Hamstring Injury Research

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Covered today…

- Risk Factors
- Exercise Selection
- HSR
- Rehab protocols

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Risk Factors

- Non-modifiable
  - PMH
  - Age

- Modifiable
  - Strength
  - Architecture
  - Prolonged neurological deficits
  - Exposure to HSR

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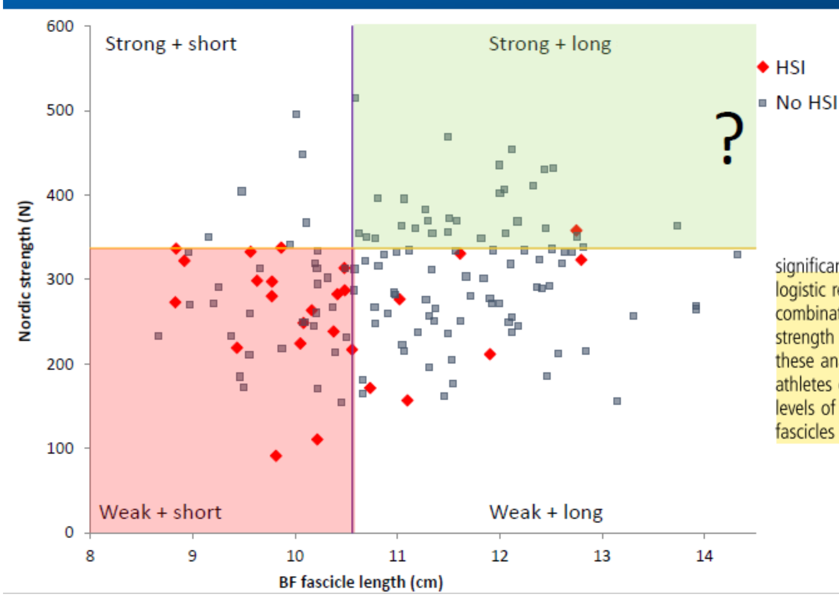
The hamstring quadrant of doom!!!



significantly increased the risk of a HSI. Multivariate logistic regression revealed significant effects when combinations of age, history of HSI, eccentric knee flexor strength and BFlh fascicle length were explored. From these analyses the likelihood of a future HSI in older athletes or those with a HSI history was reduced if high levels of eccentric knee flexor strength and longer BFlh fascicles were present.

Timmins et al., 2016b

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Risk Factors

- Prolonged deficits in previously injured participants:
  - ↓ torque and sEMG prev inj'd – up to 18 months (Opar et al., 2013)
  - Centralised effects of peripheral injury (Buhmann et al., *under preparation*)

Queensland University of Technology

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Exercise Selection

- Askling L Protocol
- The Extender, Diver, Glider

Askling et al., 2013

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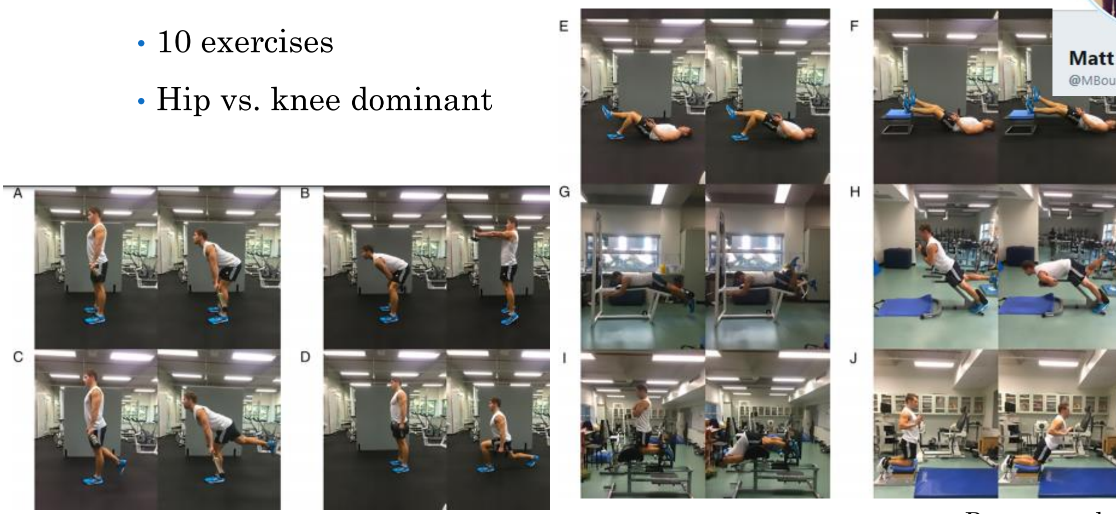
Exercise Selection

