

MUSCLES AND INJURY.

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Eccentric exercise is:

- Using muscles as brakes,
- Active muscles trying to shorten but being forcibly extended.
- Load exceeding isometric capability.
- Absorbing energy, not delivering it.
- An important function of muscle.
- Present in some sports but not others.

Eccentric exercise produces:

- Delayed Onset Muscle Soreness,
- Other physiological changes.
- Adaptation, ie less soreness next time.
- Gross muscle tear in some cases.

Mechanism.

- Muscles generate tension by forming bonds between overlapping arrays of filaments.
- Muscle active tension decreases at long length.
- A series connection of such sarcomeres is “unstable”.

Hypothesis I: Stretching of active muscle at high speeds and at lengths beyond optimum does not involve uniform lengthening of sarcomeres, but more closely resembles “popping” of sarcomeres, one at a time, in order from weakest to strongest. This leads to damage.

Hypothesis II: Adaptation.

- Muscle grows more sarcomeres in series.
- This causes a greater optimum length.
- More sarcomeres for the same muscle length leads to shorter sarcomeres, avoids extension beyond optimum length, avoids non-uniformities and so damage.
- Down side is increased energy to generate force.

Hypothesis III: Injury.

- Muscle tear starts at weak point caused by non-uniformity.
- Hence training to prevent DOMS will also prevent injury.
- Successful training will be seen by a longer optimum.

Injury Projects.

- Testing footballers on Biodex to find optimum. Measure previously injured. Test effect of training
- Devise optimum training exercises.
- Measure activity with accelerometers in a shin guard.





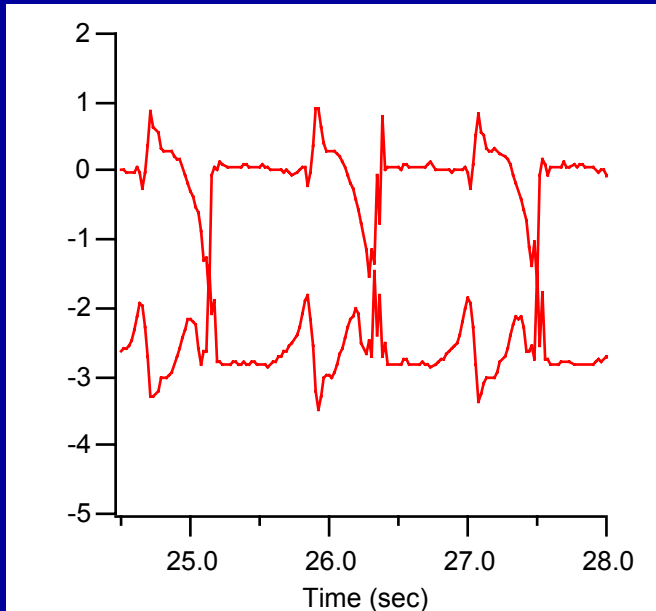


Toe walker Projects.

- Toe walkers walk with heels off the ground
- Muscles grow short.
- Can eccentric exercises make calf muscles grow longer?
- Equipment to monitor both toe-walking and exercise.



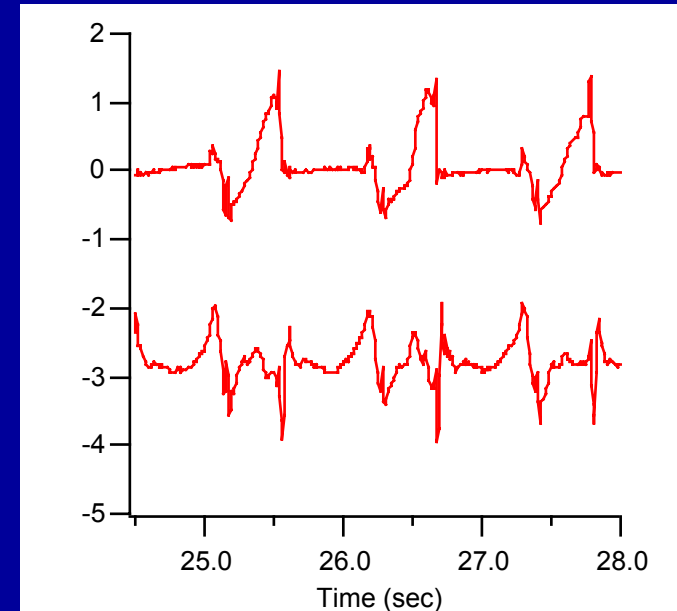
Heel strike



Horizontal

Vertical

Toe walking



Stimulation Project.

- Electrical stimulation of paraplegic muscle requires high rate to get smooth contraction.
- This causes fatigue.
- Can optimised distributed stimulation help?
- Working with NeoPraxis, an arm of Cochlear.

