ARTICLE

When and how to introduce high intensity eccentric exercises during hamstring rehabilitation

By Jack Hickey

Especially for those that work in elite sport where an injury to a star player can cost an organisation hundreds of thousands of dollars, finding safe but progressive exercises throughout a rehabilitation is crucial. When and how to introduce high intensity eccentric exercises during hamstring rehabilitation have been questions asked by many a practitioner. So we asked Jack Hickey six questions on this topic to shed some light on this area.

What is the traditional progression when rehabbing a hamstring injury?

Progression through hamstring injury rehabilitation has traditionally been based on either muscle injury healing time frames[1] or meeting certain criteria before advancing to the next stage.[2]

Criteria-based rehabilitation progression has become popular over the past 10 years,[3-5] as this approach appears to be more tailored to the individual athlete. However, it is important to consider whether the criteria to progress rehabilitation from one stage to the next are relevant to the exercises being introduced in that next stage.

For example, it has commonly been recommended that clinicians should not introduce high intensity eccentric exercises, such as Nordics, until the patient can perform isometric knee flexion strength tests without pain[6-8] or there is relative between-leg symmetry (< 10%).[4, 9] Although this criteria-based progression may seem logical, there is no direct evidence to support the suggested need to wait for pain or between-leg asymmetries to resolve during isometric knee flexion strength testing before introducing high intensity eccentric exercises into hamstring injury rehabilitation.

> **“ There is no evidence to support the suggested need to wait for pain and/or between-leg asymmetries to resolve during isometric knee flexion strength testing before doing high-intensity eccentric exercises into hamstring injury rehab ”**
>
> ***@JackHickey89***

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How soon after a hamstring injury can we safely introduce high intensity eccentric exercises?

We investigated the time it took to introduce high intensity eccentric exercises into rehabilitation for 42 male athletes who had suffered a hamstring injury within the previous seven days, if we ignored pain and between-leg asymmetries during isometric knee flexion strength testing.[10] Instead, we used exercise-specific progression criteria and found that we could safely introduce

high intensity eccentric exercises as early as the day following hamstring injury in some athletes, with the median time being five days.[10]

No adverse events occurred in our study and, although these time frames may not apply to all athletes, our findings highlight that it is possible to safely introduce high intensity eccentric exercises relatively early during hamstring injury rehabilitation.

> **“ High-intensity eccentric exercises can be safely introduced as early as the day following hamstring injury in some athletes, with the median time being 5 (2-8) days ”**
>
> ***@jackhickey89***

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Is there any entry criteria, given that lack of pain clearly isn’t one, you would recommend before starting high intensity eccentric loading?

The criteria we used in our study to introduce high intensity eccentric loading, which I still use for all athletes I work with during hamstring injury rehabilitation, is quite simply based on the individual athlete’s ability to perform a sub-maximal exercise before progressing to a higher intensity variation. Once an athlete can perform a bilateral eccentric sliding leg curl through full range of motion for at least six consecutive repetitions with pain less than 5 on a 10 point scale, we have found it is safe to introduce high intensity eccentric exercises, such as Nordics and the unilateral eccentric sliding leg curl.

This approach is exercise-specific, as the bilateral eccentric sliding leg curl replicates the eccentric contraction mode, as well as the hip and knee joint actions, of Nordics and the unilateral slider. It just does so at a lower relative intensity. In contrast, isometric knee flexion strength tests do not replicate the contraction mode or hip and knee joint actions of these exercises, which may help explain why we were able to introduce high intensity eccentric loading well before pain resolved during isometric knee flexion strength tests in a median time of 11 days following hamstring injury in our study.[10]

When it comes to hamstring injuries, is there any place for pain to be used as a way to progress or regress the rehab process?

Pain can be used to progress or regress rehabilitation following hamstring injury, provided you understand whether the context of the pain being reported is relevant to the task you are progressing towards. When progressing hamstring injury rehabilitation towards high intensity eccentric exercises, our data suggests that pain during isometric knee flexion strength testing is far less relevant than pain reported during exercises that replicate contraction mode and joint actions during these exercises.

This principle of pain-guided exercise-specific criteria can also be applied to progressing other key interventions during hamstring strain injury rehabilitation, such as hip extension exercises and progressive running.

For example, we introduce slow speed jogging as soon as athletes can walk normally with minimal pain (again, < 5/10) and then gradually increase from jogging to running using this similar pain-guided exercise-specific progression criteria throughout hamstring injury rehabilitation. We detailed our approach to progressing different hamstring injury rehabilitation interventions in a recent issue of the Journal of Athletic Training,[11] with specific video examples, which you can access for free via the link below.

https://meridian.allenpress.com/jat/article/57/2/125/466426/Hamstring-Strain-Injury-Rehabilitation

How does the presence of asymmetries affect the progression of high intensity eccentric loading and running intensity during hamstring injury rehab?

We objectively test isometric knee flexion strength of the injured and uninjured legs before every rehabilitation session. We've found that the vast majority of athletes in our study still had relatively large deficits (~25%) immediately prior to the rehabilitation session where we introduced high

intensity eccentric exercise.[10] Based on this finding, it appears between-leg asymmetries in isometric knee flexion strength should not be a barrier to introducing high intensity eccentric loading into hamstring injury rehabilitation. Some published data demonstrates an association between isometric knee flexion strength asymmetries and the progression of running intensity during hamstring injury rehabilitation.[12] However, even with a statistically significant association such as this, there will likely be substantial inter-individual variation in the time frames for progression of running intensity.

> **“ The presence of between-leg asymmetries in isometric knee flexion strength should not be seen as a barrier to introducing high-intensity eccentric loading into hamstring injury rehabilitation ”**
>
> ***@JackHickey89***

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What are the biggest mistakes you see young practitioners/clinicians make, and what advice would you give them to help?

First, I think it’s important to acknowledge that making mistakes is part of learning as a practitioner / clinician, regardless of age or experience. I don’t know whether I am classified as young or old these days, but I do know that I have made plenty of mistakes over my 10 years working in sports injury rehabilitation and will continue to do so.

The key thing for me is being able to reflect on mistakes I have made to inform my continuing development as both a clinician and researcher. One very common mistake that I made when starting my journey was thinking there should be a clear answer to every question I had. I soon realised that the reality in the broad fields of exercise science and sports injury rehabilitation is that there are many questions that cannot be clearly answered with a black or white response.

There is a tendency for practitioners to gravitate towards black or white approaches to addressing complex clinical questions. I think it is important to embrace the fact that the answer to many polarising questions often lies within the vast grey area between strong opinions on either side of these arguments.

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