- 10 exercises
- Hip vs. knee dominant



Bourne et al., 2017

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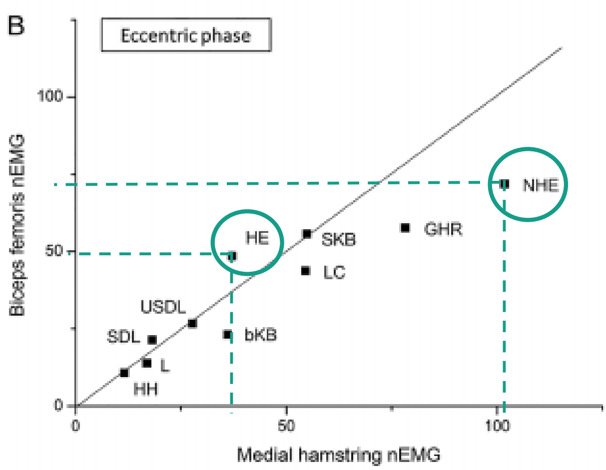
Exercise Selection



Bourne et al., 2017

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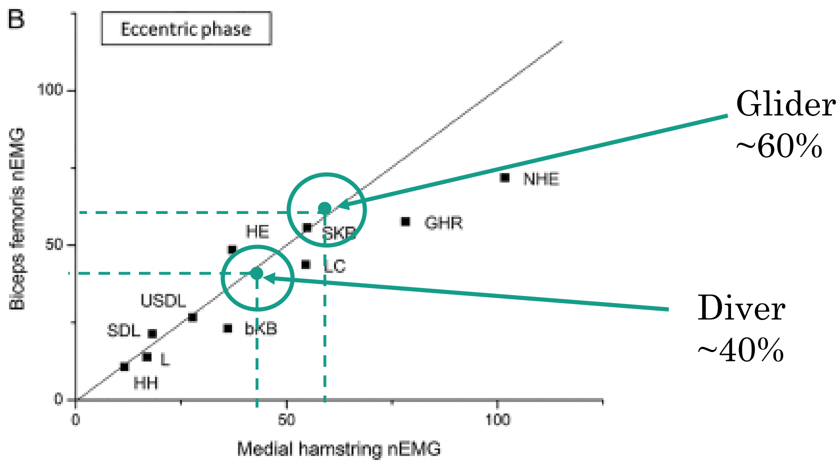
Exercise Selection



Bourne et al., 2017
Askling et al., 2013

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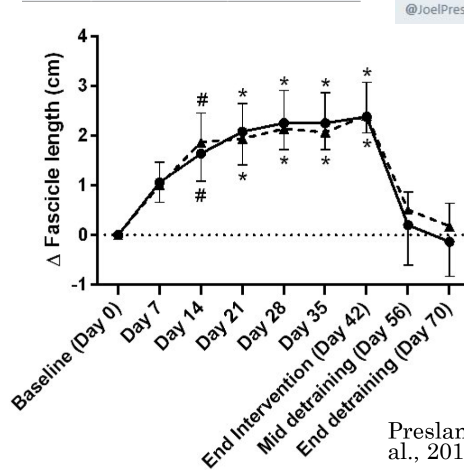
Exercise Volume

