- Unload, Rebuild, Reload; Managing the Injured Runner
- **Presenter**: Dr. Jason Soncrant, DPT, DSc. SCS, FAAOMPT

Objectives

1. Analyze biomechanical and training load factors contributing to common running-related injuries.
2. Identify key risk factors for running injury recurrence and strategies for primary and secondary injury prevention.
3. Compare evidence-based treatment approaches for high-prevalence running injuries (tendinopathies, stress reactions, overuse syndromes).

The Road to Ruin: Epidemiology of Running Related Injures

Review

A systematic review of running-related musculoskeletal injuries in runners

Nicolas Kakouris, Numan Yener, Daniel T.P. Fong*

National Centre for Sport and Exercise Medicine, School of Sport, Exercise and Health Sciences, Loughborough University, Loughborough, LE11 3TU, UK

Received 12 September 2020; revised 28 December 2020; accepted 3 February 2021
Available online 20 April 2021

Table 1
Injury prevalence and incidence of non-ultramarathoners and ultramarathoners categorized by different anatomic locations.

	Non-ultramarathoners						Ultramarathoners		
Location	Prevalence proportion (*n* (%))	Range (%)	Studies	Incidence proportion (*n* (%))	Range (%)	Studies	Incidence proportion (*n* (%))	Range (%)	Studies
Knee	3919 (31.2)	11.6–48.0	9, 28, 31, 34, 44, 45, 47–60	1036 (26.2)	14.3–36.4	20, 21, 23–39	39 (28.1)	19.4–41.7	40–43
Ankle	1669 (13.3)	6.1–34.2	9, 28, 31, 34, 44, 47–60	752 (19.0)	7.7–28.6	20, 21, 23–25, 27–39	48 (34.5)	28.1–48.1	40–43
Lower leg	2524 (20.1)	7.8–35.0	9, 28, 31, 34, 44, 45, 47–60	655 (16.6)	5.1–38.8	20, 21, 23–39	18 (12.9)	8.3–14.8	40–43
Foot/toes	1810 (14.4)	5.2–34.9	9, 28, 31, 34, 44, 45, 47–60	535 (13.5)	2.9–36.1	20, 21, 23–39	6 (4.3)	5.6–6.3	42, 43
Hip/groin	877 (7.0)	4.0–14.5	9, 31, 34, 44, 45, 47, 48, 51, 53–55, 57–60	446 (11.3)	3.5–18.4	20, 23–27, 29–39	8 (5.8)	8.3–11.1	40, 41, 43
Thigh	862 (6.9)	1.5–32.0	9, 28, 31, 34, 44, 45, 47–49, 51, 53–60	315 (8.0)	2.0–14.3	20, 21, 23–38	12 (8.6)	8.3–11.1	40, 42, 43
Lower back	434 (3.5)	2.2–11.5	28, 44, 45, 47–49, 51, 54, 55, 58–60	108 (2.7)	1.5–15.2	20, 23–28, 32, 35, 36, 38	6 (4.3)	5.6–6.3	42, 43
Other	468 (3.7)	2.6–47.8	28, 34, 44, 51, 52, 55–58, 60	108 (2.7)	2.1–19.0	21, 23, 25, 26, 28, 32, 34, 36, 38	2 (1.4)	3.1	42

Note: The sum of the percentages is not equal to 100% due to rounding.

Frandsen, Jesper Schuster Brandt, et al. "A Paradigm Shift in Understanding Overuse Running-Related Injuries: Findings From the Garmin-RUNSAFE Study Point to a Sudden Not Gradual Onset." *JOSPT Open* 3.1 (2025): 85-92

Based on our findings, most overuse injuries are likely to occur based on a sudden repetitive onset (eg, in 1 running session)

TABLE 2
Proportion of Runners Reporting a Problem in the Same Anatomical Location as the Overuse Injury Within 7, 14, 21, or 28 Days Prior to Injury Occurrence

Days Prior to Injury	Number of Runners Reporting a Problem in the Same Anatomical Location as Overuse Injury Occurrence	Number of Runners Reporting No Problems Prior to Overuse Injury Occurrence	Proportion of Runners Having Problems Prior to Overuse Injury	95% CI
1-7	83	1116	6.9%	5.5% to 8.4%
1-14	118	1081	9.8%	8.2% to 11.5%
1-21	126	1073	10.5%	8.7% to 12.2%
1-28	134	1065	11.1%	9.4% to 13.0%

Total number of reported first time injuries with anatomical location specified = 1199.
Abbreviation: CI, confidence interval.

COLLECTION REVIEW

Injuries in Runners; A Systematic Review on Risk Factors and Sex Differences

PLOS ONE | DOI:10.1371/journal.pone.0114937 February 23, 2015

- Strong and moderate evidence was found that a History of previous injury and of having used orthotics/inserts was associated with an increased risk of running injuries. Age, previous sports activity, running on a concrete surface, participating in a marathon, weekly running distance (30–39 miles) and wearing running shoes for 4 to 6 months were associated with a greater risk of injury in women than in men.

A history of previous injuries, having a running experience of 0–2 years, restarting running, weekly running distance (20–29 miles) and having a running distance of more than 40 miles per week were associated with a greater risk of running-related injury in men than in women.

