

***i*INCREDIWEAR**

**Optimizing Return to Sport: A Case Study
Integrating Sports Science and Technology for
Hamstring Rehabilitation**

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Objectives

- ✓ Discuss ways in which technology and sports science can be integrated to enhance clinical decision making.
- ✓ Highlight a case study using practical sports science strategies within the context of a hamstring strain.
- ✓ Emphasize a criterion-based hamstring injury rehabilitation progression.

Disclosures



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I have no financial disclosures or conflicts of interest

Case Study

- A 24 yr old RB sustains a R HSI during special teams coverage drill on 05/08.
- Hx of HSI previous year (Grade 2).
- Initial exam:
 - Antalgic gait.
 - TTP 18% over lateral HS muscle belly mid-way glute fold/popliteal fossa^{1,2}.
 - Decreased A/PROM SLR and MHFAKE.
 - Pain w/ SL bridge and heel drag.
 - Weak/Pain with MMT prone knee flexion @ 90, 45, and 15.
 - MRI D-1 reveals Grade 2 strain @ mid-belly of BF LH.
 - PRP injection Day 4 after MOI.

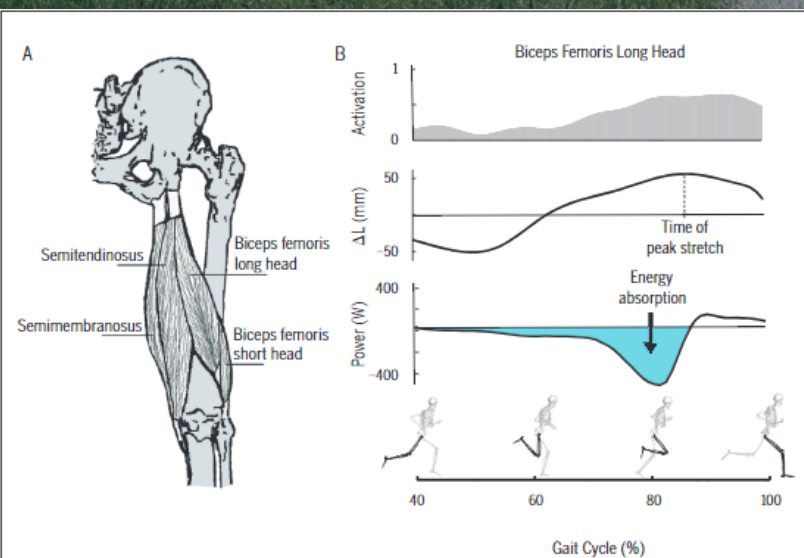


FIGURE 1. (A) The hamstring muscle group consists of the semimembranosus, semitendinosus, and biceps femoris muscles, with the biceps femoris long head being injured most often in high-speed running.³⁰ (B) During the swing phase of running, the hamstrings are active, stretched (ΔL , change in length relative to upright stance) and absorbing energy from the decelerating swing limb, creating the potential circumstances for a lengthening contraction injury.²¹ Reproduction of A is with permission of Springer Science+Business Media, ©2008.

Impairments & What to Measure³⁻⁷

Match High-Speed Running Distances Are Often Suppressed After Return From Hamstring Strain Injury in Professional Footballers

Rodney Whiteley, PhD,^{1*} Andrew Massey, MD, FIFA,² Tim Gabbett, PhD,³ Peter Blanch, BPhy, MAppSc,⁴ Matthew Cameron, PhD,¹ Greta Conlan, MHighPerfSp,⁵ Matthew Ford, BAppSci,^{**} and Morgan Williams, PhD^{††}

