Biomechanics of Running: From footwear to form

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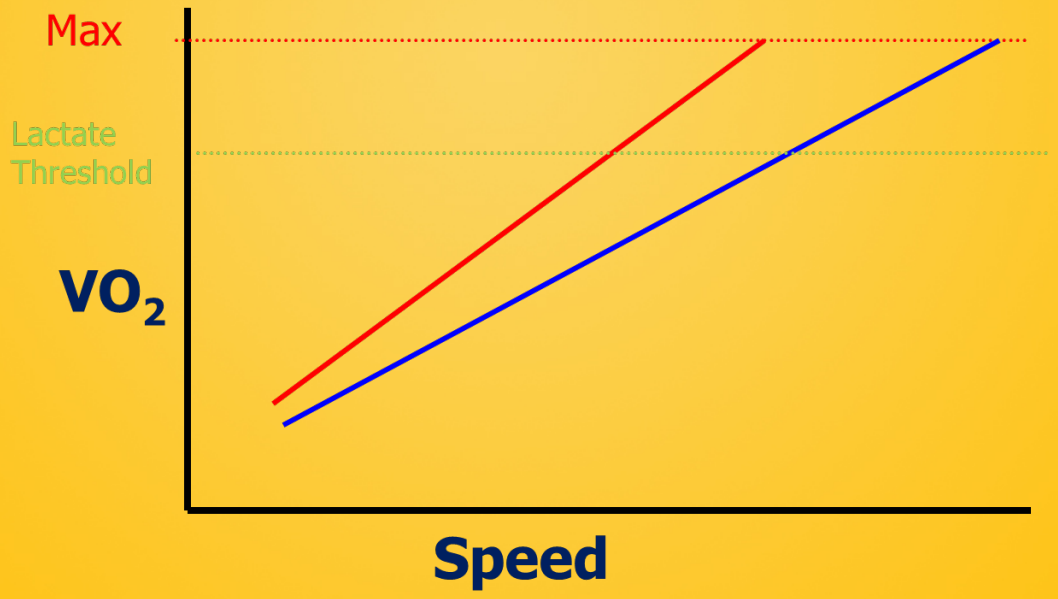
Why are footwear and form important?

- Running Performance
- Injury Risk

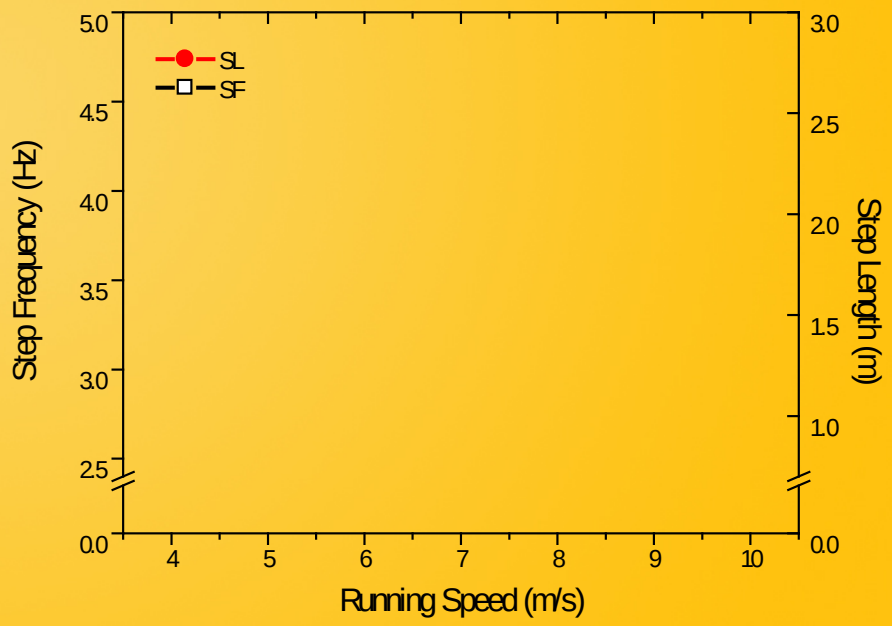
Performance

Running velocity at lactate threshold is most important!



