

The Sports MAP Network
Sports Medicine & Physiotherapy Events

Returning to play after hamstring injury: criterion-based rehab in practice

Nick Kane

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ESSENDON

The Sports MAP Network
Sports Medicine & Physiotherapy Events

SPORTS MEDICINE & PHYSIOTHERAPY CENTRE

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What is difficult about rehabilitation in the private practice?

- Limited access to the athlete
- Setting up sessions with out actually seeing them perform the session
- Access to gym or testing equipment?
- Reluctance to obtain imaging?

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What components of a hamstring rehabilitation are the most difficult to navigate for you as the clinician?

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Common Errors in a Hamstring Rehab

1. Over (or under prescription) of top end-run speed running
2. Strength Programming
 - Getting too fancy
 - Ineffective muscle recruitment patterns
3. Maintaining only low-level hamstring loading for too long
4. Missing or not identifying key aspects to reduce strain on the Hamstring


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Hamstring Rehabilitation

Practical tools to help you monitor & progress your hamstring rehabilitation from within the clinic

- Early Tissue Loading
- When to commence running?
- Strength Programming
- When to sprint?
- Clinical testing
- Returning to training & play
- Tips for recurrent issues (if time permits)

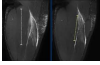



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Tips for recurrent issues

- Get your diagnosis right (imaging)
 - T Junction, IMT, Avulsion
 - Longer time to RTP?
- Ensure you are addressing acceleration & deceleration demands
 - Force velocity
- Exposure to nonlinear top end velocity
 - Exposure under fatigue?
- Value the use of isokinetic testing in the athletic population
- Targeting Bicep femoris LH in your exercise selection








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Targeting Bicep Femoris LH

Always ask where they are feeling the muscle work

- Early activation
- Exercise Selection: Hypertrophy & capacity

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Hemorrhagic Hypertrophy is Specific
 • In the presence of systemic metabolic homeostasis, hypertrophy is specific to the state of metabolic homeostasis.

1. Muscle volume: BFBH + 15% LSET vs +5% Nordic
 2. Aponeurosis area: BFBH +9% LSET vs +3% Nordic

Healthology
 • 12-week training program (2x/week)
 • 10-week MCT (3x/week) and interval training
 • 10-week Nordic training (2x/week) and interval training (2x/week)

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Case

- Male athlete semi-professional
- Diagnosed hamstring strain— 2B BAMIC
- Prognosis: 3 weeks (RTP ~ 28 days post injury)
- Presents to you in the clinic day 2 post injury (Monday)

Grade	Number of patients	Median (IQR) muscle injury length (cm)
1	14	14.0 (12.0-17.0)
2	8	12.0 (10.0-14.0)
3	14	10.0 (8.0-12.0)
4	4	10.0 (8.0-12.0)
5	17	10.0 (8.0-12.0)
6	4	10.0 (8.0-12.0)
7	4	10.0 (8.0-12.0)
8	4	10.0 (8.0-12.0)

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Rehab Key points

- The greatest emphasis needs to be on how we prescribe the **sprint dosages**.
- Strength loading** prepares the athlete for readiness to build sprint meters
- We need to address **modifiable risk factors** for hamstring injury
 - Strength
 - Fascicle length
- Need to identify & address **contributing factors** to injury
- Rely on your **clinical testing** to guide your progressions

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What is the definition of Sprinting?


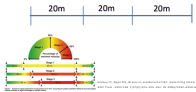
Over 85% of the athlete's max speed

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Your Key Speed Questions

1. What is their max speed?
2. How many meters do they run above 85%? 30-60 meters
3. How many meters above 90%? 10-30 meters
 - How many exposures over 90%? 1-3 efforts

30km/hr MAX SPEED ATHLETE


- +80% = 24 km/hr (8.6m/s) - 3 sec 20m
- +85% = 25.5 km/hr (7.1 m/s) - 2.8 in 20m
- +90% = 27 km/hr (7.5m/s) - 2.66 in 20m
- +95% = 28.5 km/hr (7.9 m/s) - 2.5 in 20m

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The Push & Pull of 'Tissue strain'

We want to build strain capacity to tolerate high tissue strain (sprinting)
AND
We want to look to ways to minimize unnecessary tissue strain on the Hamstring.



