MITIGATING HAMSTRING INJURIES IN THE SPRINTS

Landon Evans
University of IOWA
I have no financial relationship to the audience
We share the positives and negatives that are associated with this endeavor. But ultimately we work to find ways to be less wrong and have the courage to make our decisions.

We are a team.
... AND A SPECIAL THANK YOU TO

JOEY WOODY
1. What this talk is not

2. Setting the philosophical stage

3. Current strategies in place

4. In process for deployment

5. Closing
WHAT THIS IS NOT

HAMSTRING RECIPE

1) Do Nordics
2) Do more Nordics
   2b) Check leg length
3) Do some more of 1 and 2.
Philosophical stage

Current strategies

In process

Closing

• We are so clumsy at times
  • Biases
• Reductionism vs Holism
• Research findings and replication issues
• Risks, Patterns, Uncertainty
• Medicalization vs Performance Minded (Knowles)
• Load > Capacity = Injury (Dye, 2001, 2005)
• Readiness
• Monitoring often, but assessments are useful
• Everyone can throw gas on the fire. No one has a free pass
• “Would you have your child do this?”
GAINING CONFIDENCE

Philosophical stage
Current strategies
In process
Closing

Henk Kraaijenhof

2017 USTFCCCA NATIONAL CONFERENCE
Philosophical stage

Current strategies

In process

Closing

GAINING CONFIDENCE

Alan St Clair Gibson @ziggibbon · 21 Aug 2014
@DrMarkBurnley In my opinion, complexity and emergence research is the absolute future of and for physiology and neuroscience....

Alan St Clair Gibson @ziggibbon · 21 Aug 2014
@DrMarkBurnley Linear research studies (ie just about all research) are 'straight-jacketing' our understanding of physiological systems....

Alan St Clair Gibson @ziggibbon · 21 Aug 2014
@DrMarkBurnley The next brave generation of physiology researchers really does not to embrace these concepts and type of research...

11:37 AM · 21 Aug 2014 · Details

Alan St Clair Gibson @ziggibbon · 21 Aug 2014
@DrMarkBurnley Wish I was 25 and starting my research career again with this knowledge.....
Philosophical stage

Current strategies

In process

Closing

Reductive

Components

You and I

Inter-relational dynamics

Systems Based

Philosophical stage

Current strategies

In process

Closing

Athlete #1

Athlete #2

Both NO INJURIES
Both 20.2 sec
Even though we are NOT certain of the right components …

Experience and formulating theories via pattern recognition cannot go under-appreciated!
Coaching and Culture

“A culture is no better than its woods” - WH Auden

What are the findings?

- There is a correlation between a head coach’s leadership style and the incidence of severe injuries and players’ availability.
- Teams whose coaches who tend to employ a transformational or democratic leadership style have a lower incidence of severe injuries in their teams. The correlation between the two explains 6% of total variation in the incidence of severe injuries.
- The incidence of severe injuries was 29%–40% lower in teams where coaches communicated a clear and positive vision of the future, supported staff members and gave staff encouragement and recognition.
- Attendance at training was higher in teams where coaches gave encouragement and recognised staff members, encouraged innovative thinking, fostered trust and cooperation among team members and acted as role models.

Matthew Effect
Consider the whole person
Musculoskeletal pain is influenced by multiple factors including training load, sleep, stress, fatigue, attitudes, beliefs and mood, as well as structural morphology. Imaging findings are only one part of the jigsaw puzzle. These ‘non-structural’ factors influence the pain experience as well as tissue resilience and local sensitivity, reinforcing the need to carefully interpret aggravating patterns and physical examination tests. Modifiable factors such as these often represent more potent therapeutic targets than structural tissue changes.  

Peter O’Sullivan

Gisselman, 2016
Vilamitjana, 2014
Philosophical stage

Current strategies

In process

Closing

Philosophical stage

Current strategies

In process

Closing
Integrated Planning

Philosophical stage
Current strategies
In process
Closing

2-4 weeks at a time, a lot of communication and reflection. No special sequence, but operate with:

General -> Specific & Weakness -> Strengths & Vertically Integrated
Philosophical stage

Current strategies

In process

Closing
I suppose I should say something about the Hamstrings
Hamstring Risk Factors

These are just components, but we place emphasis on them without truly knowing their relationship amongst all other components.