Kakouris, N., Grigorakis, T. N., & Fousekis, K. (2021). Risk factors for overuse injuries in short- and long-distance running: A systematic review. *Physical Therapy in Sport, 48*, 10-21.

Consistently, **a previous running-related injury** is identified as the strongest and most consistent risk factor for future injuries in both groups. Other notable risk factors, often with moderate quality evidence, include:

- **Training characteristics:** Higher weekly running distance (for long-distance runners), inadequate recovery days, and rapid increases in training load.
- **Biomechanical factors:** Hip abductor weakness
- **Personal factors:** Higher BMI and potentially less running experience.

Running Injury Assessments

Runner Specific Patient History

Assessment Framework: Identify pertinent impairments for rehab and prevention of running related Injuries

Esculier JF, Bouyer LJ, Dubois B. Validity and reliability of lower limb assessment tools used in research on runners with knee pain. J Athl Train. 2020;55(2):169-175.

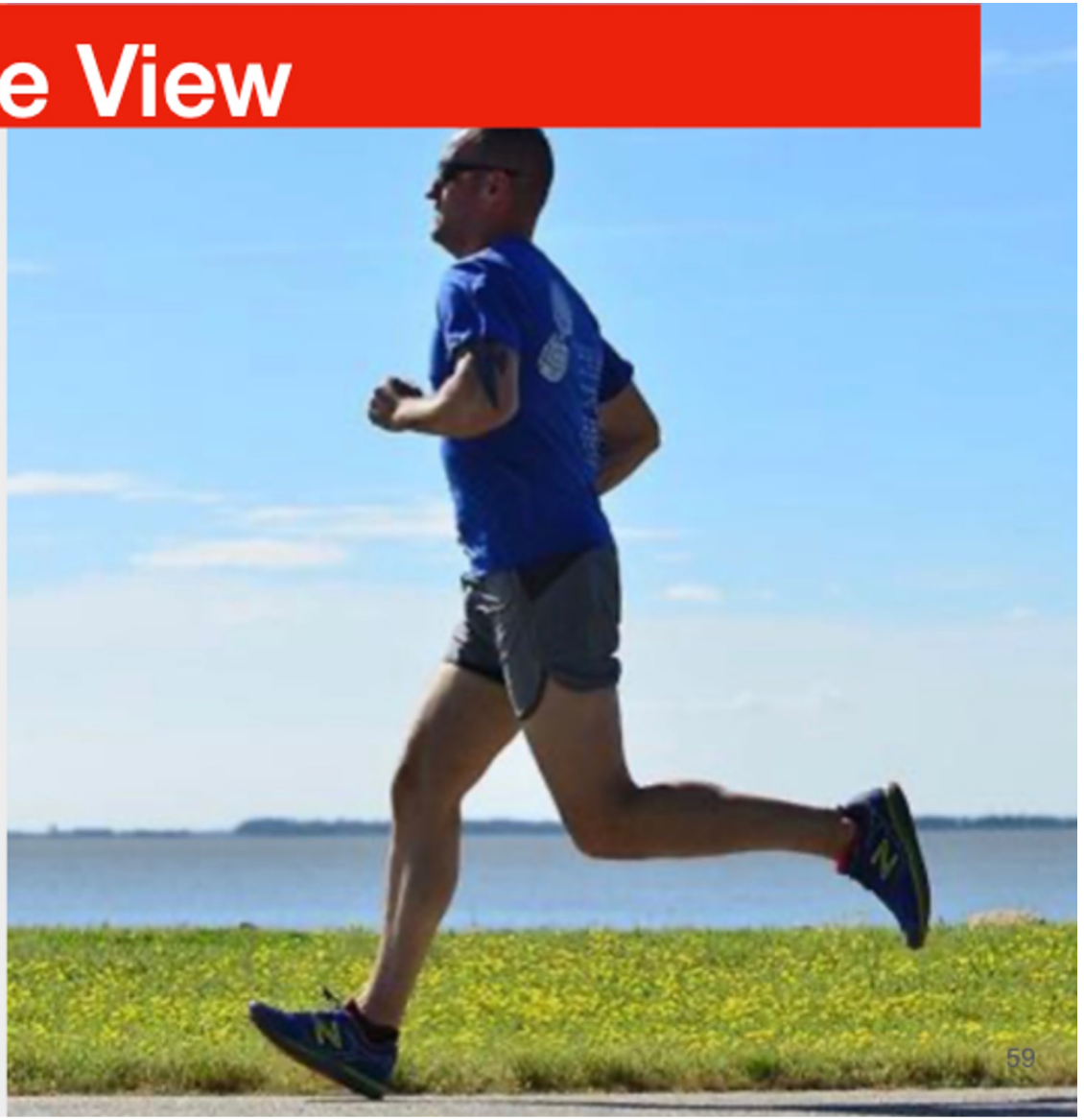
An Evidence-Based Videotaped Running Biomechanics Analysis

Richard B. Souza, PT, PhD, ATC, CSCS[a,b,c,*]

