



# How to address Achilles tendinopathy when usual first line treatment fails?

## Heavy slow resistance versus eccentric training

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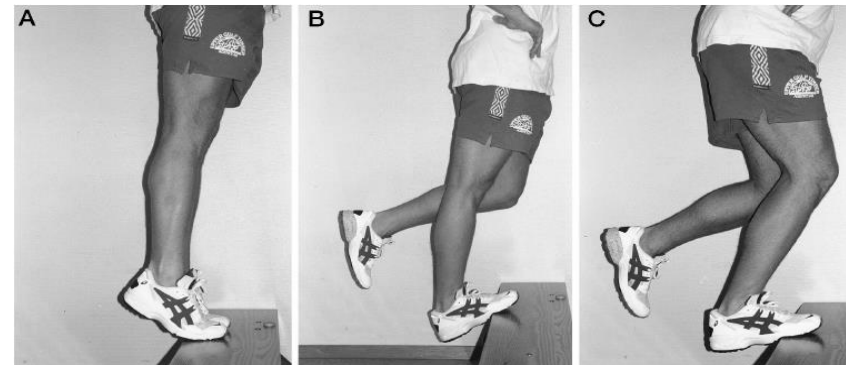
## HSR versus ECC training as treatment of Achilles tendinopathy

Eccentric training has become the dominant conservative choice of treatment for Achilles tendinopathy

(Mafi et al. 2001, Ohberg et al. 2004, Maillaras et al. 2013, Habets et al. 2014)

Achilles tendinopathy remains a clinical challenge to manage successfully, as many as 45 % may not respond to the ECC training regime.

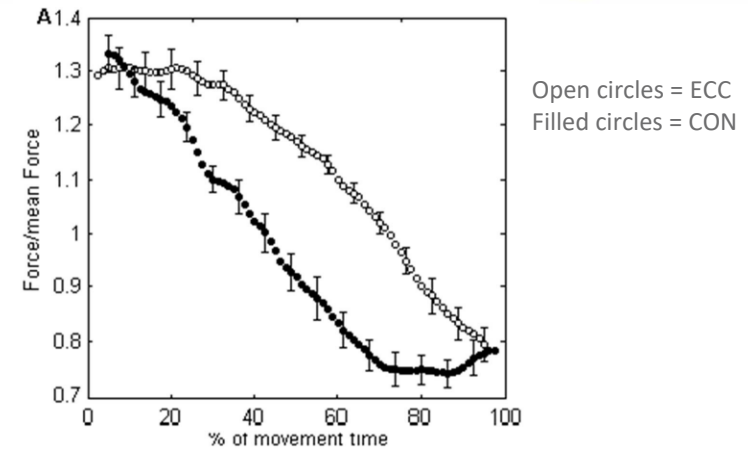
(Sayana et al. 2007)



|            |   |
|------------|---|
| Exercise   | Two types of excersis<br>3 set of 15 repetitons |
| Load       | 15 – 20 RM                                      |
| How often? | Twice a day<br>7 days a week<br>for 12 weeks    |

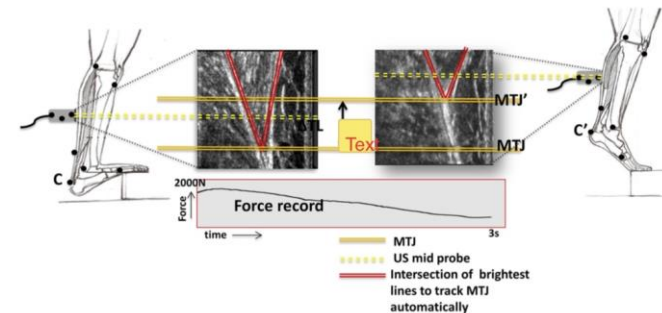
## Key components: load magnitude, time under tension and restitution

- Tendon tissue can not discriminate between eccentric or concentric muscle contraction



