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Effects of Eccentric Exercise on Tendon Loading and Ankle Power During a Single-leg Heel Rise and Lowering Tank

Derek Palmer  
*George Fox University, dpalmer12@georgefox.edu*

Jordan Visser  
*George Fox University, jvisser@georgefox.edu*

Jason Beilstein  
*George Fox University, jbeilstein12@georgefox.edu*

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Effects of Eccentric Exercise on Tendon Loading and Ankle Power During a Single-leg Heel Rise and Lowering Task

Derek Palmer, SPT, Jordan Visser, SPT, Jason Bellstein, SPT, Tyler Cuddeford, PT, PhD

Background
- Documented injury rates among recreational runners range between 25-65%.
- Achilles tendon injuries are among the highest with the incidence in recreational and elite athletes ranging between 6% and 12%.
- Chronic mid-portion Achilles tendinosis is characterized by pain, localized thickening, and results in degeneration of the tendon and changes in collagen.
- The challenge to is that a significant number of patients (29%) with Achilles tendinopathy do not respond to conservative treatment and require surgical interventions.
- The current conservative treatment modality is an eccentric exercise program.
- Eccentric loading has better outcomes in strength and pain compared to control groups. However only 12 of the 22 in the experimental group rated themselves as fully recovered after 1 year follow-up.
- Although much of the literature favors eccentric exercises and suggests that eccentricities be an integral part of the conservative management, little is known about the mechanism behind this favorable effect.
- Current studies suggest that the benefits of eccentric exercises are due to microcirculatory changes around the tendon and tendon remodeling secondary to collagen changes.
- Current research also suggests that tendons need high mechanical loading to promote the healing process.
- Based on this information, it may be that one of the reasons nearly 50% of the patients do not fully recover is that physical therapists are not dosing appropriately (ie higher eccentric loads).

Purpose
1. Determine if participants can perform an eccentric single-leg lowering exercise at a dosage higher than their concentric maximum
2. Compare forces during unweighted running trial

Methods
- 13 subjects, 9 healthy and 4 with Achilles tendinopathy were weighed at the beginning of their session.
- Subjects then removed the weight and performed three running trials on the force plate.
- Once the subject’s concentric max was reached, more weight was added to achieve 140% of their single leg concentric max, and the trial was completed using the same pass/fail scoring system.
- Subjects then completed a VISA-A form.
- Subjects then completed the VISA-A form as well as a questionnaire regarding their activity and training habits.
- Subjects were asked to perform one double limb calf raise on a foam block to assess their max plantarfexion range of motion.
- If the subject was not able to eccentrically lower themselves their weight was reduced so that they had 125% of their concentric max, and the trial was completed using the same pass/fail scoring system.
- Subjects then removed the weight and performed three running trials on the force plate.

Results/Discussion
- Achilles tendinopathy group demonstrated 8% lower concentric max than normal group during single leg heel raise.
- More importantly Achilles group demonstrated 29% lower eccentric max than normal group during single leg lower task.
- Regardless of this difference, both groups were able to tolerate significantly greater tendon loads than in any previously known study.
- Normal Group was able to concentrically lift 157% of body weight as well as eccentrically lift 218% of body weight.
- Achilles Tendinopathy Group was able to concentrically lift 149% of body weight as well as eccentrically lift 192% of body weight.
- Peak moments around the ankle joint are similar between max single leg eccentric lowering task and unweighted running trial.