Applied Strain

- Sprint training
- Sprint form
- Sprint technique
- Sprint frequency

Hamstring Strain Injury

Strain Capacity

- Previous ICI
- Age
- Neuromuscular
- Muscle fiber type
- Connective tissue
- Training history
- Neuromuscular fatigue

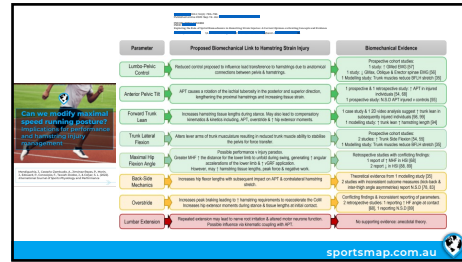
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Build strain capacity	Reduce tissue strain
<ul style="list-style-type: none"> • Eccentric strength • Fascicle muscle adaptation/ length • Muscle fatigability 	<ul style="list-style-type: none"> • Sagittal plane control: (Anterior pelvic tilt) • Hip extension ROM • Hip (glute max) strength • Frontal plane control (Lateral Hip) • Neural restriction • Calf/ ankle strength/ stiffness • Running mechanics/ efficiency
<p>Everything is in place to prepare and optimize the athlete's readiness for sprinting</p>	

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Hamstring Rehabilitation Overview

Week	1	2	3	4
Rehabilitation and adaptation goal	1. Avoid inhibition 2. Preserve tissue healing	1. Develop muscle fatigue resistance 2. Establish hip dominant eccentric loading	1. Progress eccentric loading at target lengths 2. Increase distal hamstring eccentric loading with knee dominant exercise	1. Increase knee dominant eccentric loading 2. Increase distal hamstring eccentric loading with knee dominant exercise
Disruptive stress	Low	Low-moderate	Moderate	High
Load intensity/volume	Low (eg. 10-12 RM/ moderate-high, for example, 5x3 to 5x5)	Moderate (8-10 RM/ moderate to high, 3x5 to 4x5)	Moderate-high (6-8 RM/ moderate to high, 4x5 to 5x5)	High (eg. 2-4 RM/ moderate to high, 4x5 to 5x5)
Frequency per week	3-4	3-4	3	2
Exercise selection	Isometric hamstring curls DL Roman chair isometric Squats Step ups	Isometric hamstring curls 90-90 bridge capacity Isometric hamstring curls at increased length	DL ROM DL Roman chair with load Hamstring curl	DL ROM DL Roman chair with low Nordic curl Fly wheel

DL, double leg; ME, Nordic hamstring exercise; ROM, Roman chair; RT, 3L, single leg.

Hamstring rehabilitation in elite track and field athletes: Applying the British Athletics Muscle Injury Classification in clinical practice

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- ### Week 1
1. Optimize tissue healing & reduce inhibition
 2. Obtain your ROM & Strength Baseline assessment
 3. Obtain baseline approach to addressing the contributing factors
 5. Commence Running
 5. Returning to gym-based strength conditioning

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ROM & ISOMETRIC BASELINE

	LEFT	RIGHT		LEFT	RIGHT
AKE	170	150	SLBT	300N	150N (50%)
PSLR	80	80	LLBT	250N	200N
MHFAKE	170	140	PRONE ISOMETRIC MID RANGE	300N	200N
SLUMP	170	150	PRONE ISOMETRIC OUTER RANGE	280N	140N

- Pain on ISOMETRIC tests after 7 days should be managed with caution
- Track palpation tenderness

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Early Tissue Loading- Week 1