Key Phases & Joint Positions

Side View

- Start at Initial Contact
- Work from the bottom up.
- Start **BIG** and then look small.
- Named for the limb on the ground



Side View = 11 Data Points

LEFT	SIDE VIEW	RIGHT
Rear Mid Fore	**Foot Strike Pattern at IC**	Rear Mid Fore
DF Neutral PF	**Foot Inclination at IC**	DF Neutral PF
Extended Vertical Flexed	**Tibial Angle at LR**	Extended Vertical Flexed
Extended Neutral Flexed	**Knee Flexion at LR**	Extended Neutral Flexed
Extended Neutral Flexed	**Knee Flexion at MS**	Extended Neutral Flexed
Extended Vertical Flexed	**Trunk Lean at MS**	Extended Vertical Flexed
DF Neutral PF	**Ankle Position in MS**	DF Neutral PF
Flexed Neutral Extended	**Hip Extension at LS**	Flexed Neutral Extended
Min Mod Max	**Bounce MS to MS**	Min Mod Max
Overstride Normal Understride	**Stride Length at IC**	Overstride Normal Understride
Cadence:	**X = Steps per 15 or 30 seconds**	Cadence:

Rear View

- Start at Midstance
- Work from the bottom up.
- Start BIG and then look small.
- Name for the limb on the ground
- ZOOM In foot and ankle as needed.

Rear View: 11 Data Points

- **Base of Support**
- **Rear Foot Position**
- **Foot Progression**
- **Alignment (Ankle > Knee > Hip)**
- **Knee Window**
- **Pelvic Drop**
- **Trunk Position**
- **Arm Swing**

Hands-On Video Analysis Workshop

- Participants work in pairs
- 2D video analysis setup and recording techniques
- Identifying common gait deviations
- Documentation and interpretation methods
- Practice session with provided video samples

Evidence-Based Interventions for Common Injuries

Achilles tendinopathy protocols

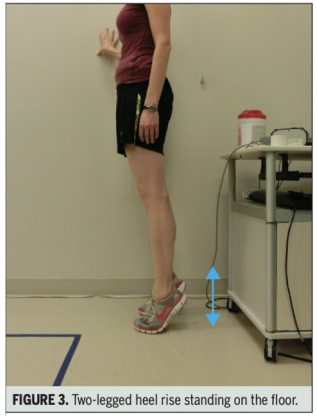


FIGURE 3. Two-legged heel rise standing on the floor.

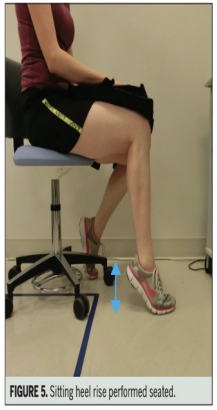


FIGURE 5. Sitting heel rise performed seated.

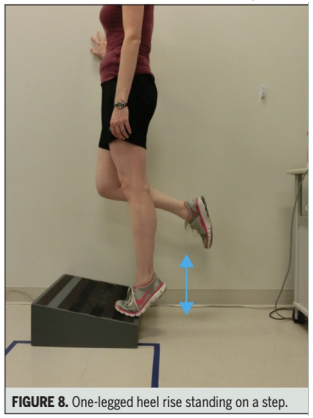


FIGURE 8. One-legged heel rise standing on a step.

Phase 1: Two Legged, one leg, Sitting eccentric heel raise (1-2 weeks)
Phase 2: Add Heel drop off step (2-5 weeks)
Phase 3: Add heavier reistance training, introduce running (3-12 weeks)
Phase 4: Maintance exercise 2-3 x week

Grävare Silbernagel, Karin, and Kay M. Crossley. "A proposed return-to-sport program for patients with midportion Achilles tendinopathy: rationale and implementation." *journal of orthopaedic & sports physical therapy* 45.11 (2015): 876-886.

Achilles tendinopathy protocols

3 x week > Full ROM
3 second concentric - 3 second eccentric
Starting at 3 x 15 with rest between sets
progressive increase load/decrease reps
Goal by week 9-12 at 3 x 6RM

Grävare Silbernagel, Karin, and Kay M. Crossley. "A proposed return-to-sport program for patients with midportion Achilles tendinopathy: rationale and implementation." *journal of orthopaedic & sports physical therapy* 45.11 (2015): 876-886.

Patellar Tendinopathy Protocols

- **Isometric knee extension** for pain relief: 5 sets × 45-s hold at 60 flexion at 80% MVC
- Heavy Slow Resistance (HSR) and Eccentric (ECC) training both have good long term results (1 year), so no need to do eccentric only
- **Eccentric Protocol**
  - 3x15 reps
  - Performed 2x/day for 12 weeks
  - Patients told soreness expected for first 1-2 weeks
  - The training was supposed to be painful, and when there was no pain in the patellar tendon during training, the load was to be increased
- **Heavy Slow Resistance Protocol**
  - 3x/week, 4x15 reps of 3 bilateral exercises from 0-90 flexion: (2–3-min rest between sets)

Rio, Ebonie, et al. "Isometric contractions are more analgesic than isotonic contractions for patellar tendon pain: an in-season randomized clinical trial." *Clinical Journal of Sport Medicine* 27.3 (2017): 253-259.
Kongsgaard, Mads, et al. "Corticosteroid injections, eccentric decline squat training and heavy slow resistance training in patellar tendinopathy." *Scandinavian journal of medicine & science in sports* 19.6 (2009): 790-802.
Malliaras, P., Cook, J., Purdam, C., & Rio, E. (2015). Patellar Tendinopathy: Clinical Diagnosis, Load Management, and Advice for Challenging Case Presentations. Journal of Orthopaedic & Sports Physical Therapy, 45(11), 887-898.

