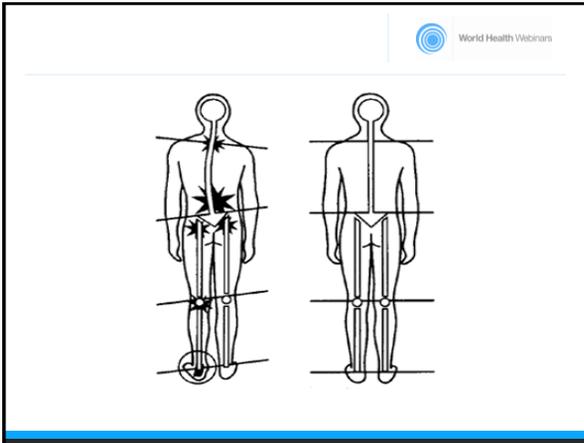
- Dr Peter Cavanagh (Author of the Running Shoe Book) using Force Plate technology in the early 80's
- 60% runners found to be a forefoot striker (barefoot)
= shoes with increased forefoot cushioning



Lower Limb Coupling



- Coordination of motion between joints and segments of the lower limb
 - Timing of peak frontal plane rearfoot motion and sagittal plane knee motion
 - Excessive pronation of the foot results in excessive internal tibial rotation and increased knee flexion



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- ④ Tiberio (1987) - excessive STJ pronation increases internal tibial rotation
- ④ Lundberg et al (1989) - Position of the subtalar joint axis in the sagittal plane effects frontal plane rearfoot motion and EV/TIR
- ④ Nigg (1993) - arch height effects EV/TIR ratios
- ④ Bellchamber, van der Bogert (2000) - proximal joint movements have a greater influence on tibial rotation compared to distal joint movements

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The 90's... More of the same



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- ④ Greater variety of sporting footwear available
- ④ Running Shoes divided into 5 categories
 - Motion Control
 - Neutral
 - Cushioning
 - Training
 - Racing
- ④ Running shoes become a complex multiple mechanised unit



The Dawn of a New Century

- ④ Motion Enhancement Vs. Motion Control
 - Running shoes designed to facilitate normal motion rather than controlling abnormal motion
- ④ Advancements in material technology, making shoes lighter but with greater shock absorption
- ④ The mechanics of the forefoot become important
 - Windlass effect
 - Forefoot axis
 - Sagittal plane theory

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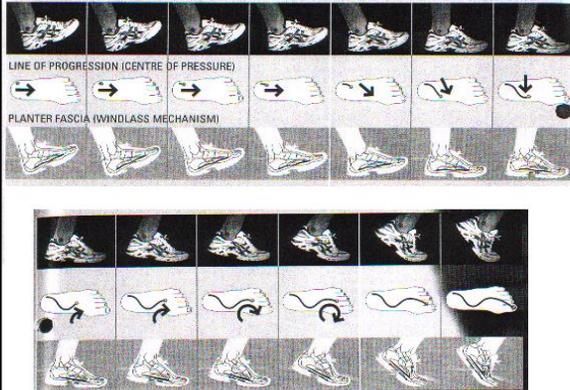
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THE RUNNING GAIT OF THE 2002 **asics** GEL KAYANO



NIKE

- ④ At the Nike Sports Research Laboratory in Beaverton, Ore., scientists have come to question the use of rigid devices such as dual-density midsoles and footbridges. Such devices create abrupt barriers to the natural inward rolling of the foot, says lab director Mario LaFortune: "It's like trying to stop pronation with a brick wall."

Watching Your Steps, Scientific American

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ADIDAS



Ⓢ The human foot is unique and highly functional. Our main goal is to design shoes that work with the foot, not against it, to help athletes in all sports achieve their highest level of performance. Therefore our shoes are equipped with the various technologies like our cushioning system: adiPRENE® - which maximised heel protection and stability or about adiPRENE®+ which maintains forefoot propulsion and efficiency. Our Torsion® system creates stability and control. Traxion® is for maximised grip in all directions. adiDRY® - the adidas waterproof membrane or adiTuff® which protects the upper from excessive wear or adiWEAR® which offers great abrasion resistance and durability.

Adidas Web Site

BROOKS



Biomechanical research has provided ways to measure the forces under foot during the heel to toe motion of the running stride, which we refer to as the pressure path. The dotted red line shows a typical pressure path created by the foot as it moves through heel strike to toe off.

Brooks designs and engineers all our shoes to allow the foot to attain its optimal pressure path.

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The foot was becoming an
'Optional Extra'



Do we need Running Shoes at all?