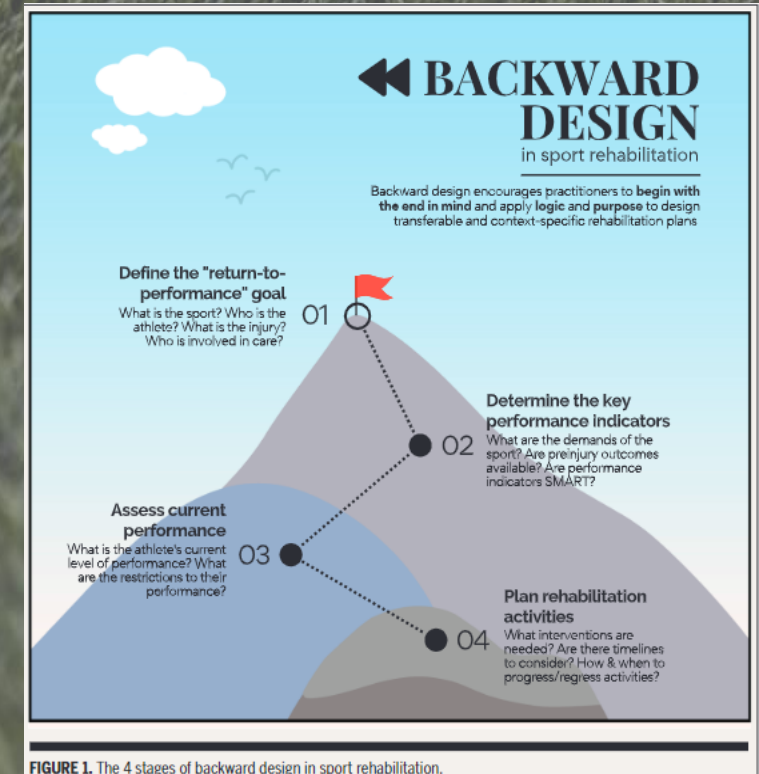
High-speed running during match-play before and after return from hamstring injury in professional footballers

Rodney Whiteley¹ | Warren Gregson^{2,3} | Roald Bahr^{1,4} | Montassar Tabben⁵ | Karim Chamari⁵ | Lorenzo Lolli^{2,3} | Valter Di Salvo^{2,6}

Exploring the Role of Sprint Biomechanics in Hamstring Strain Injuries: A Current Opinion on Existing Concepts and Evidence

Christopher Bramah^{1,2} · Jurdan Mendiguchia³ · Thomas Dos'Santos^{4,5} · Jean-Benoît Morin⁶

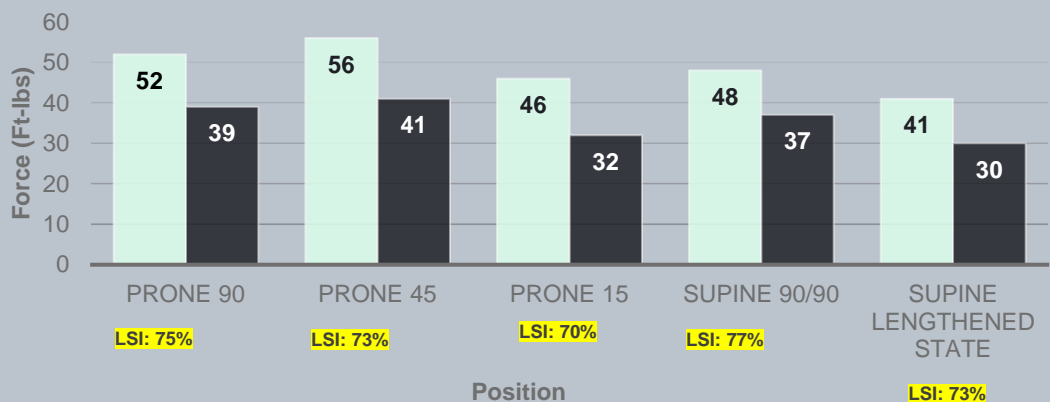
- Biggest impairments include pain, difficulty ambulating, impaired ADLs, decrease of ROM/fasicle length, and knee flexor force production⁵.



