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Title: Cognitive and contextual factors to optimise clinical outcomes in tendinopathy

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Tendinopathy, a clinical term used to describe 'tendon-related pain', is a heterogeneous clinical presentation, reflected by the wide ranging pain presentations and functional deficits.[1] For this population, load-based exercise is effective; however, the 'optimal' type of exercise, intensity, frequency and duration are not known.[2,3]

Substantial variety has been a feature of the exercise prescription used in tendinopathy research to date. However, this variation does not appear to have impacted the results. Exercise programmes as different as a concentric-eccentric heavy slow loading programme performed three times per week and eccentric only exercises performed twice daily, seven days per week have achieved similar results.[4] Whilst within-group mean severity scores improve, individual responses are wide ranging for the same exercise programme[4] and success rates vary from 44% failing to improve[5] to 100% success[6] for a similar exercise intervention.

Here we discuss a novel consideration to explain such phenomena - cognitive and contextual factors that affect each individual therapeutic encounter. We acknowledge that heterogeneity in the research cohorts (e.g. age, sex, chronicity, co-morbidities) or variations in how the exercise programme was delivered and progressed likely play a role, but we focus on factors we feel have received little attention.

Psychosocial Impact

Beliefs and fears have received little attention in current tendinopathy management models. Working alliance and self-efficacy are both associated with adherence behaviours and rehabilitation outcome,[7,8] yet measures of these factors are largely absent from the tendinopathy research to date.

Working Alliance

Working alliance is defined as the positive social connection between the patient and the therapist. A person-centred interaction style, related to the provision of emotional support and allowing patient involvement in the consultation processes develops working alliance[9]; this underscores the importance of the clinician recognising the patient's physical and emotional needs. To facilitate this, clinicians should practice skills such as active listening, paraphrasing and inviting the patient's opinion; consider initially avoiding interruptions, allowing the patient to tell their story. Within this interaction the clinician can monitor the patient's self-efficacy indicators via questioning to establish efficacy expectations and outcome expectations. Questions aimed at understanding the patient's experience with rehabilitation, hopes for the future and the expected role of exercise have been highlighted.[10]

Efficacy Expectations

We refer to efficacy expectations as the patient's beliefs about his or her ability to perform the rehabilitation tasks, and to maintain control, engagement and persistence when faced with adversity. As such, efficacy expectations are key determinants of whether the rehabilitation tasks reach their desired outcome and due

consideration must therefore be given to the dosage, levels of pain reproduced and complexity of exercises; what may be considered best for tissue, may not be optimal in terms of efficacy expectations. For example, simple, resistance exercises, completed one at a time may appear sub-optimal form the perspective of exercise physiology, yet have shown efficacy in a population with rotator cuff tendinopathy.[11] Exercise prescription should promote self-monitoring, and appropriate interpretation of physiological signs is essential.[12] In particular, pain response to a load-based exercise intervention should be self-monitored and adapted by the individual accordingly to aid efficacy expectations. Previous guidelines have included using a visual analogue scale of no more than 5/10.[13,14] However, with sufficient efficacy expectations, the use of a scale is not required; patients can determine what pain response is acceptable over a twenty-four hour period themselves.[11] This could be judged upon the perceived impact upon sleep, activities of daily living or work, for example.

Outcome Expectations

Outcome expectations relate to a person's estimate that a given behaviour will lead to certain outcomes. Reduced outcome expectations, along with negative expectations, such as a fear, concerns and uncertainty surrounding potential future damage to the tendon have been identified in people with Achilles tendinopathy.[10] Such negative outcome expectations should be discussed, challenged and reconceptualised, as they will be a critical determinant of engagement with a load-based exercise programme. For example, concerns around the risk of tendon rupture could be explored with the clinician highlighting the disparity between painful tendons preceding a rupture.[15]

Enhancing self-efficacy

Self-efficacy depends mostly on the way the person interprets their symptoms, and to what degree they believe that they can exercise control of the outcome of their injury through series of behavioural choices over time. The success of a load-based exercise programme depends upon the person interpreting the pain response in a way that facilitates the use of exercise as a management strategy. The aim of verbal persuasion is to allow patients to move beyond their current perceived pain threshold and towards an enhanced capability threshold encompassing a mixture of biological, psychological and sociological factors. For example, if the clinician provides a positive message around the patient's imaging results to reflect the lack of association morphology and pain it may to shift the patient's unhelpful beliefs. For example, from *"I shouldn't do anything that hurts"* to understanding pain during exercise might be helpful rather than harmful.[3] The choice of words to facilitate this is critical; negative perceptions of tissue health from prior imaging or consultation from prior health care providers may exist and affect the way information is perceived. It may be useful for the clinician to explain pain in terms of sensitivity, ensuring the person in pain understands why hurt does not necessarily equal harm and why pain during rehabilitation should be acceptable. Special consideration needs to be taken to ensure that experience of the exercises confirms the messages the clinician is conveying and provides the patient with an experience which solidifies their new-found beliefs via successful experiences. In turn, this will expand the patient's locus of control by gently challenging their perceived ability to perform the task without guidance. This concept provides a novel perspective for load-based exercises; providing experienced control for the person with tendinopathy. Experiencing this

control will help *'set up for success'* and ensure an understanding upon which a successful partnership can be developed. Understanding should be re-visited regularly using simple questions such as: "*What do you understand is the cause of your pain?" "Why could exercises help*?" A summary of suggested cognitive and contextual considerations to optimise clinical outcomes in tendinopathy is offered in figure 1.

In conclusion, load-based exercise is currently recommended for management of tendinopathy. However, given the wide-ranging responses from loading exercises in the research, much uncertainty remains. Contextual and cognitive factors may help explain some of the variation and also present a novel perspective to target for interventions. As such, these factors should be considered further by researchers and clinicians within the field.

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