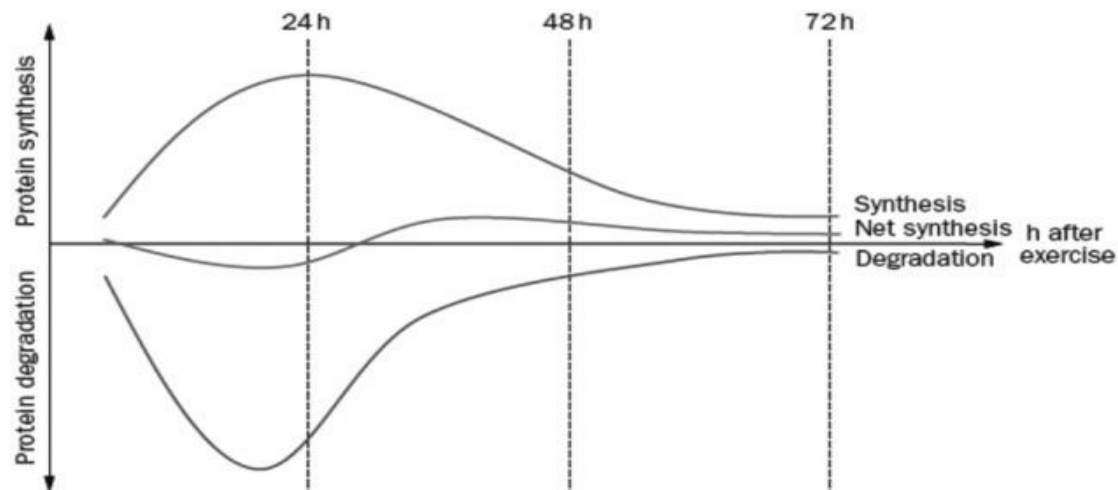
Chaudhry, S. et al. *J.applied Biomech* 2015

- Tendon tissue is affected by load magnitude and 'time under tension'



## Key components: time under tension and restitution

### Tendon protein turnover after exercise



Magnusson, S. P. *et al. Nat. Rev. Rheumatol.* 6, 262–268 (2010)

## HSR versus ECC training as treatment of Achilles tendinopathy

|                    |  |
|--------------------|--|
| Exercise program   | 3 types of exercises<br>Soleus and Gastrocnemius       |
| Load               | 15 RM to 6 RM<br>3-4 sets                              |
| Time under tension | 6 sec (3 sec + 3 sec)                                  |
| Restitution        | 72 hours restitution between sessions (2.5 times/week) |
| How long?          | 12 weeks   |

| Week | Sets and repetitions. |
|------|-----------------------|
| 1    | 3x15                  |
| 2-3  | 3x12                  |
| 4-5  | 3x10                  |
| 6-8  | 4x8                   |
| 9-12 | 4x6                   |



# Heavy Slow Resistance Versus Eccentric Training as Treatment for Achilles Tendinopathy

## A Randomized Controlled Trial

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*Investigation performed at Bispebjerg Hospital, Copenhagen, Denmark, and Faculty of Health  
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## Central instructions for patients with Achilles tendinopathy

- All patients must document every training session in a standardised training diary
- Supervised session 1 week after intervention start
- Pain are allowed to reach 40 to 50 mm VAS during the exercises
- Pain should have subsided the following training session
- If pain had not subsided, adjust:
  - training load
  - daily living activities
  - sporting activities was adjusted
- No sporting activities in the initial 3 weeks of the intervention
- No sporting activities throughout the intervention period with pain exceeding 30 mm VAS
- No NSAID's throughout the intervention