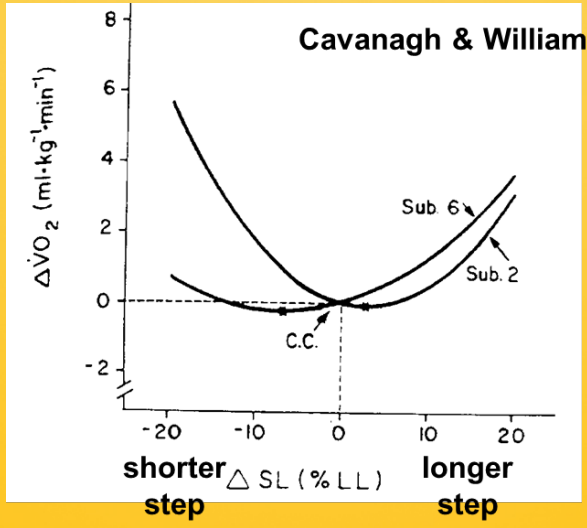
Two ways to change running speed…

- Increase Stride length
- Increase Stride rate
  - ~150 steps/minute at jogging pace



Is there an optimum SL/SR combination?

- Yes, but it is based on a number of factors individualized to the runner



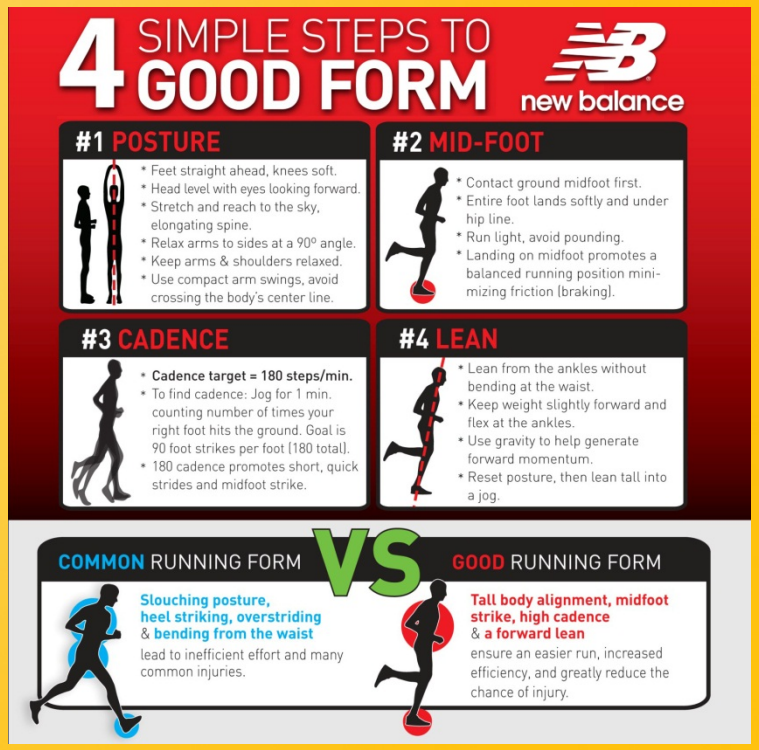
What is good running form?

- Not good…
  - http://www.youtube.com/watch?v=rfaztVg4kaA
- Good…
  - http://www.youtube.com/watch?v=9jJ7bWJfp64

Should I change my running style?

- "Good Form Running"?
- "Chi Running"?
- "POSE Running"?