Assessing Strength^{11, 12}

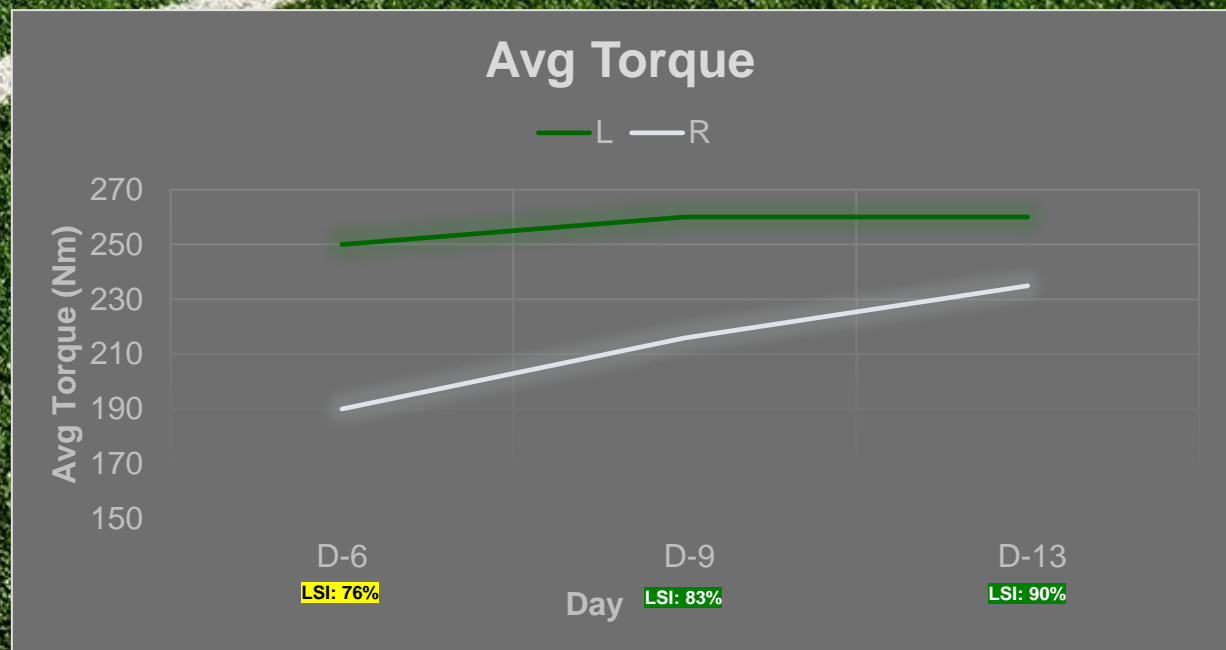
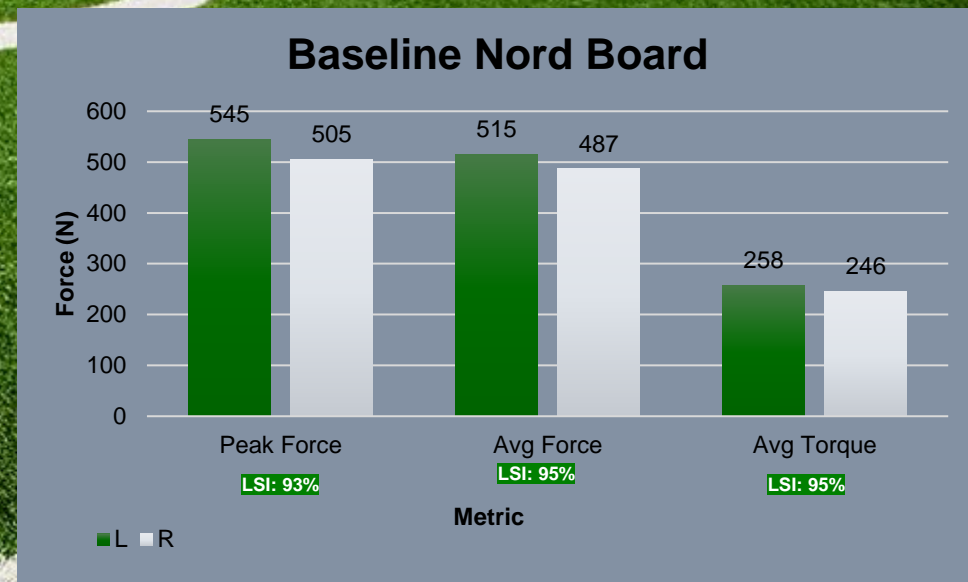