## Training diary for ECC

| Træningsdag #1               |            | Dato _____ |           |                        |             |
|------------------------------|------------|------------|-----------|------------------------|-------------|
| Ovelse                       | Set & Reps | Morgen (✓) | Aften (✓) | Ekstra belastning (kg) | Kommentarer |
| Hæl-sænkning på strakt ben.  | 3 x 15     |            |           |                        |             |
| Hæl-sænkning med bøjet knæl) | 3 x 15     |            |           |                        |             |

| Træningsdag #2               |            | Dato _____ |           |                        |             |
|------------------------------|------------|------------|-----------|------------------------|-------------|
| Ovelse                       | Set & Reps | Morgen (✓) | Aften (✓) | Ekstra belastning (kg) | Kommentarer |
| Hæl-sænkning på strakt ben.  | 3 x 15     |            |           |                        |             |
| Hæl-sænkning med bøjet knæl) | 3 x 15     |            |           |                        |             |

| Træningsdag #3               |            | Dato _____ |           |                        |             |
|------------------------------|------------|------------|-----------|------------------------|-------------|
| Ovelse                       | Set & Reps | Morgen (✓) | Aften (✓) | Ekstra belastning (kg) | Kommentarer |
| Hæl-sænkning på strakt ben.  | 3 x 15     |            |           |                        |             |
| Hæl-sænkning med bøjet knæl) | 3 x 15     |            |           |                        |             |



## Training diary for HSR

| Træningsgang nr: 1             |            | Dato _____    |             |
|--------------------------------|------------|---------------|-------------|
| Ovelse                         | Set & Reps | Belastning kg | Kommentarer |
| Læg-pres i Benpresmaskine.     | 3 x 15     |               |             |
| Hæl-loft (siddende el stående) | 3 x 15     |               |             |
| Hæl-loft m. stang              | 3 x 15     |               |             |

| Træningsgang nr: 2             |            | Dato _____    |             |
|--------------------------------|------------|---------------|-------------|
| Ovelse                         | Set & Reps | Belastning kg | Kommentarer |
| Læg-pres i Benpresmaskine.     | 3 x 15     |               |             |
| Hæl-loft (siddende el stående) | 3 x 15     |               |             |
| Hæl-loft m. stang              | 3 x 15     |               |             |

| Træningsgang nr: 3             |            | Dato _____    |             |
|--------------------------------|------------|---------------|-------------|
| Ovelse                         | Set & Reps | Belastning kg | Kommentarer |
| Læg-pres i Benpresmaskine.     | 3 x 15     |               |             |
| Hæl-loft (siddende el stående) | 3 x 15     |               |             |
| Hæl-loft m. stang              | 3 x 15     |               |             |