- NO evidence of better economy or reduced injury risk



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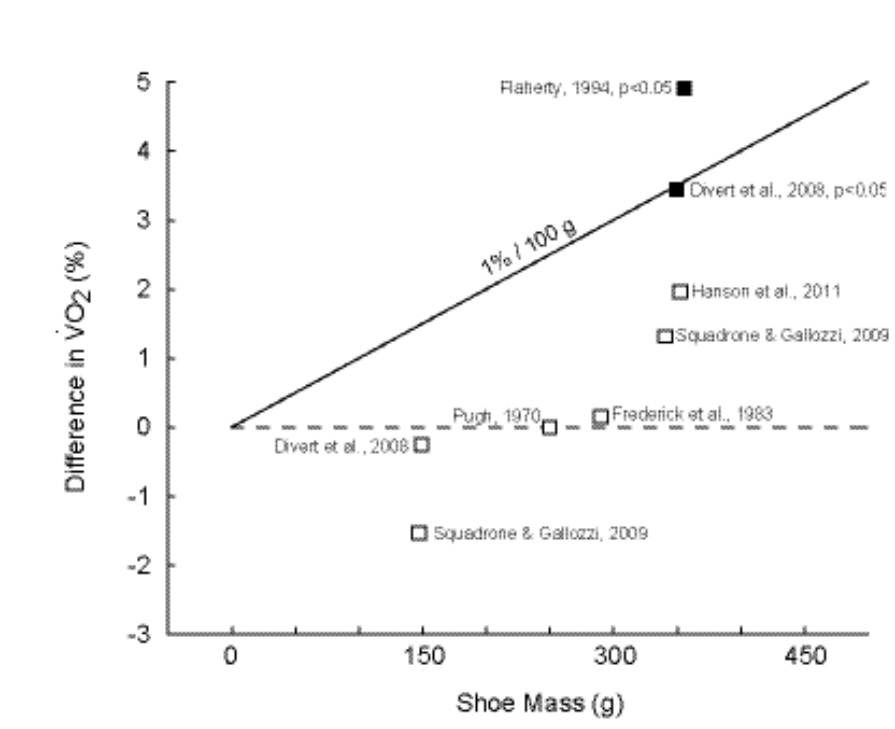
Some basic running tips

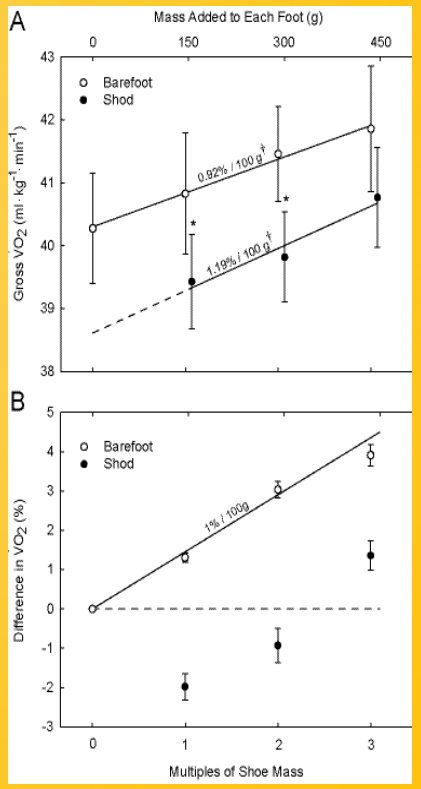
- Slight forward lean is okay (10-13°)
- Avoid excessive vertical oscillation
  - More oscillation relates to greater metabolic cost
- Avoid under- and over-striding…
  - Weak or no relationship between SL and leg length (height)
- Ignore advice in popular literature to dramatically change your running style!