JOSPT INFOGRAPHIC

Diagnosing and Treating Patellofemoral Pain

J Orthop Sports Phys Ther 2021;51(6):316. doi:10.2519/jospt.2021.9001

KEYS TO RECOVERY

- Recovery can take time, often 12 weeks or more. People with patellofemoral pain for more than 2 months or with greater pain levels can expect a longer recovery.
- Focusing on progressive loading of the muscles around the hip and knee is important for full recovery.
- Gradually resume sports activities that heavily load the knee.
- Staying in shape and maintaining a healthy weight improve long-term recovery.

IMPORTANT: The study concluded that for patients with PFPS, **initial hip strengthening may lead to an earlier reduction in pain** compared to exercises that primarily focus on the quadriceps. This suggests that while both are important, prioritizing hip strength initially can offer faster pain relief

Dolak, K. L., Silkman, C., Medina McKeon, J., Hosey, R. G., Lattermann, C., & Uhl, T. L. (2011). Hip strengthening prior to functional exercises reduces pain sooner than quadriceps strengthening in females with patellofemoral pain syndrome: A randomized clinical trial. *Journal of Orthopaedic & Sports Physical Therapy, 41*(8), 560-570.

Distefano LJ, Blackburn JT, Marshall SW, Padua DA. Gluteal muscle activation during common therapeutic exercises. *J Orthop Sports Phys Ther*. 2009;39(7):532-540.

TABLE 2 Normalized Gluteus Medius Mean Signal Amplitude (% MVIC)

Exercise	Mean ± SD (95% CI)
Side-lying hip abduction	81 ± 42 (62, 101)
Single-limb squat	64 ± 24 (53, 75)
Lateral band walk	61 ± 34 (46, 76)
Single-limb deadlift	58 ± 25 (47, 70)
Sideways hop	57 ± 35 (41, 73)
Transverse hop*	48 ± 25 (37, 59)
Transverse lunge*	48 ± 21 (38, 57)
Forward hop*	45 ± 21 (38, 57)
Forward lunge*†	42 ± 21 (33, 52)
Clam with 30° hip flexion*	40 ± 38 (23, 57)
Sideways lunge*†	39 ± 19 (30, 47)
Clam with 60° hip flexion*†	38 ± 29 (25, 51)

TABLE 3 Normalized Gluteus Maximus Mean Signal Amplitude (% MVIC)

Exercise	Mean ± SD (95% CI)
Single-limb squat	59 ± 27 (47, 72)
Single-limb deadlift	59 ± 28 (46, 71)
Transverse lunge	49 ± 20 (39, 58)
Forward lunge	44 ± 23 (33, 54)
Sideways lunge	41 ± 20 (32, 50)
Side-lying hip abduction	39 ± 18 (31, 47)
Sideways hop	30 ± 19 (31, 48)
Clam with 60° hip flexion	39 ± 34 (24, 54)
Transverse hop*†	35 ± 16 (28, 43)
Forward hop*†	35 ± 22 (25, 45)
Clam with 30° hip flexion*†	34 ± 27 (21, 46)
Lateral band walk*†‡	27 ± 16 (20, 35)

Ayotte NW, Stetts DM, Keenan G, Greenway EH. Electromyographical analysis of selected lower extremity muscles during 5 unilateral weight-bearing exercises. *J Orthop Sports Phys Ther*. 2007;37(2):48-55.