1. ROM:

1. Active Knee extensions 2x15 (twice daily)
2. Slump sliders 2x8 (twice daily)

2. Isometric loading

1. Prone 2x (5x10-20sec) 30-50% MVC
2. Long lever bridge isometric 2x (5x 10-20sec) at 30-50% MVC
3. Supine Cable Hip extension ISO 2x (5x10-20sec)

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PRONE ISO

Supine Hip Ext ISO

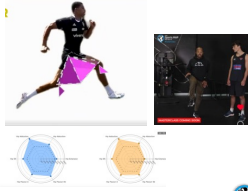
Hamstring ISO Bridge

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STRAIN REDUCTION STRATEGIES

- Hip Extension ROM
- Hip Extension Power
- Frontal plane control
 - Hip Abduction
- Lumber Pelvic Control
 - Double leg lowers
- Calf strength & stiffness
- Neural limitation



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ANTERIOR LENGTH



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Week 1 Gym Program

It is not all about the hamstring...

1. Hip extension Strength (Squat/ Hip thrust)
2. Lateral hip Strength – Cable Abductions
3. Calf strength and stiffness (Calf raises, hopping)
4. Anterior chain (Resisted Hip flexor strength, Adductors & quads)
5. Adductor magnus/ hip strength (Step ups/ Lunges)

Our hamstring loading fits with in this session

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When can we start running?

- AKE within 10 degrees
- Pain free walking and stairs
- ~70% contraction L Vs R
- Typically, day 3-5 post injury
- Commence with general volume-based running
- SESSION 1: 1min jog, 1min walk x 10 (3km)
- SESSION 2: 2x 2min jog, 25 x 100m (self paced), 2x 2min (5km)

Utilize the PATS program to get the athlete going

Use drilling - A, B & C drills for the speed / quality of movement


Chris Bellizzi - Institute for Run & Handwriting Fluency



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Week 1 layout


	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SAT	SUN
MANUAL THERAPY							OFF
WATER IMMERSION							
ROM EXERCISES							
HS EARLY LOADING							
WORK ONS (GT)							
RUNNING							
GYM							



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Weeks 2-3 Post Injury

- BUILD capacity via our gym loading
 - Strength
 - Fascicle adaptation
- BUILD running towards our high strain loads (Sprinting)
- BUILD on our strain reduction exercises



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Strength Benchmarks

Why are we doing this exercise and what do we want to achieve from it?

STREAM	EXERCISE	TARGET
ISOMETRIC	HAMSTRING ISO BRIDGE	1 min
	ISO HAMSTRING CURL	50-60% BW
	GHR ISO HAMSTRING	3 x 10sec 10kg
KNEE DOMINANT	HAMSTRING BRIDGE	30 reps
	PRONE HAMSTRING CURL	1/3 BW thru range 6RM
	HS ECCENTRIC SLIDES	2x12
	PRONE ECC HAMSTRING CURL	70-80% x BW 6RM
HIP DOMINANT	NORDIC	5x BW
	DL RDL	1-1.1 x BW 6RM
	B Stance RDL	60-80% BW 6RM
	SL RDL	40-50% x BW 6RM
	CABLE HIP EXTENSION	50% X BW 6RM

Where are you feeling it?

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ISOMETRIC

EXERCISE	TARGET
HAMSTRING ISO BRIDGE	1 min
ISO HAMSTRING CURL	50-60% BW
GHR ISO HAMSTRING	3 x 10sec 10kg

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Knee Dominant

HAMSTRING BRIDGE	30 reps
PRONE HAMSTRING CURL	1/3 BW thru range 6RM
HS ECCENTRIC SLIDES	2x12
PRONE ECC HAMSTRING CURL	70-80% x BW 6RM
NORDIC	5x BW