Shoe weight affects energy cost



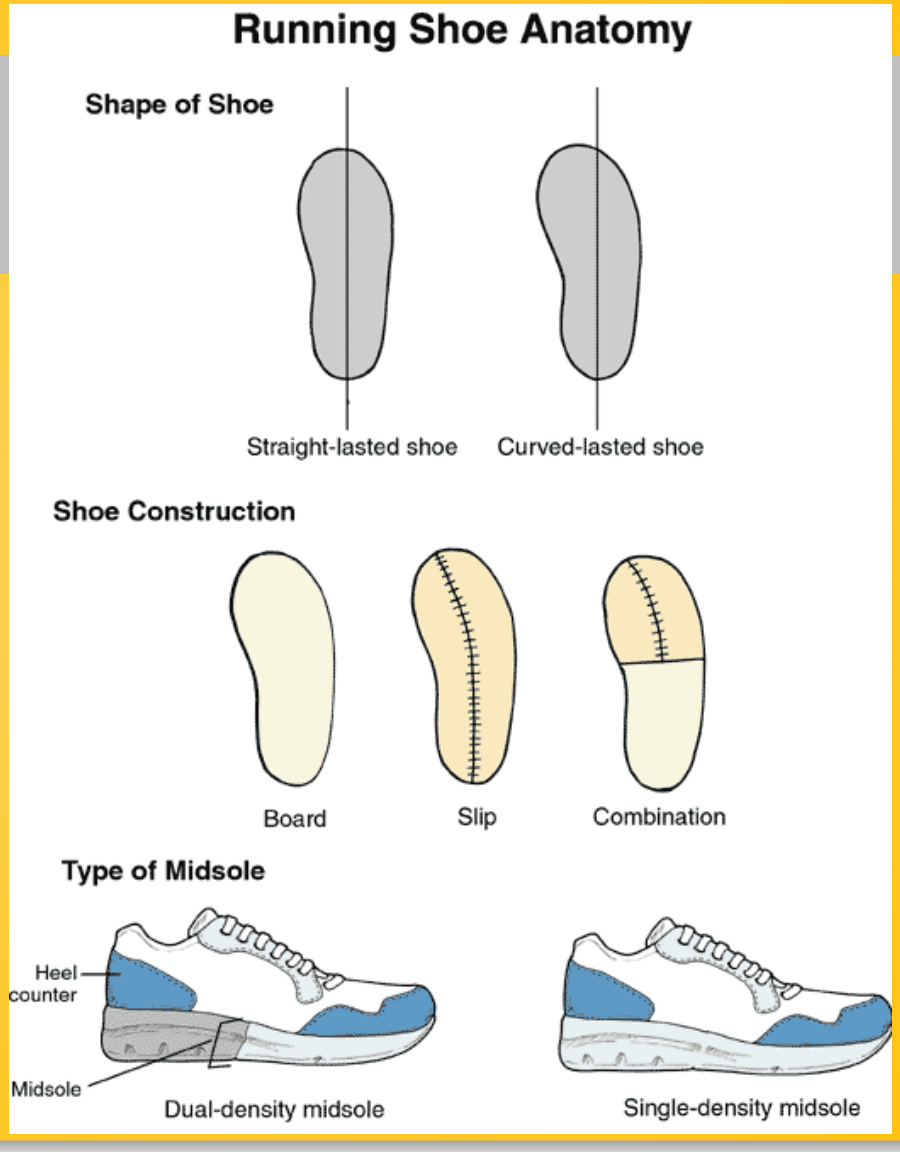
- However, running barefoot may cost more energy than wearing shoes

Franz et al. (2012)



Injury: What is the role of the shoe?

