Chiropractic Management of Running Injuries

Presented by Dr. Zach Shiels

Background

- Wisconsin Lutheran College
- Cross Country
- NCAA DIII XC National Championships
- Track & Field
- 2 Marathons, 7 Half-Marathons
- Chiropractor at 3 Milwaukee area marathons, numerous 10k races, and the Wisco Mile
- Adjunct professor Wisconsin Lutheran College Sport & Exercise Science Department

Disclaimer

- All presented material and demonstrations are for instructional purposes only. Diagnosis and treatment approaches may be discussed, but are not intended to establish a doctor/patient relationship.
The body as a kinetic chain

- The body operates as a moving system and thus should be analyzed as one.
- Functional abnormalities found within the spine are the result of an underlying cause.

Kinetic Chains

- Specific motions at certain segments of the kinetic chain have a dramatic effect in movement of other joints (or lack there of), and turning on or off certain muscles.

Human Kinetics Role in Pain

- The site of pain does not equal the source of the problem.
- "He who treats the site of pain is lost & so is the patient." - Karel Lewit
Quick Review

Lower Extremity Anatomy

Running Injuries
Common Running Injuries

- Runner’s Knee/Patellofemoral Pain Syndrome (PFPS)
- Achilles tendinopathy
- Hamstring Strain
- Plantar Fasciitis
- IT-band Syndrome (ITBS)
- Shin Splints/Medial Tibial Stress Syndrome (MTSS)
- Stress Fracture
- Piriformis Syndrome/Sciatica/LBP

*according to Runner’s World

Knee Pain/PFPS

- About 40% of running injuries are knee injuries
- According to Runner’s World about 13% of runners experience knee pain per year
- Worse after long runs or going down hills or stairs

Risk factors
- Overpronation
- Quad dominance
- Weak hips/glutes

Achilles Tendinopathy

- According to RW, 11% of running injuries with 8% of runners experiencing it each year
- Typically worse first thing in the morning and for the first several minutes of a run

Risk factors
- Increasing mileage and intensity at the same time
- Mid-foot and fore-foot strikers
- Wearing flip-flop sandals
Hamstring Strain

- 7% of runners reported hamstring issues in RW poll
- Risk factors
  - Tight, short hamstrings - lack of flexibility
  - Tight, long, weak hamstrings - excessive flexibility
  - Quad/hamstring imbalance

Plantar Fasciitis

- Comprises about 15% of all running injuries
- 10% of RW poll respondents reported struggling with it in the past year
- Typically worse first thing in the morning, after prolonged periods of sitting, and for the first several minutes of a run
- Risk factors
  - Extremely high or extremely low arches
  - Poor footwear (i.e. shoes without arch support and flip-flops)
  - Poor foot biomechanics

IT Band Syndrome

- Typically comprises 12% of all running injuries
- 14% of RW poll respondents reported experiencing in the past year
- Typically painful over Gerdy’s Tubercle and can extend along the lateral thigh, even involving trochanteric bursitis and TFL pain
- Risk factors
  - Leg-length discrepancy
  - Overpronation
  - Weak hip abductors/glutes
Shin Splints/MTSS
- Comprises about 15% of running injuries
- RW poll reported 10% had shin splints in the past year
- Typically gets worse as the individual continues to run or runs faster
- Risk factors
  - Too much, too soon
  - Poor footwear or too many miles
  - Very high arches or flat feet

Stress Fracture
- Comprises around 5% of all running injuries
- Typically in the tibia or metatarsals, can also occur in pubic ramus, lumbar spine (spondylolisthesis), femur, or calcaneus
- Risk factors
  - Overtraining
  - Increasing mileage and intensity simultaneously
  - Nutritional deficiencies

Piriformis Syndrome/Sciatica
- Not included in Runner’s World poll
- Characterized by pain deep in the posterior hip/buttock with radicular symptoms spreading down the posterior leg
- Risk factors
  - Weak hip abductors and glutes
  - Leg-length discrepancy
  - Overpronation
Running Gait

Normal Running Gait

- Define phases of running gait
- Describe the 3D kinematics for the pelvis, hip, knee, ankle and subtalar joint that occur during the different phase of gait
- Analyze muscle activity of major muscles associated with running gait
- Explain the lower extremity kinetics during running
- Describe common gait abnormalities
- Describe common injuries associated with running

Normal Running Gait

- Gait - a person’s manner of walking/running
- Gait cycle is the period of time between successive ipsilateral heel strikes
- Human locomotion is bipedal and follows a cross-crawl pattern of locomotion
- Muscles and joints form a kinetic chain
Kinetic Chains

- Specific motions at certain segments of the kinetic chain have a dramatic effect on the movement of other joints (or lack thereof), and turning on or off certain muscles.