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Hip Dominant

DL RDL
B stance RDL
SL RDL

DL RDL	1-1.5 x BW GRM
B stance RDL	80-90% x BW GRM
SL RDL	40-50% x BW GRM
CABLE HIP EXTENSION	50% x BW GRM

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CABLE HIP PROGRESSIONS





50% BW x 6-8 reps

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Gym Program

Gym Rehabilitation 1												
Week	Day	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday
Week 1	1	DL RDL	B stance RDL	SL RDL	Cable Hip Extension	Core	Cardio	Rest	DL RDL	B stance RDL	SL RDL	Cable Hip Extension
Week 1	2	DL RDL	B stance RDL	SL RDL	Cable Hip Extension	Core	Cardio	Rest	DL RDL	B stance RDL	SL RDL	Cable Hip Extension
Week 1	3	DL RDL	B stance RDL	SL RDL	Cable Hip Extension	Core	Cardio	Rest	DL RDL	B stance RDL	SL RDL	Cable Hip Extension
Week 1	4	DL RDL	B stance RDL	SL RDL	Cable Hip Extension	Core	Cardio	Rest	DL RDL	B stance RDL	SL RDL	Cable Hip Extension
Week 1	5	DL RDL	B stance RDL	SL RDL	Cable Hip Extension	Core	Cardio	Rest	DL RDL	B stance RDL	SL RDL	Cable Hip Extension
Week 1	6	DL RDL	B stance RDL	SL RDL	Cable Hip Extension	Core	Cardio	Rest	DL RDL	B stance RDL	SL RDL	Cable Hip Extension
Week 1	7	DL RDL	B stance RDL	SL RDL	Cable Hip Extension	Core	Cardio	Rest	DL RDL	B stance RDL	SL RDL	Cable Hip Extension
Week 1	8	DL RDL	B stance RDL	SL RDL	Cable Hip Extension	Core	Cardio	Rest	DL RDL	B stance RDL	SL RDL	Cable Hip Extension
Week 1	9	DL RDL	B stance RDL	SL RDL	Cable Hip Extension	Core	Cardio	Rest	DL RDL	B stance RDL	SL RDL	Cable Hip Extension
Week 1	10	DL RDL	B stance RDL	SL RDL	Cable Hip Extension	Core	Cardio	Rest	DL RDL	B stance RDL	SL RDL	Cable Hip Extension
Week 1	11	DL RDL	B stance RDL	SL RDL	Cable Hip Extension	Core	Cardio	Rest	DL RDL	B stance RDL	SL RDL	Cable Hip Extension
Week 1	12	DL RDL	B stance RDL	SL RDL	Cable Hip Extension	Core	Cardio	Rest	DL RDL	B stance RDL	SL RDL	Cable Hip Extension

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Hamstring Programming

Week	Day	WEEK 1		WEEK 2		WEEK 3	
		MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
1	1	3 x 10	3 x 10	3 x 10	3 x 10	3 x 10	3 x 10
1	2	3 x 10	3 x 10	3 x 10	3 x 10	3 x 10	3 x 10
1	3	3 x 10	3 x 10	3 x 10	3 x 10	3 x 10	3 x 10
1	4	3 x 10	3 x 10	3 x 10	3 x 10	3 x 10	3 x 10
1	5	3 x 10	3 x 10	3 x 10	3 x 10	3 x 10	3 x 10
1	6	3 x 10	3 x 10	3 x 10	3 x 10	3 x 10	3 x 10
1	7	3 x 10	3 x 10	3 x 10	3 x 10	3 x 10	3 x 10
1	8	3 x 10	3 x 10	3 x 10	3 x 10	3 x 10	3 x 10
1	9	3 x 10	3 x 10	3 x 10	3 x 10	3 x 10	3 x 10
1	10	3 x 10	3 x 10	3 x 10	3 x 10	3 x 10	3 x 10
1	11	3 x 10	3 x 10	3 x 10	3 x 10	3 x 10	3 x 10
1	12	3 x 10	3 x 10	3 x 10	3 x 10	3 x 10	3 x 10