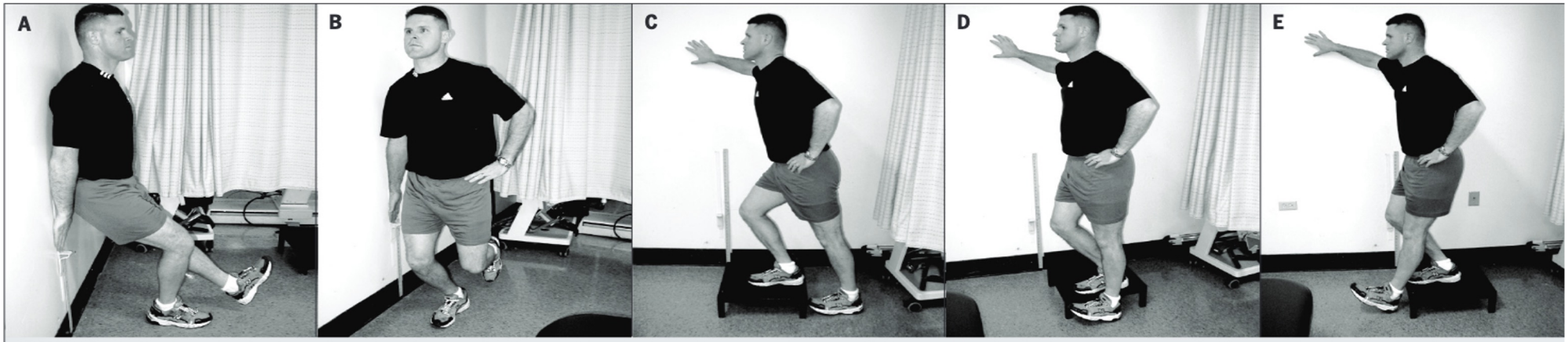


FIGURE 3. (A) Test position for the unilateral wall squat. (B) Test position for the unilateral mini-squat. (C) Test position for the forward step-up. (D) Test position for the lateral step-up. (E) Test position for the retro step-up. Note: The object on the wall at the subject's right hand served as guide to standardize the lowering height of 15.24 cm.

TABLE 2 NEMG Signal Amplitude for Each Muscle*

EXERCISE†	GMAX‡	GMED§	VMO‖	BF¶
1. Wall squat	86 ± 43 (9)	52 ± 22 (5)	66 ± 16 (3)	15 ± 8 (2)
2. Mini-squat	57 ± 44 (9)	36 ± 17 (4)	60 ± 17 (3)	11 ± 6 (1)
3. FSU	74 ± 43 (9)	44 ± 17 (4)	65 ± 17 (4)	12 ± 6 (1)
4. LSU	56 ± 29 (6)	38 ± 18 (4)	55 ± 12 (3)	9 ± 4 (1)
5. RSU	59 ± 35 (7)	37 ± 18 (4)	57 ± 17 (4)	10 ± 5 (1)

Core Training

1. Front Saw
2. Side Plank : stacked ; staggered; split (Dips)
3. (Elevated) Clams
4. Resisted Bridge > ISO Bridge > Heel Walk > SL Bridge
5. Airplanes
6. MB Twist (American & Russian)
7. Med Ball Routine: Fig-8, Wide Rotation, Tight Rotation, Over-The-Top

Summary of Recommendations

INTERVENTIONS – MANUAL THERAPY

A Clinicians should use manual therapy directed at the joints and soft tissue structures of the lower extremity to address relevant joint and flexibility restrictions, decrease pain, and improve function in individuals with plantar heel pain/plantar fasciitis.

INTERVENTIONS – STRETCHING

A Clinicians should use plantar fascia-specific and gastrocnemius/soleus stretching to provide short- and long-term pain reduction, as well as to improve short- and long-term function and disability.

INTERVENTIONS – THERAPEUTIC EXERCISE AND NEUROMUSCULAR RE-EDUCATION

B Clinicians should prescribe therapeutic exercise that includes resistance training for the musculature of the foot and ankle.

INTERVENTIONS – TAPING

A Clinicians should use foot taping techniques, either rigid or elastic, in conjunction with other physical therapy treatments for short-term improvements in pain and function in individuals with plantar fasciitis.

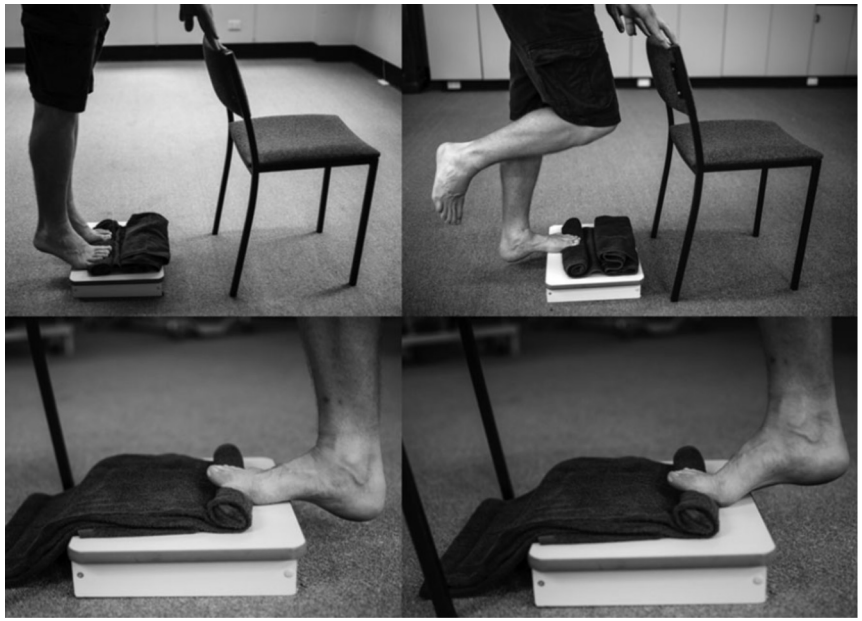
INTERVENTIONS – FOOT ORTHOSES

B Clinicians should not use orthoses, either prefabricated or custom fabricated/fitted, as an isolated treatment for short-term pain relief in individuals with plantar fasciitis.

C Clinicians may use orthoses, either prefabricated or custom fabricated/fitted, when combined with other treatments in individuals with heel pain/plantar fasciitis to reduce pain and improve function.