Contrasts Between Walking & Running

- Running has a Float Period and no Double Stance Period.
- Both feet are off the ground.
- The running cycle is quicker.
  - Running cycle typically lasts ~0.7 sec.
  - Walking cycle typically lasts ~1.0 sec.
- Ground Reaction Force (GRF) is greater.
  - Running GRF is 2-6x BW.
  - Walking GRF is 1-1.5x BW.

Gait Cycle

- Two Phases of Gait.
- Stance Phase
  - Contact Period
  - Midstance Period
  - Propulsive Period
- Float Phase
Stance Phase

- Contact Period begins at heel strike (HS)
- A transfer of weight from the heel to the forefoot occurs during the Contact Period
- Full forefoot load (FFL) defines the Midstance Period
- Once the forefoot is fully loaded, heel lift (HL) begins the Propulsive Period
- The Propulsive Period ends with toe off (TO)

Swing Phase

- The muscles and joints of the lower extremity reset for the impact of HS

Joint & Muscle Function - Contact

- HS ideally occurs with slight hip flexion, knee extension, and the foot in dorsiflexion and supination
- Upon HS the knee flexes slightly and the foot begins plantar flexion and pronation
  - The quads eccentrically control knee flexion and the anterior compartment muscles eccentrically control ankle plantar flexion.
- These three movements all act as a shock absorption mechanism
Joint & Muscle Function - Midstance

- Pronation continues to absorb shock and transfer weight from the heel to the forefoot, as the weight is transferred forward and FFL occurs.
- The hip continues to move toward extension and the knee begins to extend as well.
- Gluteus medius and minimus activation is very important during this period.

Joint & Muscle Function - Propulsive

- The hip and knee reach full extension at HL and begin to flex during TO.
- Weight is transferred toward the hallux (big toe) for TO.
- The plantar fascia tightens, the calf muscles activate during HL to propel the body forward at TO.
- Full knee flexion and hamstring activation is reached just after TO.

Joint & Muscle Function - Swing Phase

- During swing phase the hip flexes with hip flexor activation and the knee moves to full extension with quadriceps activation.
- The foot moves back to dorsiflexion and supination to prepare for HS.
Subtalar Joint

Subtalar joint

- Articulation between talus and calcaneus
- Diarthrodial joint with three main joint surfaces
  - Combination of saddle-shaped and gliding allows for triplanar motion
- Triplanar motion described as pronation and supination
  - Inversion/eversion
  - Dorsiflexion/plantar flexion
  - Adduction/Abduction

Pronation

- WB pronation consists of:
  - Calcaneal eversion (frontal plane)
  - Talar adduction (transverse plane)
  - Talar plantar flexion (sagittal plane)
  - Tibial internal rotation (transverse plane)
Pronation

Supination consists of:
- Calcaneal inversion (frontal plane)
- Talar abduction (transverse plane)
- Talar dorsiflexion (sagittal plane)
- Tibial External rotation (transverse plane)

Supination
Similarities Between Walking & Running

- Running has a Stance and Swing Phase
  - Stance Phase
    - Contact Period
    - Midstance Period
    - Propulsive Period
  - Swing Phase
    - Float Period

Stance Phase

- Contact Period begins at foot strike (FS)
  - Note: not necessarily considered heal strike (HS) in running
- A transfer of weight from the heel/midfoot to the forefoot occurs during the Contact Period
- Full forefoot load (FFL) defines the Midstance Period
- Once the forefoot is fully loaded, heel lift (HL) begins the Propulsive Period
- The Propulsive Period ends with toe off (TO)
Joint & Muscle Function - Contact

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Pathologic Gait

Texas-sized findings
Don't get caught up on the minutiae.
Abnormal Gait Variations

- Foot Types
  - Pes Planus (flat foot)
  - Pes Cavus (rigid foot)
- Genu Valgus
  - Limited dorsiflexion
  - Lack of glute control
- Hallux Limitus/Rigidus