• Non-modifiable
  • Previous injury and AMI
  • Structural
  • Age
  • Gender
  • Genetics

• Modifiable
  • Lifestyle
  • Not exposed to the fire
  • Training load errors
  • Mechanics:
    • Pelvis position and range
    • Ankle position and range
    • Limb dominance (Kinematic & Kinetic)
    • FH0
  • Eccentric Hamstring strength
  • Fascicle Length

Temporal relationships?

Bittencourt, N. F. N.(2016)
Reductionist Examples

Philosophical stage

Current strategies

In process

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Timmins (2016) MSSE

Opar (2015) MSSE

Timmins 2016 BJSM
RESEARCH ARTICLE
Built for speed: musculoskeletal structure and sprinting ability
Sabrina S. M. Lee, Stephen J. Piazza

Sprint performance is related to muscle fascicle length in male 100-m sprinters.
Kumagai K¹, Abe T, Brechue WF, Ryushi T, Takano S, Mizuno M.

& possibly not doing anything like this:
So … are these helpful for sprinters?

They definitely can.

Dealing with uncertainty, these findings may help cover up other components and may help protect the athlete.

But …
Zoom out and look at the overall plan.

These can be useful strategies to put in place when you’re not eliciting specific adaptations to tissues in the coordinative sense of sprinting.

General → Specific
GPP of tissue → SPP of tissue
Assumptions, then logic chain. This has a ways to go.

But, I see no reason why you can’t implement isometrics in your GPE and SPE selections.
Philosophical stage

Current strategies

In process

Closing

Normalized Distribution

Legend

GPE  SPE  SDE  CE
Tissue Homeostasis

Dye, 2001
Tissue Homeostasis

Dye, 2001
Muscles prefer forces, brakes, motors, springs, transfer forces
Tendons do well with speed, act like springs, shock absorber

John Kiely
Philosophical stage

Current strategies

In process

Closing

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<th>JUN</th>
<th>JUL</th>
<th>AUG</th>
<th>SEPT</th>
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<td>X</td>
<td>XX</td>
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</table>

Some of the GPE/SPE Used this year so far:

- **High Speed Ballistics**: Trap Bar Jumps, Weighted Rocket Jumps, Submaximal olympic variations
- **High Force Ballistics**: Heavier TB Jumps, Heavier olympic variations
- **High Force Isometrics**: Hip bridges (bands), inverted planks, DB stork holds, split lunge
- **High Speed Isometrics**: Straight Leg Physioball/4D Extensions, Supine, SL Straight Leg Drops
- **Low Force Isometrics**: Split lunge, rear-foot elevated split squat
- **Supramax Eccentrics**: 2/1 RDL, 2/1 Back extensions, Nordic curls
- **Submax Eccentrics**: Front squat, back squat, deadlift, RDL, etc (all of our classic static lifts)
- **High Force Concentric**: Front Squat, Back Squat, Deadlift, RDL
- **Strength Endurance**: GS & BB Circuits

Influenced by:
Keitaro Kubo, Christian Thibaudeau, John Kiely, Angus Ross, Jill Cook, Jeremy Lewis
Other possible helpful clues ...

Philosophical stage

Current strategies

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![Graph showing the relationship between average peak Nordic strength and average biceps femoris fascicle length, with quadrants labeled Long and weak, Long and Strong, Short and weak, and Short and strong. The graph includes data points for High Volume Post and Low Volume Post training conditions.]
Why We Monitor?