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DAY 2	DAY 4	DAY 7	DAY 10
DOUBLE LEG ECCENTRIC 3 SETS X 8 REPS X 30 PAIN	SINGLE LEG ECCENTRIC 3 SETS X 8 REPS EACH X 30 PAIN	SINGLE LEG 3 SETS X 8 REPS EACH X 30 PAIN	SINGLE LEG 3 SETS X 8 REPS EACH X 30 PAIN
DOUBLE LEG 3 SETS X 8 REPS X 30 PAIN	SINGLE LEG 3 SETS X 8 REPS EACH X 30 PAIN	WEIGHTED SINGLE LEG 3 SETS X 8 REPS EACH X 30 PAIN	WEIGHTED SINGLE LEG 3 SETS X 8 REPS EACH X 30 PAIN

E3 Rehab
Chris Hughson

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Running (Weeks 2-3)

- Running volume = 10-12km +
- Moderate running (over 75%) = ~ 600-1000m for a match
- Acceleration/ Deceleration
- Kicking, ground balls and sports specific skill work

Day/Phase	W	TH	FR	SA	SU
Week 1	<ul style="list-style-type: none"> • 2 sets, 10 x 100m in 10-12sec • 2 sets, 1000m, 10 x 10-12sec • 10 x 100m, 10 x 10-12sec • 10 x 100m, 10 x 10-12sec • 10 x 100m, 10 x 10-12sec • 10 x 100m, 10 x 10-12sec • 10 x 100m, 10 x 10-12sec • 10 x 100m, 10 x 10-12sec • 10 x 100m, 10 x 10-12sec • 10 x 100m, 10 x 10-12sec 				
Week 2					
Week 3					

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WEEK 4

- Hitting speed numbers
 - Max speed exposures
 - Meters above 85% = 30-60m
 - Meters above 90% = 10-30m
- Full training
- Return to play

WEEK 4 TIPS

- No new additions to the gym program
- Optimize recovery: Schedule 2 days clear post a high eccentric / high strain activity
- Plan for the coming weeks around consistency
 - Prevention focus

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WHEN IS MY ATHLETE READY TO SPRINT?

- NIL CLINICAL SIGNS ✓
- ROM OPTIMAL ✓
- FULL ISOMETRIC POWER ✓
- NIL NEGATIVE RESPONSE TO PREVIOUS RUN EXPOSURE ✓
- FULL ECCENTRIC POWER ✓

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ALTERNATIVE ISOMETRIC TESTING


Prone ISO 90/20 Test Hip ISO PUSH

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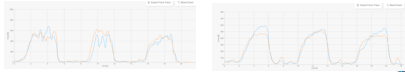
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ECCENTRIC TESTING

1. PRONE MID RANGE ECC
2. MHFAKE BRAKE
3. NORDIC TEST



TEST	REPS	1RM	5RM	10RM
CONCENTRIC				
ECCENTRIC				



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Return to Training & Play

- It should take care of itself by your rehab process....
- Clinical Markers ✓
- Tissue healing time ✓
- Eccentric strength markers ✓
- Gym Strength benchmarks ✓
- Running volume, moderate speed running & Sports Specific ✓
- Max speed exposures & meters ✓
- Confidence ✓
- FULL TRAINING ✓
- RTP ✓

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Summary

SPRINT PRESCRIPTION & DOSEAGE
 TARGETED HAMSTRING ADAPTATION
 SPORTS SPECIFIC RUNNING
 CLINICAL TESTING
 GLOBAL STRENGTH
 STRAIN REDUCTION
 MANUAL THERAPY
 OTHER

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Hamstring Resources

MASTERCLASSES

- Dean Butler - Return to Play & Hamstring Function**
- Jordan Mordguchis - Hamstring Rehabilitation**
- Coming in 2025: Bryan Heiderscheit, Fearghal Kerin, Nick Court**

PODCASTS

- Dr. Scott Cook, Dr. James Cook, Dr. James Cook, Dr. James Cook**
- Dr. James Cook, Dr. James Cook, Dr. James Cook, Dr. James Cook**

SOLVING SOFT TISSUE INJURIES
A SPORTS MAP NETWORK PODCAST

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FOOT & ANKLE SHOWCASE

FREE ONLINE



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