Abnormal Gait Variations

- Trunk
  - Backward lean: decrease demand on hip extensors
  - Forward lean: due to increased hip flexion
  - Lateral lean: weak hip abductor muscles
- Pelvis
  - Contralateral drop: weak hip abductor muscles
  - Ipsilateral drop: compensation for short leg
  - Anterior pelvic tilt: Lower Crossed Syndrome

Abnormal Gait Variations

- Hip
  - Excessive flexion/limited extension: hip flexor contracture
  - Internal rotation: weak external rotators, femoral antversion
  - External rotation: limited dorsiflexion, femoral retroversion
  - Adduction: secondary to contralateral pelvic drop
  - Abduction (swing leg): long leg, limited dorsiflexion
Abnormal Gait Variations

Knee
- Excessive flexion: weak quadriceps, short leg on opposite limb
- Hyperextension: decreased ankle dorsiflexion, ligament hyper-mobility (Beighton test)
- Valgus: weak femoral external rotators, joint instability
- Varus: joint instability, bone deformity

Abnormal Gait Variations

Ankle
- Over-pronation: subtalar joint deformity, weak intrinsic foot muscles
- Flat foot contact: limited dorsiflexion, weak dorsiflexors
- Early heal lift: tight dorsiflexors
- Foot slap: weak dorsiflexors

Toes
- Limited extension: Hallux limitus/rigidus, tight FHB
- Clawed or hammered: imbalance of extensors and intrinsic muscles

Trendelenburg (Hip Drop) Gait

- Deviation occurs in the frontal plane
- Characterized by hip abductor weakness on the stance side
- Gluteus medius functions to stabilize pelvis in the frontal plane
- Weakness results in excessive hip drop on the opposite side (swing leg)
- In some cases this will occur bilaterally
  - (https://youtu.be/pHyBakY-gkw)
Hip Drop Research

- "This study identified a number of global kinematic contributors to common running injuries...Contralateral pelvic drop appears to be the variable most strongly associated with common running related injuries."
- "For every 1° increase in pelvic drop there was an 80% increase in the odds of being classified injured."


Common Running Injuries
Proper Footwear

- Is there a correct shoe for each foot type? **Probably not**
- Shoe types: cushioned, neutral, structured, support, and motion control

Shoe Types

- **Cushioned/Neutral** - emphasizes enhanced shock dispersion in its midsole and/or outsole design.
- **Structured** - offers a good blend of motion control and cushioning, not as heavy and controlling as maximum support running shoes, but still offer excellent support.
- **Support/Motion Control** - emphasizes medial support by having dual density midsoles, medial posts, roll bars or foot bridges. This medial support is designed to slow the rate of over-pronation.

Common Running Injuries

- LBP/Sciatica/Piriformis Syndrome
- Iliotibial Band Syndrome (ITBS)
- Plantar Fasciitis
- Runner's Knee (Patellofemoral Pain Syndrome - PFPS)
- Achilles Tendinopathy
- Shin Splints/Medial Tibial Stress Syndrome (MTSS)
Assessment of Running Injuries

Runner Groupings Based on Speed

- Common grouping of runners and walkers based on pace:
  - Recreational walker (>15 min/mi)
  - Power walker (12-15 min/mi)
  - Fitness runner (8-12 min/mi)
  - Competitive runner (6-8 min/mi)
  - Elite runner (<6 min/mi)

Individual History

- History of Present Illness (OPQRST)
- Outcome Assessment (LEFI)
- Affect on daily activity
- Goals for recovery
Chiropractic Assessment

- Pick your preferred way to assess joint motion and identify joint restrictions.

Orthopedic Tests

- Rule out red and yellow flag conditions
- Identify differential diagnoses
- Identify provocative tests for retesting after treatment
- Pick your favorites...

Gait Assessment

- Gait is as individual as a finger print
- Great insight into the patient’s condition
- Cause vs compensation
Walking Gait Assessment

Running Gait Assessment

Functional Movement Assessment

- Gain further insight into how the patient moves
- Identify muscle (group) imbalances
- Identify joint hyper-/hypo-mobility
Single Leg Stance

FAIL

6-Inch Step Down

FAIL

6-Inch Step Down

FAIL
Deep Squat Test

FAIL

What To Do If You “Fail” The Test?