High-load strength training improves outcome in patients with plantar fasciitis: A randomized controlled trial with 12-month follow-up

M. S. Rathleff[1], C. M. Mølgaard[2], U. Fredberg[3], S. Kaalund[4], K. B. Andersen[3], T. T. Jensen[4], S. Aaskov[5]
J. L. Olesen[6,7]

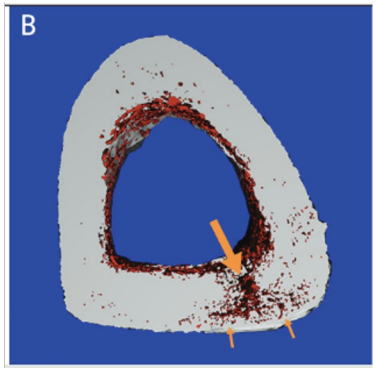


Warden, S. J., Edwards, W. B., & Willy, R. W. (2021). Optimal Load for Managing Low-Risk Tibial and Metatarsal Bone Stress Injuries in Runners: The Science Behind the Clinical Reasoning. *Journal of Orthopaedic & Sports Physical Therapy, 51*(3), 101–111.

"optimal load" – not complete rest, but a level of mechanical loading that promotes bone healing without causing further damage.

Key principles include

Managing load (often with initial reduction, but not necessarily full non-weight bearing for low-risk sites)
Maintaining fitness with pain-free cross-training
Addressing muscle function (e.g., hip and core strength),
Gradual, progressive return to running based on pain and clinical signs, rather than solely radiographic healing.
Reducing the risk by addressing underlying factors.



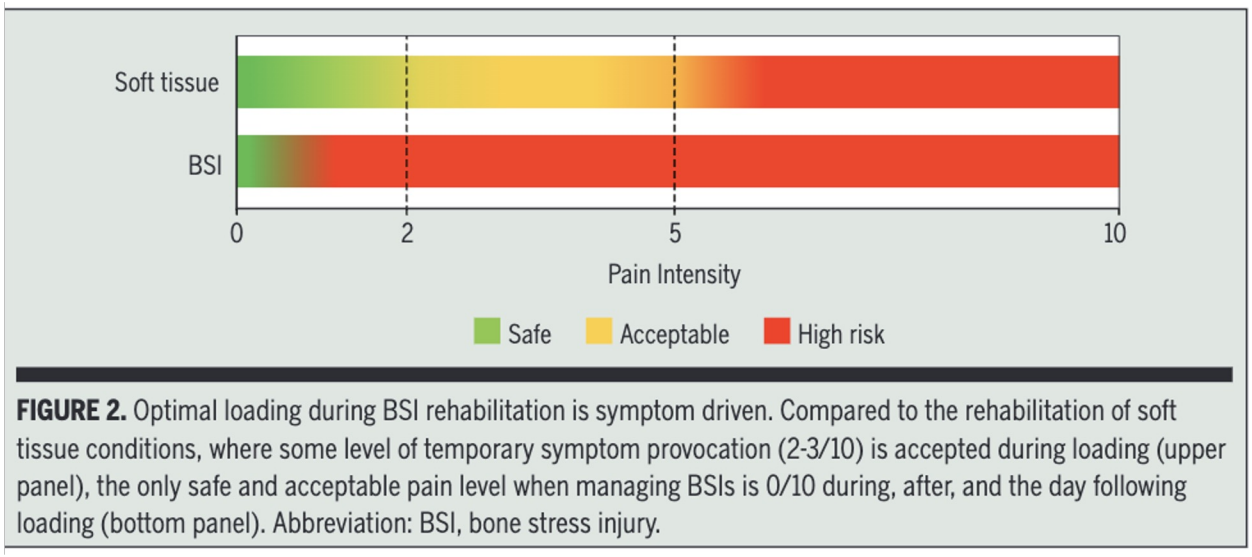


FIGURE 2. Optimal loading during BSI rehabilitation is symptom driven. Compared to the rehabilitation of soft tissue conditions, where some level of temporary symptom provocation (2-3/10) is accepted during loading (upper panel), the only safe and acceptable pain level when managing BSIs is 0/10 during, after, and the day following loading (bottom panel). Abbreviation: BSI, bone stress injury.

Table 2 Low and high risk stress fracture classification and Fredericson tibial MRI classification

Low risk classification	High risk classification	Fredericson classification for tibial stress fractures
• Heal with conservative treatment • Nonsurgical management • Compression stress fractures • Typically includes o Femoral shaft o Medial tibia o Fibula o Calcaneus o 1st–4th metatarsals	• Risk for complete fracture • Risk for nonunion • Delayed union • Typically requires surgical intervention • Requires nonweight-bearing or assisted weight-bearing • Tension stress fractures • Typically includes o 5th metatarsal o Anterior tibia o Tarsal navicular o Femoral neck o Patella o 1st metatarsal sesamoid	• Grade 1: periosteal edema only • Grade 2: bone marrow edema visible on T2-weighted images • Grade 3: bone marrow edema visible on both T1-weighted and T2-weighted images • Grade 4: intracortical signal abnormalities

Note: Data from Kaeding et al,[6] and Fredericson et al.[36]
Abbreviation: MRI, magnetic resonance imaging.