- Cushioning
- Support
- Both



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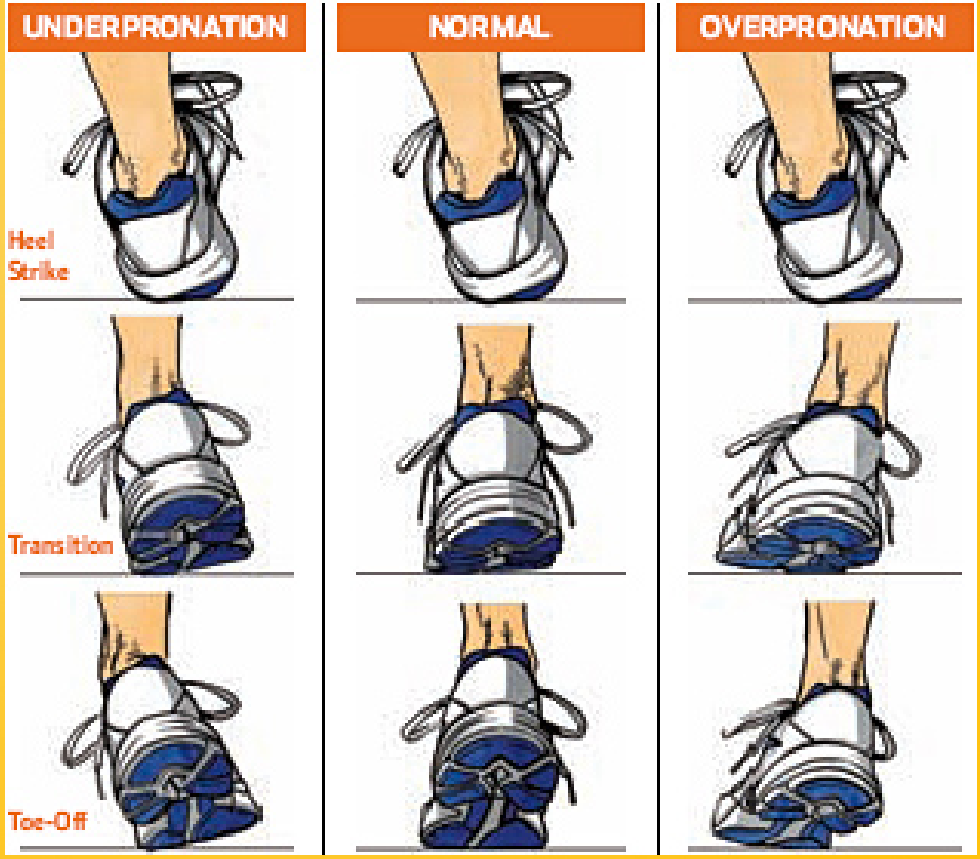
Shoe Construction

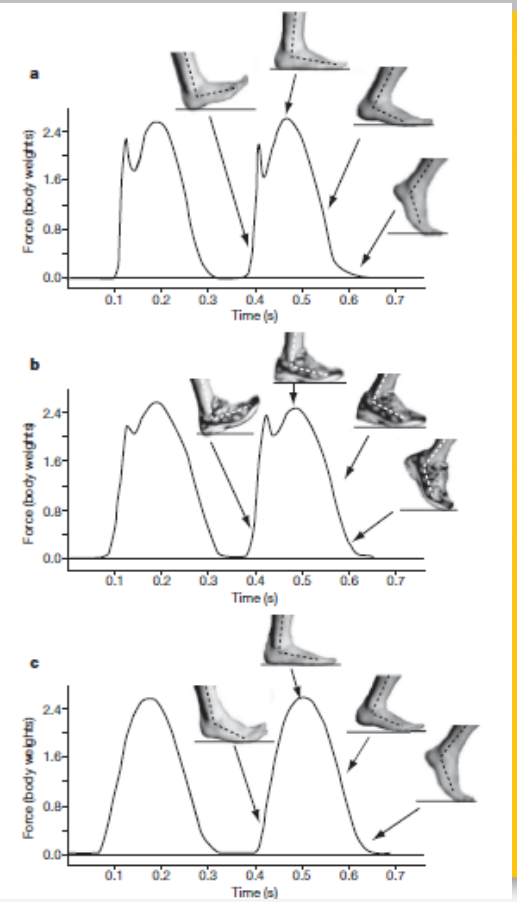
- Each company has its own cushioning/stability technology
  - Air, Grid, Gel, etc.
- Each company uses its own last (shape)
  - Try them all on!
  - Within a category of shoe, buy the shoe that is most comfortable.

Support


UNDERPRONATION
NORMAL
OVERPRONATION
Heel Strike
Transition
Toe-Off

Cushioning

- Heel Contact – No shoes
- Heel Contact – Shod
- Forefoot contact



Traditional Prescription

Static/Dynamic Factors	Recommended Shoe Category
• Flat foot/ “overpronator”; flexible foot	• Stability (+) --- Motion Control
• Neutral foot	• Cushioned/Neutral --- Stability
• High-arched foot/ “supinator”; rigid foot	• Cushioned/Neutral

Further Consideration

- What is the current footwear?
- What are the structural influences?
  - Static
  - Dynamic
  - Anthropometric
- How will the shoes be used?
  - Volume
  - Intensity
  - Goals

Training Programs

- The 10% Rule
  - Avoid increasing weekly mileage >10% of the previous week's total
- Mileage progression
  - Training mileage plateaus should be built into the program