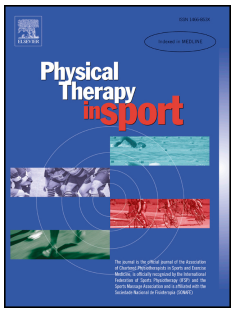
Accepted Manuscript



Understanding mechanisms to improve exercise interventions in tendinopathy

Peter Malliaras

PII: S1466-853X(16)30246-2

DOI: 10.1016/j.ptsp.2016.12.006

Reference: YPTSP 795

To appear in: *Physical Therapy in Sport*

Accepted Date: 10 December 2016

Please cite this article as: Malliaras, P., Understanding mechanisms to improve exercise interventions in tendinopathy, *Physical Therapy in Sports* (2017), doi: 10.1016/j.ptsp.2016.12.006.

Understanding mechanisms to improve exercise interventions in tendinopathy

There is a significant body of evidence supporting exercise interventions in the management of tendinopathy. Exercise has been described as the most evidence based intervention; this may be partly because it is also one of the most studied. Certainly exercise is not a panacea. Reported success rates from comparable exercise programs in Achilles tendinopathy vary from 56% to 94% (Alfredson, Pietilä et al. 1998, Sayana and Maffulli 2007).

A clear narrative from the current literature is the lack of differential response when comparing exercise interventions. This editorial will focus on Achilles and patellar tendinopathy given they have been extensively investigated. A recent review of Achilles and patellar tendinopathy loading protocols found at least equivalent evidence for the popular Alfredson protocol that isolates the eccentric component and other protocols that utilise concentric-eccentric muscle actions (Malliaras, Barton et al. 2013). Two recent high quality trials have compared heavy slow resistance (HSR, heavy load gym based exercise performed 3x/week) with Alfredson eccentric protocol (lower load isolated eccentric exercise performed 2x/day) both in the Achilles (Beyer, Kongsgaard et al. 2015) and patellar tendinopathy (Kongsgaard, Kovanen et al. 2009). There were no differences in self-reported pain and function at any outcome time (up to 6 months for the patellar and 12 months for the Achilles study). Patient satisfaction was significantly greater in the HSR versus the eccentric group in the patellar tendinopathy study and authors suggest this may be explained by the lower exercise frequency. Rathleff et al. (Rathleff, Mølgaard et al. 2015) compared HSR and stretching in plantar fasciopathy and although self-reported pain and function were superior at 3 months in the HSR group, there were no differences at 6 and 12 months.

It appears that vastly different loading interventions produce similar clinical outcomes in the longer term. Sound familiar? A Cochrane review recently concluded no additional benefit of specific motor control exercise versus other general exercise in low back pain (Saragiotto, Maher et al. 2016). One hypothesis is that exercise interventions are simply increasing tolerance to exercise and load. Narrative reviews of exercise mechanisms in tendinopathy focus on muscle and tendon mechanisms (Allison and Purdam 2009, O'Neill, Watson et al. 2015), but muscle dysfunction (Silbernagel, Thomeé et al. 2007) and tendon pathology (Drew, Smith et al. 2012) may remain even after resolution of symptoms. Non-tissue mechanisms such as reduced fear and increased self-efficacy need to be explored further in the tendinopathy literature. They may help to explain variability in individual and inter-study exercise response to exercise, along with other obvious factors such as disease severity and demographic factors.

We must not, however, abandon tissue mechanisms until we know more about the dose-response relationship. Time under tension and load intensity are key factors for both muscle (Roig, O'Brien et al. 2008) and tendon adaptation (Bohm, Mersmann et al. 2015), yet they are either not reported or not monitored in most tendinopathy exercise studies (Malliaras, Barton et al. 2013), and the same is true for adherence to exercise (Habets and Cingel 2015). In the aforementioned HSR vs eccentric studies, it is therefore impossible to ascertain whether load intensity was in fact higher in the HSR arm, as would be expected. Do specific