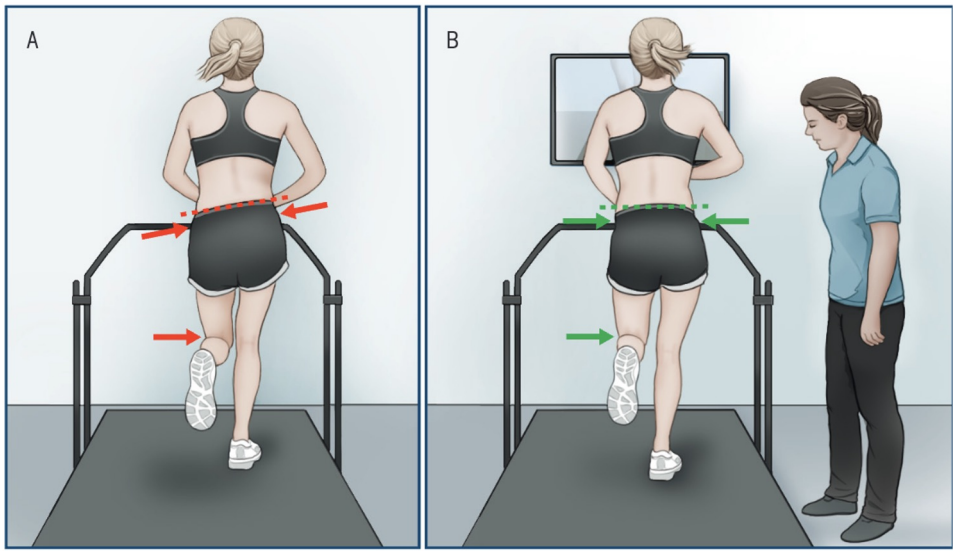
Gait Retaining Interventions

- It’s all about live feedback

Running

Improving Form to Reduce Injuries

J Orthop Sports Phys Ther 2015;45(8):585. doi:10.2519/jospt.2015.0503

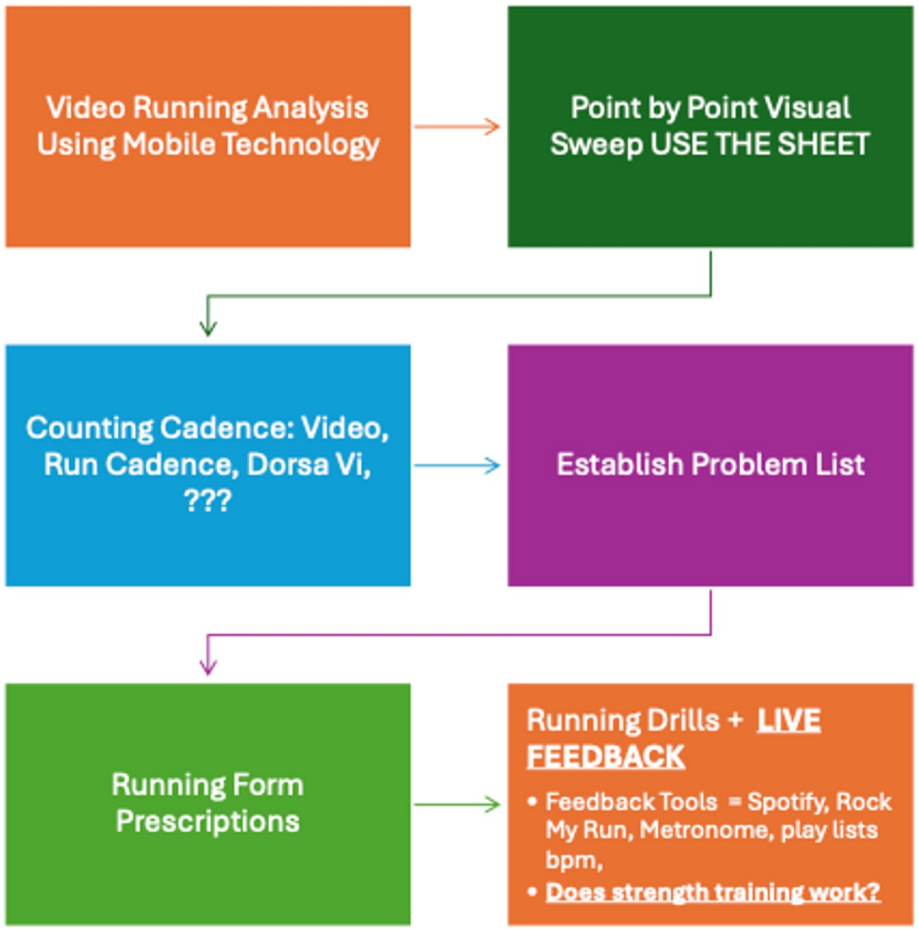


BENEFITS OF VISUAL AND AUDIO FEEDBACK. Evidence supports the use of real-time visual and audio feedback to improve running form. (A) The runner on the treadmill exhibits poor running form. (B) Visual feedback on the screen and audio cues from the physical therapist are used to provide the runner with the necessary feedback to improve her running mechanics.