Week	High volume (reps)	Low volume (reps)
1	48	48
2	48	48
3	64	8
4	80	8
5	100	8
6	100	8

- High vol versus low vol group
- Completed NHE
- OM: BFlh architecture, strength

- No diff between high and low load groups



Presland et al., 2018

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Incorporating exercise - Timing

- NHE pre vs. post training
- Both groups increased eccentric strength and voluntary activation
- Only pre-training group → ↑ FL

- IPPs with eccentrics can be delivered early in micro-cycle (match day + 1)
- Mid-week → soreness day before match in 6 day cycle

Lovell et al., 2017, 2018

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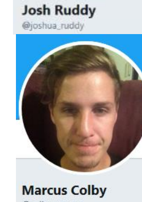
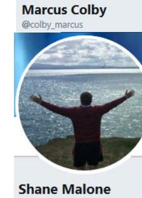
HSI & Running





- Consistent theme
  - AFL and soccer (Duhig et al., 2016; Ruddy et al., 2018; Colby et el., 2018; Malone et al., 2016)
- Too much exposure = bad
- Too little exposure = worse

- Avoid sharp spikes or declines
- Progressive exposure

<u>Goldilocks</u>

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Running exposure in rehab

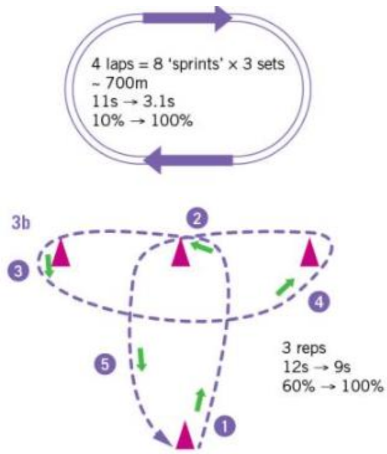

TABLE 2. Nine stage progressive running protocol.

Stage	Acceleration phase (Intensity/distance)	Hold phase (Intensity/distance)	Deceleration phase (Intensity/distance)
1	Walk/20m	Jog/10m	Walk/20m
2	Walk/15m	Jog/20m	Walk/15m
3	Walk/10m	Jog/30m	Walk/10m
4	Jog/20m	Run/10m	Jog/20m
5	Jog/15m	Run/20m	Jog/15m
6	Jog/10m	Run/30m	Jog/10m
7	Run/20m	Sprint/10m	Run/20m
8	Run/15m	Sprint/20m	Run/15m
9	Run/10m	Sprint/30m	Run/10m

Walk = regular gait; Jog <50% of perceived maximal running speed; Run <70% perceived maximal running speed; Sprint >90% of perceived maximal running speed.

Hickey et al., 2019

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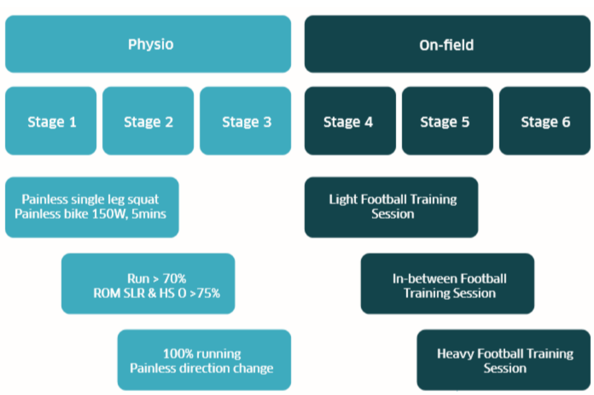
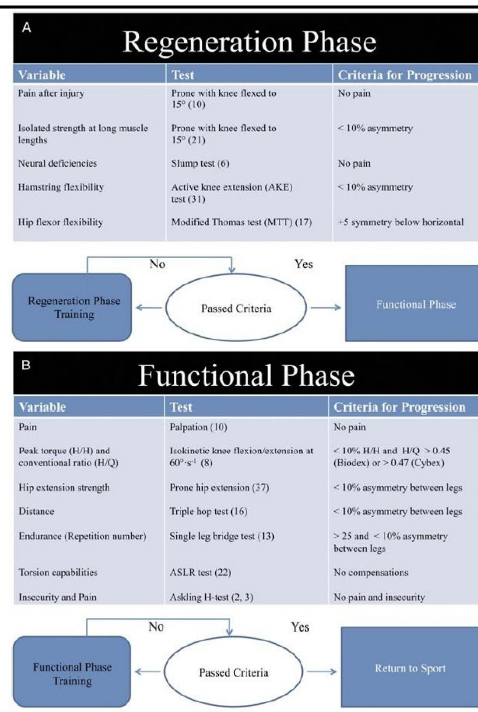
Rehab