D-4 Strength Results



■ L ■ R

Assessing Strength



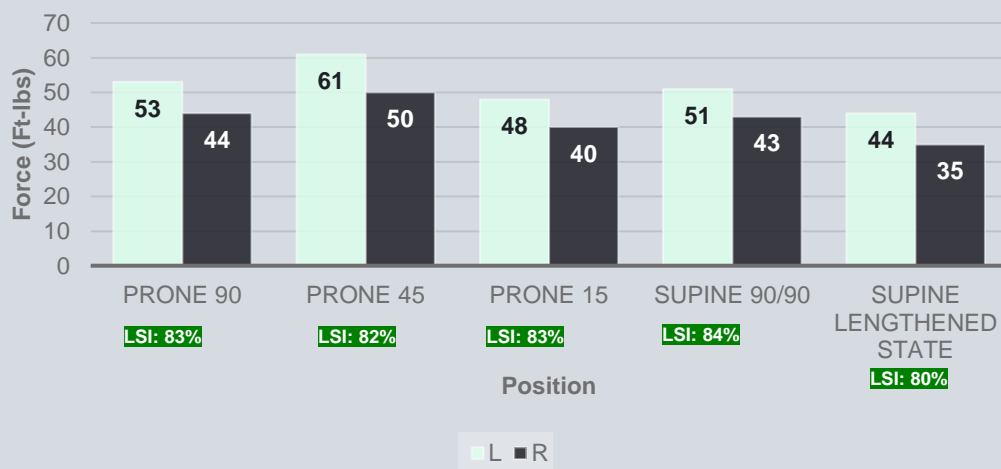
Strength Reassessment

Criteria to initiate tempo running^{8-11, 13, 14}

- Pain free gait.
- No palpable tenderness.
- Full, pain-free ROM.
- Pain free submax isometrics.
- HS strength >80% LSI.
- Nord Board > 80% LSI.

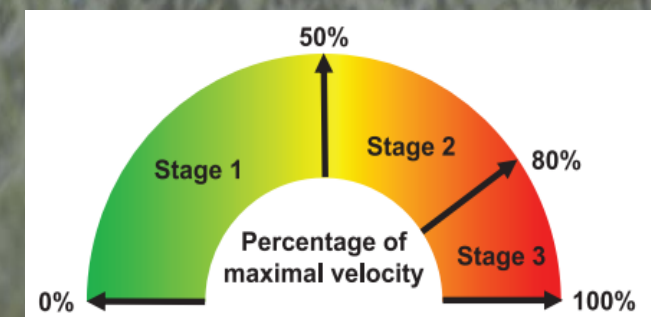


D-8 Strength Results



Force Plate Iso Data D-9

	Peak Force	RFD - 50ms	Time to Peak Force
L	483	410	0.598
R	390	325	0.725
LSI	81%	79%	82%



Sprinting Reintegration¹⁴

Criteria to Initiate Sprinting^{8-11, 13}

- Full pain free ROM.
- No pain with tempo <80% MV running.
- HS strength > 90% LSI.
- Nord board > 90% LSI.
- Askling H-Test 0/10 pain.