BORN TO RUN
A Hidden Tribe, Super Athletes,
and the Greatest Race the World
Has Never Seen
Christopher McDougall



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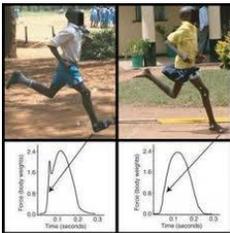


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- Published 2009
- Since the 1970's, more running injuries
- 80% of runners will experience an injury every 12-18 months
- No scientific evidence to support the general use of running shoes to reduce overall running injury statistics
- Traditional running shoes make the foot / individual weaker
- Running shoe companies only interested in the \$\$\$



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- 3 footfall patterns in distance running; (Hasegawa et al., 2007)
 - Heel Contact 75-80%
 - Forefoot with Heel contact 20-25%
 - Forefoot with No Heel Contact 2%
- Forefoot footfall pattern difficult to maintain over increased distances (Slavin, 1992)
- Computer modelling; (Harrel 2012)
 - Heel contact gait = higher energy efficiency
 - Faster running with Forefoot footfall but low economy

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- ④ It is unclear why different runners run with individual footfall patterns
- ④ Individual footfall patterns are an intrinsic dynamic and difficult to alter and may increase injury risk
(Hamill, 2012)
- ④ Little evidence that a particular footfall pattern is more efficient or less injury prone than others
(Kleindienst, 2003), (Walther, 2005)

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The Modern Era

They're natural and
they're
spectacular!



Nike Free

- ④ Exercises muscles normally weakened by traditional running shoes
- ④ Feature siping (deep slices) and reverse flex grooves to encourage flexion and extension in both directions
- ④ Merge the natural, healthy motion of a bare foot with the protection of traditional footwear



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Vibram 5 Fingers



- ④ Training without shoes allows you to run faster and further with fewer injuries
- ④ Optimum balance, increased stability, less impact and greater propulsion
- ④ Improved strength, agility and equilibrium (and proprioception)
- ④ May not be appropriate for severe pronation or supination.



On - Cloud Technology



- ④ Supernatural
- ④ Nature Improved shoe
- ④ Land soft, push off hard
- ④ Enjoy a very light running sensation and stay away from pain and injuries
- ④ Have the best of both worlds: cushioned landing, barefoot take off



Hoka One



- ④ 'Time To Fly'
- ④ maximally cushioned midsoles
- ④ rockered geometry creates a platform for optimally efficient natural running



MBT's / Fit Shoes



- ④ The Anti Shoe' - mimics walking on soft, uneven ground
- ④ Patented Masai Sensor and Balancing Area induce instability that your body instinctively attempts to correct
- ④ Activates the whole body, increases back muscle activity, improves posture, tightens buttocks and thighs and even burns more calories
- ④ Reduces stress on the ankle, knee and hip joints



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The Modern Running Shoe



- ④ Traditional
 - Control, Support, Neutral, Cushioning
 - Still popular
- ④ Transitional
 - Low Pitch, lighter weight, more simplistic
 - Greatest area of growth
- ④ Minimalistic
 - Offers basic foot protection only
 - Simulates Barefoot Running

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Transitional



- ④ Low Pitch
- ④ Lighter weight
- ④ Less mechanised
- ④ Increased forefoot cushioning
- ④ Facilitates mid foot –forefoot footfall

Minimalistic



- ④ Offers basic foot protection only
- ④ Simulates Barefoot Running
 - Facilitates forefoot footfall
- ④ 0-4 degree pitch
- ④ A conditioning running shoe



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- Ⓢ American National Sporting Goods Association
 - Running shoes sales = \$2.46 Billion in 2011
 - Record High
 - 6% expected annual growth
- Ⓢ Majority of running shoes sold not used exclusively for running
- Ⓢ Sales of minimalist shoes declined more than 10% in the first quarter of 2013 (Runners World - Sales of Minimalist Shoes Plummet, May 21013)
 - minimalist/barefoot only about 4% (exclusive of Nike Free)
 - Sales of motion control shoes increased by more than 25% during the first quarter of the year, and sales of stability shoes increased by more than 10%.

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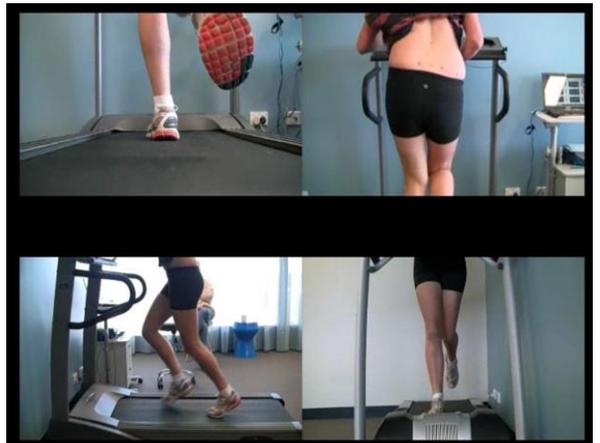
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Vs.