- Criteria/time based vs symptom based
- Aspetar Protocol, Mendiguchia algorithm





A

Regeneration Phase

Variable	Test	Criteria for Progression
Pain after injury	Prone with knee flexed to 15° (10)	No pain
Isolated strength at long muscle lengths	Prone with knee flexed to 15° (21)	< 10% asymmetry
Neural deficiencies	Slump test (6)	No pain
Hamstring flexibility	Active knee extension (AKE) test (31)	< 10% asymmetry
Hip flexor flexibility	Modified Thomas test (MTT) (17)	+5 symmetry below horizontal

B

Functional Phase

Variable	Test	Criteria for Progression
Pain	Palpation (10)	No pain
Peak torque (H/H) and conventional ratio (H/Q)	Isokinetic knee flexion/extension at $60°\cdot s^{-1}$ (8)	< 10% H/H and H/Q > 0.45 (Biodex) or > 0.47 (Cybex)
Hip extension strength	Prone hip extension (37)	< 10% asymmetry between legs
Distance	Triple hop test (16)	< 10% asymmetry between legs
Endurance (Repetition number)	Single leg bridge test (13)	> 25 and < 10% asymmetry between legs
Torsion capabilities	ASLR test (22)	No compensations
Insecurity and Pain	Askling H-test (2, 3)	No pain and insecurity

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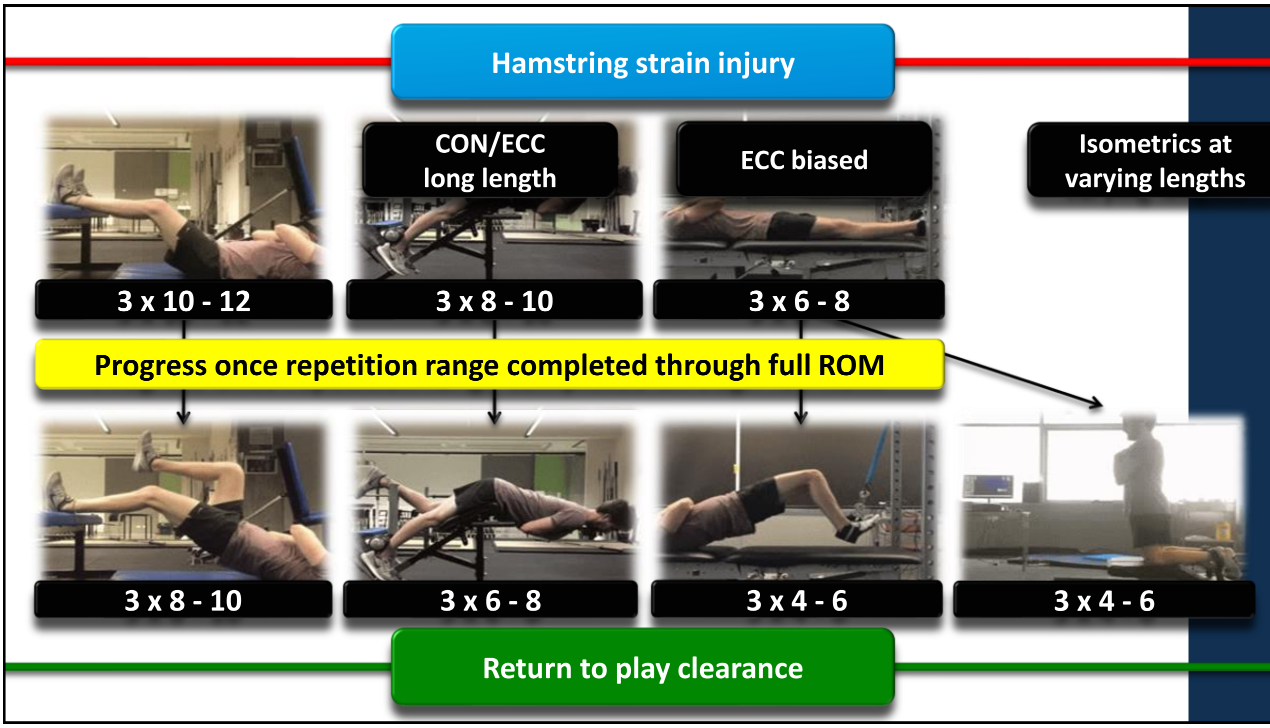

