



# Running Mechanics

Evidence in literature shows relationship between running mechanics and running economy

A Mechanically efficient runner is more economical and research shows economy correlates to enhanced performance

Running Injury Rates		Common Injuries	
- Knee	25%	- Patella Femoral	32%
- Lower Leg	20%	- Shin Splints	17%
- Foot	16%	- Achilles Tendonitis	7%
- Ankle	15%	- Stress Fractures	7%
- Upper leg	10%	- Plantar Fascia	7%
- Back	7%	- ITBFS	7%
- Hip	7%	- Patella Tendonitis	6%

## Risk Factors

### Intrinsic

- Malalignment
- MS Imbalance
- Decreased Flexibility
- MS Weakness
- Gender

### Extrinsic

- Training errors – Volume/Intensity
- Unsuitable Foot ware
- Running Conditions

## Men vs Women

### Men

- Achilles Tendonitis
- Calf Injuries
- Patella Tendonitis
- Long Distance running per week > 40km/week

### Women

- PFJPS 2 x as likely as men
- ITBFS 2 x as likely as men
- Stress Fractures
- (Women are 3 x as likely to develop glutei med injuries compared to men)

## RUNNING ANALYSIS

### SAGITAL PLANE

#### LATERAL VIEW

Look at:	Foot Strike	Heel/Midfoot/Forefoot
	Stride length	Equal R to L
	Foot position under body	Foot under COG/ In front of COG
	Knee Displacement on contact to mid stance	Min/Mod/Max
	Posture	Forward lean (5-8°)/Upright/backwards
	Upper Body rotation	Min/Mod/Max
	Degree of vertical displacement vs. horizontal	

## CORONAL AND TRANSVERSE VIEW

### POSTERIOR

Look at:	Heel strike to Mid Stance	Neutral/Pronated/Everted – Orthotics!
	Knee Valgus/Varus	Nil/Min/Mod/Max
	Hip Drop/Trendelenburg	Nil/Min/Mod/Max
	Heel recovery height	Equal/uneven R:L
	Heel IR/ER	Nil/Min/Mod/Max for IR and ER
	Pelvis	posterior/neutral/anterior tilt
	Trunk	Side Flexion Nil/Min/Mod/Max
		Rotation Nil/Min/Mod/Max
	Elbows	Close to body/sticking out/compare L:R

### ANTERIOR

Look at:	Toe to Heel	Too much sole/no sole
	Toe inline with Heel	Yes /NO min/mod/max ER/IR
	Foot Crossover	Nil/Min/Mod/Max
	Knee Valgus/Varus	Nil/Min/Mod/Max
	Hip/Knee IR/ER	Patella IR/ER
	Hip Drop/Trendelenburg	Nil/Min/Mod/Max
	Trunk Rot/Shoulders	Nil/Min/Mod/Max
	Trunk SF	Nil/Min/Mod/Max
	Elbows	Close to body/sticking out

# PERSONAL TRAINING RELATED RESEARCH

## STRENGTH TRAINING

- Research has shown significant improvements in running performance with heavy weights sessions.
- Running efficiency has also been shown to be improved through plyometrics

## FLEXIBILITY

- Being too flexible has been shown to negatively effect running.
- Less flexibility means less work for stability and more elastic energy return from stiffer muscles.
- Aim for balance - front to back, left to right

# KEY CONCEPTS FOR EFFICIENT RUNNING

## MODIFYING ONE BODY PART CAN CAUSE SIGNIFICANT CHANGES TO GROSS MOTOR FUNCTION

### CONTACT POINT

- Most efficient with placement of foot as close as possible underneath Centre of Gravity
- An extended leg too far in front of the body causes an increased braking effect
- Can result in additional stress to adductor and hamstring muscles
- Causes the knee and foot to collapse faster
- Increases ground reaction impact forces.

### MIDFOOT vs. HEEL STRIKE vs. FOREFOOT

- Aim is for mid foot over heel strike. This reduces ground reaction impact forces. Body weight Load dispersed over a larger surface area with mid foot than heel strike.

### NO EXCESSIVE PUSH OFF

- Causes excessive plantarflexion and vertical oscillation

### MINIMAL BODY/TRUNK/ARM ROTATION

- Excessive UL movement can interrupt normal swing phase and upset balance of the lower limb
- Greater hip IR at heel strike increases eccentric work in transverse plane

## **BIGGEST RISK FACTORS**

### **KNEE ABDUCTION**

Patients who develop knee pain have significantly higher knee abduction than asymptomatic patients and patients whom remain uninjured.

### **PELVIC ANTERIOR TILT**

Increased anterior tilt displacement during running is related to injury.

### **HIP ABDUCTION**

Women exhibit greater peak hip adduction

Greater hip angle

Women are x2 as likely to develop knee pain compared to men

Women are x3 as likely to develop glute med injuries to men

### **OVERPRONATION**

Overpronation together with above have been shown to have links with injury. This may be related to problems with incorrect foot ware and altered biomechanics at the foot all the way up to the hip.

**IF ANY OF YOUR CLIENTS HAVE PAIN AND/OR SHOW ANY OF THE ABOVE WHILST  
RUNNING, PLEASE REFER THEM TO US IMMEDIATELY FOR A FREE 10 MINUTE  
ASSESSMENT**