



Biomechanics Builds Better Bodies

Agenda

- A Better Body....Really?
- The Pedal Stroke
- Biomechanics / Speed Ride
- Q&A

A red circular graphic is on the left side of the slide.

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A Better Body

When a rider does not take the time to focus on proper form and pedal stroke technique, they can place themselves at risk:

- Over-use / Repetitive Injuries
- Muscle Strain (Upper and Lower Body)
- Excessive Joint Stress

A red circular graphic is on the left side of the slide.

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A Better Body

When a rider does not take the time to focus on proper form and pedal stroke technique, they can forfeit many of the benefits received from cycling due to:

- Fighting their own mechanics
- Wasting Fuel & Oxygen
- Muscle Imbalance
- Poor Postural Alignment

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Bike Fit

- Although this is out of the scope of this presentation, proper bike fit or setup is the first step in developing solid biomechanics.
- If the rider is not setup correctly, the resulting posture and joint articulation may hinder their ability to engage the desired muscles.

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IMPORTANT!

- During the course of a 60-minute indoor cycling class or outdoor ride, it is not uncommon to pedal 10,000 rotations
- Make sure you (and your riders) are setup properly so these 10,000 rotations are building your fitness and not destroying your joints

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The Pedal Stroke Muscles and Technique



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Ankling


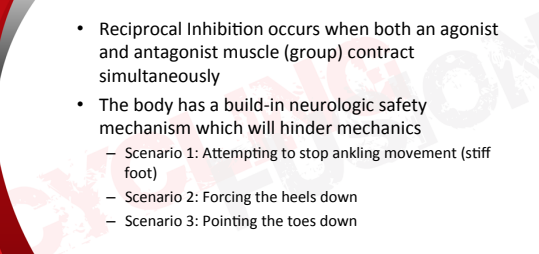
- The foot should be a “firm” but **not** a “stiff” lever
- A natural ankling movement



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Reciprocal Inhibition

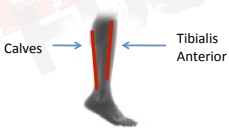
- Reciprocal Inhibition occurs when both an agonist and antagonist muscle (group) contract simultaneously
- The body has a build-in neurologic safety mechanism which will hinder mechanics
 - Scenario 1: Attempting to stop ankling movement (stiff foot)
 - Scenario 2: Forcing the heels down
 - Scenario 3: Pointing the toes down
- Which muscles are being activated?




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Reciprocal Inhibition (Cont.)

- Both the calves and tibialis anterior contract, fighting each other
- The gastrocnemius (muscle of the calf) crosses the back of the knee joint. When contracted (voluntarily), hinders the movement (speed) of the leg.



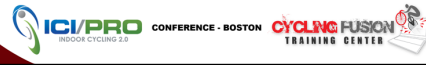

Calves Tibialis Anterior



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The Up-Stroke

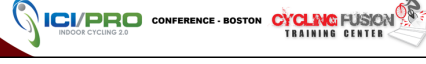
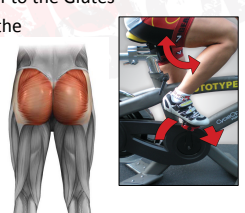
- The Up-Stroke engages the hip flexors (Iliacus, Psoas Major and Minor, Rectus Femoris)
- The Rectus Femoris is both a hip flexor and knee extensor because it crosses both the hip and knee joints.



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Top of the Stroke?

- The top of the stroke is more a transition from upstroke to down stroke
- Hip Flexors handing off to the Glutes
- Glutes handing off to the Quads



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The Down-Stroke



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The Down-stroke

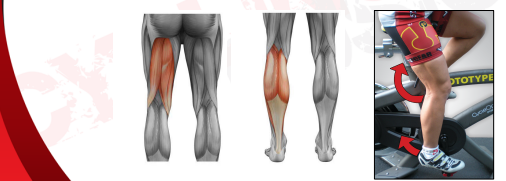
- The down-stroke starts with the Glutes firing at the top (extending the hips)
- **NOTE:** The Hamstrings (hip extensors) do not have a mechanical advantage at Top Dead Center (12 o'clock)
- **NOTE:** The Quads (leg extension) do not have a mechanical advantage at 12 o'clock
- If the upstroke is not emphasized (and trained), Glute engagement is hindered
- Think of the **up-stroke** as pulling the hammer back on a gun which loads (stretches) the Glute muscle fibers to fire the **down-stroke**.

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The Bottom of the Stroke

- Pulling back at the bottom of the stroke engages the hamstrings, and to a lesser extent, the calves (stabilizers)
- Transition from the **Down-Stroke** to the **Up-Stroke**



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Misconception / Confusion

"EFFICIENCY"
Theory: There is no difference in the metabolic cost of either only pushing down on the pedals (piston-style) or circular pedaling.

From what we know: Yes, sort of...

Thought: Regardless of whether one uses 100% of 1 muscle groups or 50%-30%-20% of 3 muscle groups, the total is still 100%

Additionally: Current studies on metabolic cost have not taken the mechanical cost / muscle fatigue into consideration




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Misconception / Confusion

"CIRCULAR PEDAL STROKE?"
Theory: Pedaling circles means one is using all of the muscles equally

NO. The size and strength of the muscles varies greatly. The strength of the hip flexors (up-stroke) generally does not equal the strength of the quadriceps (down-stroke)

Smooth Pedal Stroke
A smooth pedal stroke indicates that muscles are contributing to a "smooth transition" (maintaining velocity) between muscle groups.



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Misconception / Confusion

"Piston or Circular Pedaling?"
Theory: Based on the previous slide, pulling up is futile since we just said the hamstrings can't apply the same force as the quads. The best we can do is "un-weight" the back foot so as not to fight the quads.

INSERT "GRAVITY"
Wait a minute, we said "un-weight". How do you do that? We LIFT the leg. Holy.....!

Also, we don't begin pulling up at 6 o'clock (which is how many people explain it), we pull up closer to 10 o'clock after the quads have exceeded their mechanical advantage.

NOTE: These "lifting" and "pulling-up" muscles (hip flexors) need to be conditioned, hence the need for drills that focus on pedal stroke.



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Let's Ride!

Experience the Muscles at Work



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Q & A

Questions, Concerns &
Cries of Despair



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Thank You!

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