

Eccentric Strengthening at Long Muscle Lengths Reduces Hamstring Strain Recurrences: Results of Long Term Follow-up

Timothy F. Tyler, Brandon Schmitt, Joshua M. Gellert and Malachy P. McHugh

Orthopaedic Journal of Sports Medicine 2014 2:

DOI: 10.1177/2325967114S00081

The online version of this article can be found at:
http://ojs.sagepub.com/content/2/2_suppl/2325967114S00081

Published by:



<http://www.sagepublications.com>

On behalf of:



The American Orthopaedic
Society for Sports Medicine

[American Orthopaedic Society of Sports Medicine](#)

Additional services and information for *Orthopaedic Journal of Sports Medicine* can be found at:

Email Alerts: <http://ojs.sagepub.com/cgi/alerts>

Subscriptions: <http://ojs.sagepub.com/subscriptions>

Reprints: <http://www.sagepub.com/journalsReprints.nav>

Permissions: <http://www.sagepub.com/journalsPermissions.nav>

>> [Version of Record](#) - Aug 1, 2014

[What is This?](#)

Eccentric Strengthening at Long Muscle Lengths Reduces Hamstring Strain Recurrences: Results of Long Term Follow-up

Timothy F. Tyler, MS, PT, ATC¹, Brandon Schmitt, DPT ATC², Joshua M. Gellert, DPT³, Malachy P. McHugh, PhD⁴

¹PRO Sports Physical Therapy, Scarsdale, NY, USA, ²PRO Sports PT, Scarsdale, NY, USA, ³Nicholas Institute of Sports Medicine and Athletic Trauma, Lenox Hill Hospital, New York City, NY, USA, ⁴Nicholas Institute of Sports Medicine and Athletic Trauma, Lenox Hill Hospital, New York, NY, USA.

Objectives: Hamstring injuries are among the most common injuries in sports involving sprinting and have a high recurrence rate (20-33% recurrence rates reported in the literature). Rehabilitation protocols that can prevent recurrences are needed. The purpose of this study was to determine if a protocol emphasizing eccentric strength training with the hamstrings in a stretched position resulted in a low recurrence rate after return to play.

Methods: Forty-eight athletes (age 35±16 yr; 31 men, 17 women) with unilateral hamstring strains (3 G1, 41 G2, 4 G3; 27 recurrent injuries) followed a 3-phase rehabilitation protocol (phase 1: isometric and isotonic strengthening at short to intermediate muscle lengths; phase 2: eccentric strengthening at short to intermediate lengths; phase 3: eccentric strengthening in a stretched position). Athletes progressed to the next phase when pain free with maximum contractions and were discharged to sports when pain free with maximal eccentric contractions in a stretched position and with functional tests. Prior to discharge, isometric strength was assessed bilaterally at 80°, 60°, 40° and 20° knee flexion in sitting with the thigh flexed to 40° above horizontal. Eight athletes chose to return to play prior to completing the rehabilitation and were categorized as noncompliant (5 completed phase 2, 3 completed phase 1). Reinjury rates and hamstring strength were compared between compliant and noncompliant athletes using Fisher exact tests and analysis of variance.

Results: None of the 40 compliant athletes had sustained a reinjury at an average of 20±13 months after returning to sports (18>2yr, 7 1-2yr, 15<1yr). Three of the 8 noncompliant athletes sustained reinjuries between 3 and 5 months after return to play (P<0.01 vs. compliant athletes). At time of return to sport, noncompliant athletes had significant hamstring weakness, which was progressively worse at longer muscle lengths (20% deficit at 80°, 23% at 60°, 31% at 40°, 43% at 20°; Angle effect P<0.001). Compliant athletes had symmetrical strength at all angles (P=0.99). Compliant athletes averaged 17±7 treatments over 11±7 wks versus 12±7 treatments over 13±11 wks for noncompliant athletes (P=0.11, P=0.53).

Conclusion: Rehabilitation with an emphasis on eccentric strength training with the hamstrings in a stretched position resulted in zero recurrent injuries at an average of 1.7 years after return to play.

This open-access article is published and distributed under the Creative Commons Attribution - NonCommercial - No Derivatives License (<http://creativecommons.org/licenses/by-nc-nd/3.0/>), which permits the noncommercial use, distribution, and reproduction of the article in any medium, provided the original author and source are credited. You may not alter, transform, or build upon this article without the permission of the Author(s). For reprints and permission queries, please visit SAGE's Web site at <http://www.sagepub.com/journalsPermissions.nav>.

The Orthopaedic Journal of Sports Medicine, 2(7)(suppl 2)

DOI: 10.1177/2325967114S00081

©The Author(s) 2014