“All human beings should be able and willing to participate, being the best they can, on themselves.” - Kelly Starrett

Treatment of Running Injuries
Use the right tool for the job!
Not everything is a nail...

Passive Care Treatments

- Chiropractic Manipulation
- Manual myofascial release
- IASTM
- Dry Needling
- KinesioTaping
- PNF/PIR

Physiologic Classification

- Structural Immobility: Joint/Osseous
  - FAI, femoral retroversion, etc

- Tissue Contracture
  - tendinopathy, contusion, DOMS, etc
Neurological Classification

- Functional
  - trigger points, not-pathological hypertonus

- Pathological: Spasticity & Rigidity
  - CNS - cord trauma, stroke, CP

Trigger points are neurological expressions of dysfunction.
Common LE TPs in Runners
Neurological Techniques vs Structural Techniques

- Post Isometric Relaxation (PIR)
- Ischemic Compression
- Reciprocal Release

Static Stretching
Active/Passive Myofascial Release
IASTM

Active Care Treatments

- Neuromuscular Stabilization
- Functional Rehab
- Corrective Exercises
- Gait Retraining
Postural Syndromes - Upper & Lower Cross Syndrome

- Result of long-term poor posture with symptoms typically starting over time

Common In:
- Static sitting or standing
- Repetitive motion

Stabilizing System of the Spine

- Diaphragm
- Abdominal Wall
- Pelvic Floor
- Multifidi
- Deep Neck Flexors

*The Integrated Stabilizing System of the Spine (ISSS)

Functional Stabilization

- Deep stabilizing muscles (ISSS) fire to provide a stable core for dynamic movement
  (*"Feed Forward Mechanism"*)
- Activation of these muscles during any movement is automatic or subconscious
- Essential for safe, purposeful movement as well as static loading
When ISSS is Compromised...

- If one muscle is dysfunctional, then the stabilizing system is compromised
- Compensatory mechanisms occur to provide some degree of stability
- Typically involve superficial muscle groups designed for movement (not stabilization)

When ISSS is Compromised...

- Overload of spinal joints and discs
- Chronic overuse of muscles and repetitive strain
- Imbalance in kinetic chain and decreased spinal stability
- Firing a cannon from a canoe...

Extension/Compression

- Extension/compression stabilization (ECSS)
- Can lead to low back pain
- How to shut off ECSS and activate deep core stabilizers:
  www.athlete-enhancement.com
Joint by Joint Approach

- Our joints are designed to perform certain movements and function.
- In the kinetic chain, joints alter between mobility & stability.
- If one joint doesn’t perform its designated function, others compensate for it.

The Need for Balanced Movement

- “Restriction of motion in one part of the spine cause increased motion of another part of the spine.”
  - Nordin & Frankel, 1989
- “The segments that show the most degeneration are at the places of the spine where the most movement occurs.”
  - Sahrmann, 2002

Resetting Movement

- One approach is comparing a patient’s movement pattern with the developmental stabilization pattern.
Foundation of Movement

- Disorders of breathing have stronger association with back pain than obesity and physical activity
  - Smith et al, Aust J Physio 2006

Joint Centration

- Faulty breathing patterns develop subcortically
- Correction of faulty breathing pattern is integral to any rehabilitation program designed at correcting a faulty movement pattern
- Specific functional exercises improve spinal stability by activating the ISSS
- The brain must be properly stimulated and conditioned to retrain automatic activation of optimal movement patterns

3-month supine to Dead Bug

A great place to start!
Corrective Exercises

- Hip/Glute Strength
  - Very Important!
  - It’s Your Engine
- Core Strength
  - Stuart McGill - Big 3

Glute Exercises
- Fire Hydrants
- Monster Walks
- Side Plank Clam Shells

Big 3 Core Exercises
- Front Plank
- Side Plank
- Bird Dog
Self Treatments

- Stretch
- Foam Roll
- Self-Massage
- Correctives

Foam Rolling

- Thoracic Spine (Mid-Back)
- Glutes & Piriforms
- Quadriceps
- IT-Band
- Hamstrings
- Calves
Return to Activity

Gait Retraining

Form Running Drills

Return to Running

- Gradually load tissues
- Possibly a run/walk strategy
- Running is a repetitive trauma
- Keep the easy days easy and the hard days hard
Sources