## HSR versus ECC training as treatment of Achilles tendinopathy. A randomized controlled trial.

### Results

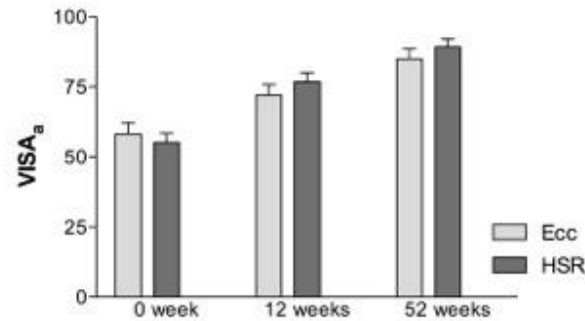


Figure 1

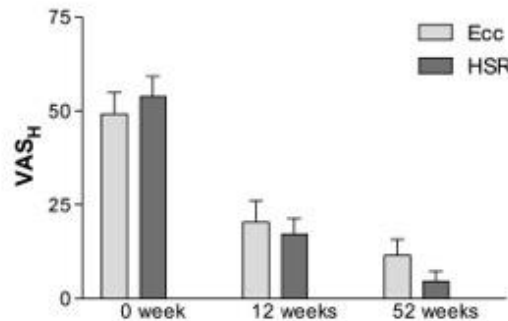


Figure 2

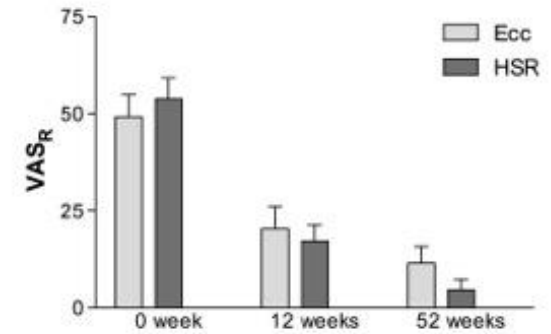


Figure 3

VISA-A, VAS<sub>H</sub> and VAS<sub>R</sub> score at baseline (0 weeks), after treatment intervention (12 weeks) and at one year follow-up (52 weeks) for the two intervention groups. Values are means  $\pm$  SEM.

For VISA-A, VAS<sub>H</sub> and VAS<sub>R</sub> there was a significant effect of time ( $P < 0.0001$ )

# HSR versus ECC training as treatment of Achilles tendinopathy. A randomized controlled trial.

## Results

|                                     | ECC        | HSR        |
|-------------------------------------|------------|------------|
| Treatment satisfaction 12 wk        | 80 %       | 100 % *    |
| Treatment satisfaction 52 wk        | 76 %       | 96 %       |
| Training session compliance         | 78 %       | 92 % *     |
| Time spend to complete the training | 308 min/wk | 107 min/wk |

Values are presented as means.

\* Significant difference between groups  $P < .05$

## Heavy slow resistance training versus eccentric training as treatment for Achilles tendinopathy. A randomized controlled trial.

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### Results

Both groups showed significant ( $p < .0001$ ) improvements in VISA-A and VISA-T from 0 to 12 weeks, and these improvements were maintained at 52-week follow-up. Concomitant with the clinical improvement there was a significant reduction in tendon thickness and neovascularization. None of these robust clinical and structural improvements differed between the ECC and HSR groups. However, patient satisfaction tended to be greater after 12 weeks with HSR (100%) than ECC (80%) ( $P=0.002$ ), as well as after 52 weeks (HSR 96%, ECC 76%) ( $P=0.10$ ).

**Figure 1-5**  
VISA-A, VISA-T, A-P thickness and Color Doppler traction score at baseline (0 weeks), after 12 weeks (12 weeks), and at 52-week follow-up (52 weeks) for the two intervention groups. Values are means  $\pm$  SD.

### Introduction

Previous studies have shown that eccentric training has a positive effect on Achilles tendinopathy, but few randomized controlled trials have compared it to other loading-based treatment regimens. The purpose is to evaluate the effectiveness of eccentric training (ECC) and heavy slow resistance training (HSR) in patients with mid-portion Achilles tendinopathy. The study design is a randomized controlled trial.

### Material and Methods

Fifty-eight patients with chronic ( $> 3$  months) mid-portion Achilles tendinopathy were randomized to ECC or HSR training for 12 weeks. Function and symptoms (Victorian Institute of Sports Assessment: VISA-A), tendon pain during activity (VISA-T), tendon swelling, tendon neovascularization and treatment satisfaction were assessed at 0 weeks, 12 weeks and at follow-up at 52 weeks. Analyses were performed on intention-to-treat basis.

### Exercises, Heavy slow resistance training



### Conclusion

The result of this study show that both the traditional eccentric training (ECC) and heavy slow resistance training (HSR) yields positive and equal good lasting clinical result in patients with Achilles tendinopathy, and that the latter tends to be associated with greater patient satisfaction.

### Contact information

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## How to address Achilles tendinopathy when the usual first line treatment fails?

### Take home message

- Both the ECC and HSR are equally good
- Tendon tissue do not distinguish between ECC and CON muscle contractions
- '*Load*' is a key factor
- '*Time under tension*' is a key factor
- The optimal restitution length for Achilles tendinopathy is still unknown
- HSR is not that time consuming as ECC  
(107 min/week = 308 min/week)
- HSR has a higher compliance compared to ECC