Mechanics of the Human Hamstring Muscles during Sprinting

ANTHONY G. SCHACHE¹, TIM W. DORN¹, PETER D. BLANCH², NICHOLAS A. T. BROWN³, and MARCUS G. PANDY¹

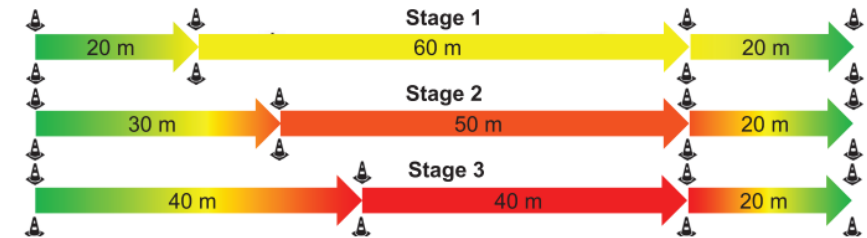
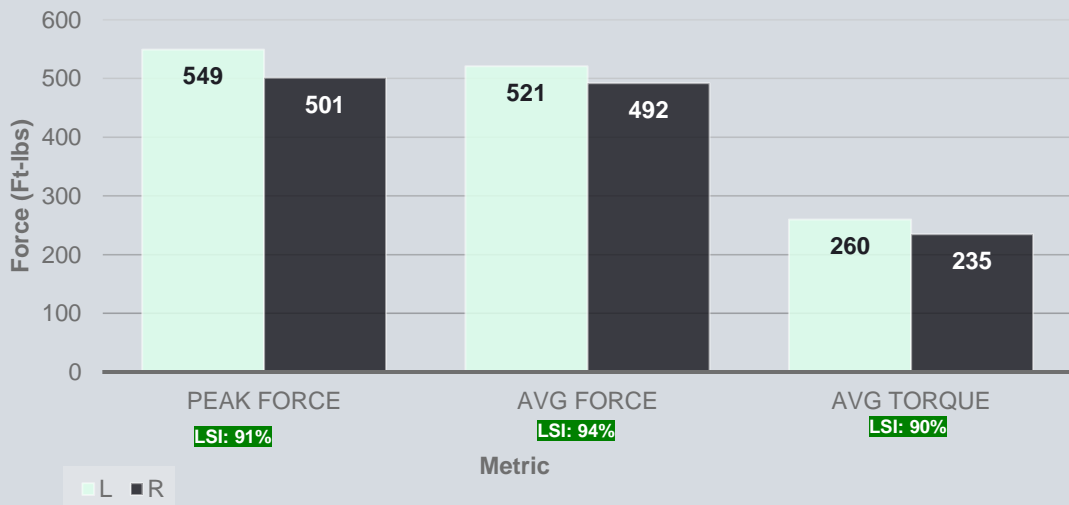


Figure 3. Example of 3-stage progressive running protocol over 100 m, accounting for greater acceleration distances and more gradual-intensity increases at higher percentages of maximal velocity.

D-13 Nord Board



Force Plate Iso Data D-13

	Peak Force	RFD - 50ms	Time to Peak Force
L	490	435	0.591
R	434	380	0.641
LSI	89%	87%	92%

Sprinting Progression¹⁵⁻¹⁷



POSITIONAL DIFFERENCES IN RUNNING AND NONRUNNING ACTIVITIES DURING ELITE AMERICAN FOOTBALL TRAINING

PATRICK A. WARD,¹ SAM RAMSDEN,² AARON J. COUTTS,³ ANDREW T. HULTON,⁴ AND BARRY DRUST¹

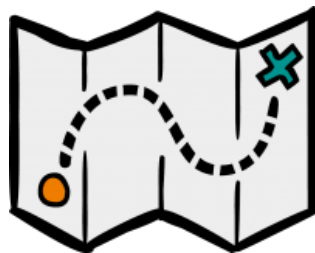
Article

Positional Movement Demands during NFL Football Games: A 3-Year Review

Erin Sanchez^{1,*}, Leigh Weiss², Tyler Williams³, Patrick Ward⁴, Ben Peterson⁵, Aaron Wellman⁶ and Jeff Crandall¹



