

## Pain-free vs pain-threshold rehabilitation following acute hamstring strain injury: A randomised controlled trial

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**Introduction & Aims:** Conventional guidelines recommend that hamstring strain injury (HSI) rehabilitation should only be performed & progressed in the complete absence of pain, despite lack of scientific comparison to alternative approaches. This study aimed to investigate whether performing & progressing rehabilitation up to a pain-threshold alters time from HSI to RTP clearance, hamstring muscle structure & function & re-injury compared to remaining pain-free.

**Methods:** Forty-three men with an acute HSI were randomly allocated to either a pain-free (n=22) or pain-threshold (n=21) rehabilitation group. All participants completed a fully supervised progressive rehabilitation protocol twice per week. Pain had to be rated 0 on a 0-10 scale during exercise in the pain-free group. Participants in the pain-threshold group were permitted to perform & progress rehabilitation if they rated pain  $\leq 4$  on a 0-10 scale during exercise. Biceps femoris long head fascicle length (FL), isometric (ISO) and eccentric (ECC) knee flexor strength were objectively monitored during rehabilitation. Days from HSI to RTP clearance & re-injuries in the following 6 months were reported.

**Results:** No clear difference was seen in the number of days from HSI to RTP clearance ( $d=-0.1$ , 95%CI=-0.8 to 0.5) between the pain-free (15 $\pm$ 4) and pain-threshold (16 $\pm$ 6) group. Large FL improvements were seen in the pain-free ( $d=2.7$ , 95%CI=2.5 to 2.9) & pain-threshold ( $d=2.1$ , 95%CI=1.9 to 2.3) group from initial assessment to RTP clearance. The pain-threshold group had greater ISO ( $d=0.6$ , 95%CI=0.4 to 0.8) & ECC ( $d=1.2$ , 95%CI=1.0 to 1.4) at RTP clearance compared to the pain-free group. In the 6 months following RTP clearance, two re-injuries occurred in the both the pain-free & pain-threshold group.

**Conclusion:** Allowing exercise to be performed and progressed up to a pain-threshold, results in greater knee flexor strength compared to conventional pain-free rehabilitation, in equivalent time from HSI to RTP clearance.