Injury Management

- Ⓢ What tissues are involved in the injury
- Ⓢ What mechanics are contributing to the injury
- Ⓢ Proximal or distal influences
- Ⓢ Did the current footwear contribute to injury
- Ⓢ What do you want new footwear to change any why



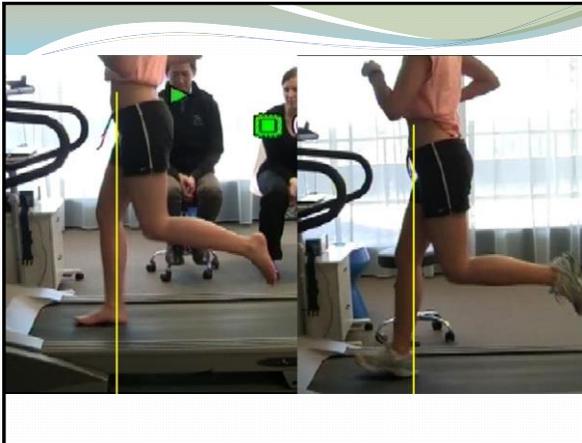
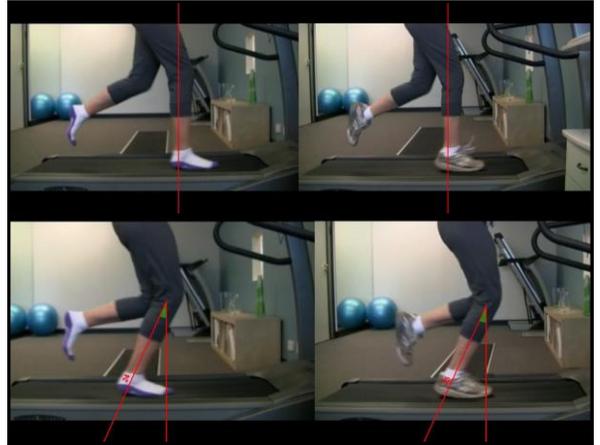
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Biomechanical Profile



- Ⓞ Foot posture
- Ⓞ General joint stiffness
- Ⓞ Gait analysis findings
 - Angle of gait
 - Excessive pronation
 - Tibial angle
- Ⓞ Running analysis
 - Footfall position
 - Knee flexion
 - Pelvic instability



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Body Weight



- Ⓞ >85 kg is heavy
- Ⓞ Durability
- Ⓞ Traditional shoes typically last 700km



Foot Width



- Ⓞ New Balance and Asics have width fittings
- Ⓞ Men shoe for women with wide foot?



Orthotics



- Ⓞ Is the shoe wide enough
- Ⓞ Deep enough
- Ⓞ Neutral or supportive



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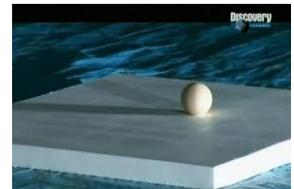


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Cushioning



- Ⓞ Rearfoot or Forefoot
- Ⓞ Running forces can exceed 3x body weight
- Ⓞ Hardening running surfaces may need > cushioning



<http://youtu.be/CEgo1pYyVKg>

Support



- ⦿ Decelerate pronation moment
- ⦿ Reduce Torsional instability
- ⦿ Forefoot plates for stability during toe-off



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Weight



- ⦿ Fast shoes are light shoes
- ⦿ Racer vs Trainer
- ⦿ Transitional shoes are lighter
- ⦿ Too light may influence durability



Pitch



- ⦿ Reduced heel height may influence less heel contact
- ⦿ Reduced pitch = reduced weight
- ⦿ Insertional TA, pes cavus, ankle stiffness



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- ⦿ There is no 'one' right shoe
 - You don't have to prescribe the best shoe, you just want to avoid the wrong shoes
- ⦿ Give patients several options and let them choose
 - Comfort is king
- ⦿ Prescribe with familiarity
- ⦿ Know your local running shoe team and talk with them frequently

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Changing running shoes and technique is useless if there is poor dynamic functional control



THE FUTURE...



Outdoor Mens World Records



100m	Usain Bolt	9.58	Oscar Pistorius	10.91
200m	Usain Bolt	19.19	Oscar Pistorius	21.30
400m	Michael Johnson	43.18	Oscar Pistorius	47.07
Half Marathon	Zersenay Tadese	58.23	Richard Whitehead	1.17.45
Marathon	Patrick Makau Musyoki	2.03.38	Richard Whitehead	2.42.52

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Live Q & A

With David Ferguson



Live Q & A

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Thank you

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