What distance runners can learn from sprinters

“It’s at the borders of pain and suffering that the men are separated from the boys” – Emil Zatopek

Sprint Mechanics

F = ma
FΔt = mΔv

Running at 1:00 min/ml

Sprint Mechanics

“The maximal horizontal velocity that a sprinter can produce is dependent upon the amount of effective vertical force that the athlete can apply during ground contact.” – Ralph Mann

For sprinting, the goal is to increase force through strength or efficiency

Sprint Mechanics

Speed = Stride Rate x Stride Length

Sprint Mechanics

Stride Rate

Stride Length

Ground Time

Stride Rate (steps/s)
Sprint Mechanics

The way to increase **maximum** sprinting speed is to minimize ground contact time without decreasing air time.

Distance Mechanics

**Vicon Movie of 5 Speeds**

Distance Mechanics

**Stride Rate**

Distance Mechanics

**Stride Length**

Distance Mechanics

**Ground Time**

Distance Mechanics

**Men**
Ground Time as a Result of Speed

Championship Pace

Leg Stiffness

Stiffness = Force/displacement

What determines leg stiffness?

• Bone
• Muscle
• Tendon
• Other Tissues
**Leg Stiffness**

Stiffness = Force/displacement

![Graph showing stiffness vs. speed for 2008 Olympic Trials Men's 5k](image)

**Plyometrics**


**Moving into the Top 3**

- ↑ Running Speed
- ↓ Ground Time
- ↑ Power
- ↑ Energy Cost
- Optimal Training

**Distance Mechanics**

<table>
<thead>
<tr>
<th>Athlete</th>
<th>Lagat</th>
<th>Jennings</th>
<th>Manzano</th>
<th>Lukezic</th>
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</thead>
<tbody>
<tr>
<td>Stride length (m)</td>
<td>4.00</td>
<td>3.57</td>
<td>3.70</td>
<td>4.08</td>
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</tbody>
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**The Future**

![Image of children participating in a race](image)