“The responses from any training will not result in readily predictable fitness outcomes.” John Kiely
Philosophical stage

Current strategies

In process

Closing

Wellness Questionnaire

Date: 2016-09-0

Duration of Sleep:

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>3</td>
<td>8+ Hours</td>
</tr>
<tr>
<td>1</td>
<td>None</td>
</tr>
</tbody>
</table>

Rate the quality of your sleep:

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
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<tbody>
<tr>
<td>3</td>
<td>Can't Sleep</td>
</tr>
<tr>
<td>1</td>
<td>Very Rested</td>
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</tbody>
</table>

Rate your nutrition from yesterday:

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Skipped Meals/Junk Food</td>
</tr>
<tr>
<td>1</td>
<td>Very Healthy</td>
</tr>
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Rate your level of fatigue:

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>High</td>
</tr>
<tr>
<td>1</td>
<td>Low</td>
</tr>
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Rate your level of stress:

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<th>Description</th>
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</thead>
<tbody>
<tr>
<td>3</td>
<td>High</td>
</tr>
<tr>
<td>1</td>
<td>Low</td>
</tr>
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</table>

Rate your level of muscle soreness:

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<thead>
<tr>
<th>Rating</th>
<th>Description</th>
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<tbody>
<tr>
<td>3</td>
<td>Can't Move</td>
</tr>
<tr>
<td>1</td>
<td>None</td>
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</table>

Wellness Composite Score:

Comments:

HAMSTRING (RIGHT) SORENESS

Pain: NO

5

Low

High
Philosophical stage

Current strategies

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Omegawave

Windows of Trainability™

Endurance  Speed & Power  Strength  Coordination & Skill

Go  No

Endurance  Speed & Power  Strength  Coordination & Skill

Go  No
If hamstrings are of concern, local monitoring can help aid the subjective.
Tensiomyography (TMG)

Philosophical stage

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MITIGATING HAMSTRING INJURIES IN THE SPRINTS
Simple rule -> No high risk tasks

Female Sprinter (Chronic Hamstring Strain Injuries)

Philosophical stage
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# Plan B

<table>
<thead>
<tr>
<th>INITIAL THEME</th>
<th>A</th>
<th>B - Hamstring</th>
<th>B - Ankle/foot</th>
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</thead>
<tbody>
<tr>
<td>ACCELERATION DEVELOPMENT</td>
<td>[3-4]x[3-4]x30m 3 min RRI 6 min SRI</td>
<td>DRIBBLES over ANKLE or CALF</td>
<td>RESISTED BIKE SPRINTS</td>
</tr>
<tr>
<td></td>
<td>4x4x40-50m 3 min RRI 5-6 min SRI</td>
<td>4x6x10-15s 1.5-2 min RRI 4-6 min SRI</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B - Sympathetic</th>
<th>B - Wellness Composite</th>
<th>B - DC Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>If significant or long lasting, drop to extensive tempo</td>
<td>See sympathetic suggestions</td>
<td>HOW ARE MUSCLES?</td>
</tr>
<tr>
<td>[1-2]x[3-4]x30m 3 min RRI 6 min SRI</td>
<td>Look at specific question scores</td>
<td>Sleep? Anxiety?</td>
</tr>
</tbody>
</table>
Zero Resources?

- Your eye, your relationships, your culture, and your aptitude are >>>>>> shiny tools.
- What risk factors can you influence?
  - Low hanging fruit for us is still lifestyle. Attack that.
  - Previous injury histories really matter.
  - Internal (psychophysiological parameters) are big.
- Simple plans. “Basics before biometrics!”
- Avoid training load spikes. Biology takes time.
- Consider lowering density
- Consider chopping daily volumes
- Free subjective wellness tools (Google Forms -> Excel Dashboard for quick analysis)
  - Need help? Email me.
- Microcycle design, timing, and compatible tasks
- Statistics primer, or get statistics student/department to help
Moving forward ...

Trying to deal with this

Philosophical stage
Current strategies
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Closing

Emerging Pattern
(Injury or Adaptation)

Regularities
(Risk or Protective Profile)

Web of Determinants

Bittencourt, N. F. N. (2016)
Philosophical stage
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Dynamic Bayesian Belief Network

Peterson, Evans
Unpublished
Philosophical stage

Current strategies

In process

Closing

Mitigation Formula

- Thinking systems based
- Culture and your relationships
- Appreciate your experience, but search to falsify
- Frequent monitoring with simple decision trees
- Calculate risk inductively
Sincere thank you to everyone.

Any questions?

Twitter: landon_evans
Email: landon-evans@uiowa.edu