Shoes and Orthotics

FORM AND FUNCTION
Locomotion

ability to move from one place to another
Ground Force Reaction

Newton's 3rd Law of Motion states that “For every action there is an equal and opposite reaction.” According to that, when we walk or run, every time our foot lands, there is what is called a 'Ground Reaction Force' produced.
When the Foot Hits the Ground

Chain reaction of forces ricocheting up the body on impact.

Ricochet is defined as to bounce off a surface and go another direction.
National Collegiate Athletic Association (NCAA) injury surveillance data for 15 sports and to identify potential modifiable risk factors to target for injury prevention initiatives.

182,000 injuries and slightly more than 1 million exposure records captured over a 16-year time (ISS) injury surveillance system.

More than 50% of all injuries were to the lower extremity. Ankle ligament sprains were the most common injury over all sports, accounting for 15% of all reported injuries.
Reducing Injuries

More than 27,000 ankle ligament sprains were reported over the 16 academic years, yielding an average of approximately 1700 per year.

Effective interventions exist that can reduce the incidence of ankle injury without critically impairing performance. Prophylactic bracing or taping and neuromuscular/balance exercise programs can reduce the rate of lower extremity injuries by as much as 50%.

Footwear the great UNLOADER

Comfort, Performance, and Injury Prevention

athletic footwear is designed for numerous, diverse sports

acceleration, sprinting, deceleration, cutting, turning jumping, or landing

cleated footwear would include sports like soccer, football, rugby, baseball, cricket, and golfing

playing on hard court in comparison to playing on clay or grass courts
Footwear design friend or foe


Harmful cleats of football boots: a biomechanical evaluation.

Bentley JA¹, Ramanathan AK, Arnold GP, Wang W, Abboud RJ.

Abstract

BACKGROUND:

Football players wear boots of varying cleat designs with some preferring the bladed cleats while others opting for the conventional studded cleats. The current study compares biomechanically the boots with differing cleat designs and their effect on feet, if any.

METHODS:

Twenty-nine healthy male volunteers were recruited from amateur football teams. They were asked to perform three trials each of two activities: a straight run and a run cutting at a 60° angle wearing bladed and studded Adidas®-F series boots on artificial turf. Plantar pressure values were recorded using the Pedar®-X in-shoe pressure measuring device. Peak pressure and pressure-time integral were analyzed over 11 clinically relevant areas under the foot.
So much to consider...

**RESULTS:**

While the in-shoe pressure and pressure-time integral were higher under the medial half of the foot with studded boots, they were higher under the lateral half of the foot with the bladed design.

**CONCLUSIONS:**

The studded boots can be considered safer as the pressure distribution across the foot and the pattern of center of pressure progression mimicked the normal motif, whereas the bladed boots could potentially be deemed relatively more harmful due to the unnatural increased loading under the lateral half of the foot, predisposing the foot to injuries.
Statement of Problem

Professor Von. M. Homer, M.Sc, BOCPD, PhD-c

Non-contact athletic injuries are the result of forces generated during athlete-to-surface interactions.

Associations between playing surface conditions and injury incidence have been reported and numerous devices have been used to measure the vertical and horizontal forces occurring during athlete-to-surface interactions.

However, nearly all of these instruments evaluate horizontal and vertical force separately.
TAFT Tennessee Athletic Field Tester
Footwear must match Foot Shape

1. Flat foot, over pronation.
2. Normal arch, mild pronation
3. High arch, supination control
Tread and Traction
Sport Specific Footwear
Match the Shoe to the Surface

Clay Court - Lateral support for sliding, Herringbone for grip

Hard Court - Herringbone pattern for traction, sock absorbing materials

Grass Court – Nubs for protection from slipping on grass, stability control

Carpet – Smooth, stability control
If the shoe fits wear it

Properly fit shoes can reduce the impact of each step and cushion the foot from heavy landings. Sport or exercise specific shoes can improve your performance, for example, quick direction changes, reduced impact, quicker stride.

Improper or ill fitting footwear can cause a number of injuries. Ankle strains and fractures, bunions, corns, toe nail injuries, blisters, knee and back pain.
Injury Prevention

The most common *taping* procedures are: low Dye strapping, turf toe strapping, ankle strapping and Achilles tendon strapping.
Injury Prevention

Bracing provides stability protection commonly used for sprains, overuse and ligament injuries.
Foot Orthotics

Shoe inserts control forces and reduce shear, friction and impact. Turf toe, metatarsal, sesamoid pain and plantar fasciitis.
The Future is Smart Footwear

Built-in shoe technology, was introduced to the athletic footwear market with the Adidas A1.

The shoe was automated and capable to adjust its functional cushioning properties at the rear foot by built-in programming and actuator instrumentation.

Smart footwear constructions consist of three components, a sensor unit, a data processing unit, and an actuator unit. The process of monitoring, evaluation, and alteration of locomotion patterns is constantly executed throughout exercise.

Smart shoe designs are the next generation, personalized and specialized.
The Future
Orphe is a smart-shoes system designed for performance that functions both as a customizable lighting system and a musical instrument/audio-visual controller.

DIGISOLE SMARTSHOE
Reinventing traditional footwear with connected sneakers that integrate wearable technology.

WARM YOUR FEET
TRACK YOUR DAY
Kcal
CHECK BURNED CALORIES
AUTOMATIC TIGHTENING
SHOCK ABSORPTION MEASUREMENT

Control your shoe with your smartphone
When the Foot Hits the Ground

Stuff Happens!!!

Uneven terrain
Weather conditions
Impact contact
Impaired balance perception

Locomotion getting from one point to the other can be challenging.
Thank You

Teresa Alpert, Orthotist, C. Ped
CU Department of Orthopedics
Division of Foot and Ankle
Teresa.Alpert@ucdenver.edu
303-877-0567