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I'm not here to sell you Nordics but…

Sports Med (2017) 47:907–916
DOI 10.1007/s40279-016-0638-2

CrossMark

SYSTEMATIC REVIEW

Effect of Injury Prevention Programs that Include the Nordic Hamstring Exercise on Hamstring Injury Rates in Soccer Players: A Systematic Review and Meta-Analysis

Wesam Saleh A. Al Attar[1,2,3] · Najeebullah Soomro[1,4] · Peter J. Sinclair[1] · Evangelos Pappas[2] · Ross H. Sanders[1]

51% reduction in risk

RR = 0.49

Including the Nordic hamstring exercise in injury prevention programmes halves the rate of hamstring injuries: a systematic review and meta-analysis of 8459 athletes

Nicol van Dyk,[1] Fearghal P Behan,[2] Rod Whiteley[3]

Br J Sports Med 2019;**0**:1–10. doi:10.1136/bjsports-2018-100045

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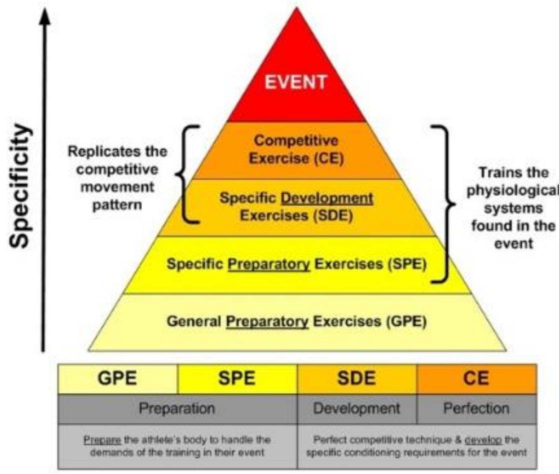
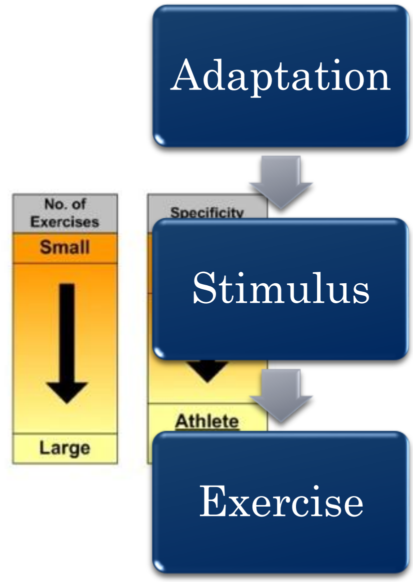
Programming





Bondarchuk, 2007

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Summary

- Consider modifiable risk factors
- In prev inj, need to consider prolonged effects
- Exercise selection – muscle bias?
- Low volume effective in supramax ex
- HSR – Goldilocks approach
- Rehab – early loading, early adaptation

Final note: exposure is great, adherence is key.

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