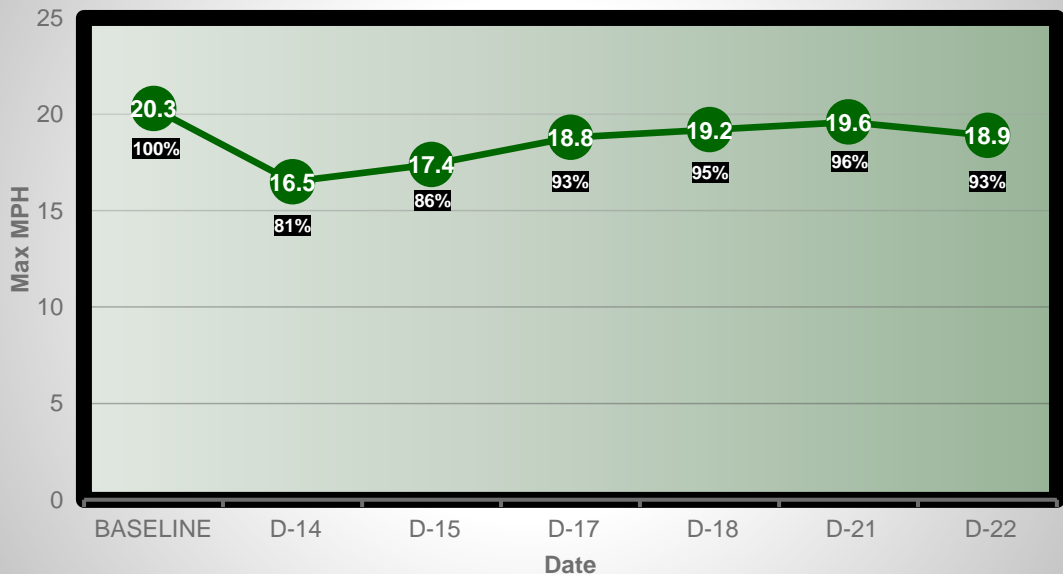
Sprinting Cont.



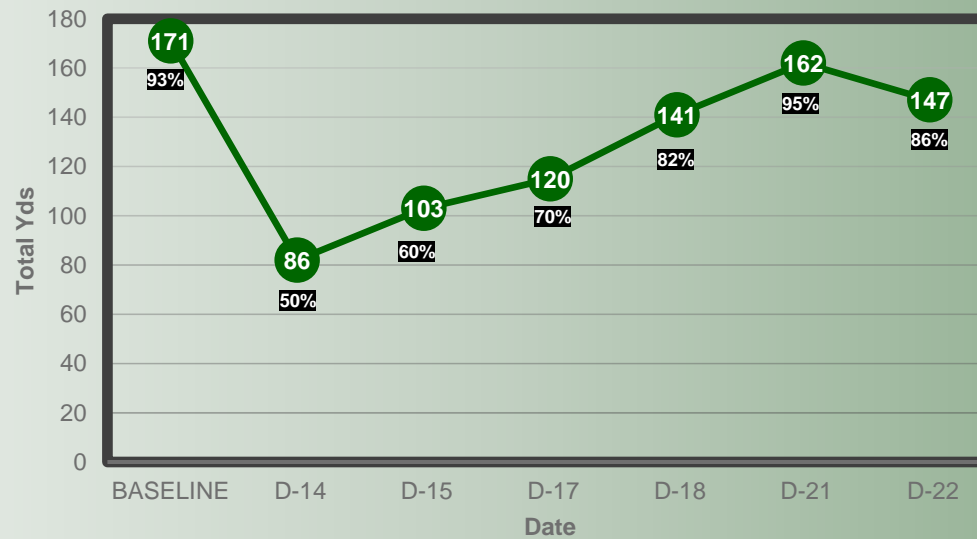
Highest Practice Output

Total PL	IMA	Max Velo	Total Distance	High Speed Distance (>12mph)	High Speed Distance (>14mph)	High Speed Distance (>16mph)
436	16	20.3	2540	600	340	171

Max MPH Attained Per Session



>16 MPH Distance



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THANK YOU!

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