Fatiguing Resistance Exercise Does Not Enhance Hamstring Muscle Cramping from Maximum Contraction in Shortened Position

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Disclosure: The contents presented herewith do not represent the views of the Department of Veterans Affairs or the US Government.
Prior Studies of EAMCs

• Observational

• Experimental
  - Electrically stimulated contractions
  - Voluntary contractions (1 Study)
General Conclusions

Incidence

Very common!

- 23% in Ironman triathlon (Schwellnus et al. 2011)
- 41% in 56-km ultramarathon (Schwellnus et al. 2011)
- 41% in 161-km ultramarathon (Hoffman et al. 2015)

Etiology

- Multifactorial
- Neuromuscular fatigue

Prevention/Treatment

- Proper training
- TRP channel receptor stimulation?
Ingredients include: salt, cinnamon, ginger and capsaicin.
Objective

• Develop a new technique for inducing skeletal muscle cramping to allow further studies on etiology, prevention and treatment

• Make use of observations that muscle cramping seems more common when the muscle is (1) fatigued (2) in a shortened position (3) recently contracted
Methods

• 15 healthy adults (12 with EAMC hx)

• Familiarization
  • fatiguing knee flexion resistance exercise
  • cramp induction technique

• Those with evidence of cramping (n=10) were examined twice before and 1 and 3 min after fatiguing exercise
Did you have a cramp?

• No
• No, but a near cramp
• Yes, an unsustained cramp
• Yes, a sustained cramp
The chart shows the force (N) in different fatigue conditions:

- Pre-Fatigue 1
- Pre-Fatigue 2
- Post-Fatigue 1
- Post-Fatigue 2

The force values are indicated as follows:

- Pre-Fatigue 1: 81%
- Pre-Fatigue 2: 89%
- Post-Fatigue 1: 81%
- Post-Fatigue 2: 89%

The bars represent the force with error bars indicating variability.
Overall effect p = .04

Sustained or Unsustained Cramping (%)

- Pre-Fatigue 1: 45%
- Pre-Fatigue 2: 10%
- Post-Fatigue 1: 20%
- Post-Fatigue 2: 15%
Conclusions

• The technique can induce cramping in some individuals…but

• Acute fatiguing resistance exercise causing ~10-20% reduction in maximal strength at the time of attempted cramp induction does not increase cramping…so

• The model does not appear specific for study of EAMC
Future Considerations

• Trial the technique after prolonged endurance exercise
• Examine the calf muscles