NEW INSIGHTS

Researchers reviewed 974 published studies and identified 10 high- and medium-quality studies that examined the effectiveness of visual and audio feedback for improving running mechanics. Overall, the evidence supported the use of real-time feedback. Using feedback tools, physical therapists were able to help runners (1) decrease the force with which their feet hit the ground during running, and (2) improve running form at the hips, knees, and ankles. For visual feedback, runners watched themselves run in a mirror or viewed a video of their running while a physical therapist coached them on how to improve their form. Audio feedback consisted of verbal coaching from the physical therapist, or the use of simple tools such as a metronome, to improve running cadence.

Should I modify their running form?



Clin Biomech (Bristol, Avon). 2012 December ; 27(10): 1045–1051. doi:10.1016/j.clinbiomech.2012.07.011.

Mirror gait retraining for the treatment of patellofemoral pain in female runners

Richard W. Willy, PT, PhD[1,*], **John P. Scholz, PT, PhD**[2], and **Irene S. Davis, PT, PhD**[3]

[1]Division of Physical Therapy, Ohio University, Athens, OH, USA

[2]Department of Physical Therapy, University of Delaware, Newark, Delaware, USA

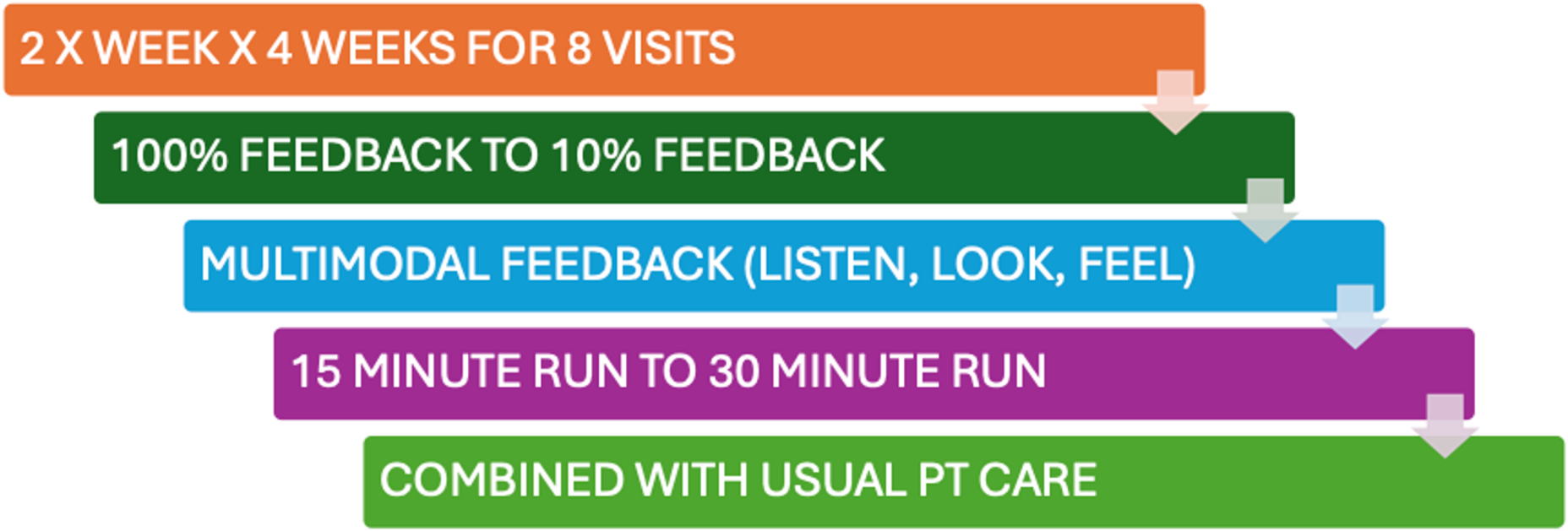
[3]Spaulding National Running Center, Harvard Medical School, Cambridge, MA, USA

ROY T.H. CHEUNG, PT, PhD[1] • IRENE S. DAVIS, PT, PhD[2]

Landing Pattern Modification to Improve Patellofemoral Pain in Runners: A Case Series

| DECEMBER 2011 | VOLUME 41 | NUMBER 12 | JOURNAL OF ORTHOPAEDIC & SPORTS PHYSICAL THERAPY

A Prescription for Changing Running Form



Running Scripts: Fault Reason Correction

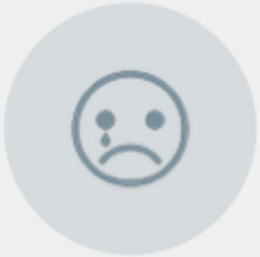
- Cadence = Metronome. 10% rule? “Run to the beat”
- Knee Valgus = Mirror or video = “Run with your knees out
- Heavy for strike & bounce = “ Run soft”. Cadence
- Crossover = “Run the rails”
- Poor Triple Extension = “ Drive not stride”
- Over stride = metronome, “get your feet on the ground, “Get your foot down fast”
- Arm Swing = “ hold pennies loosely”, “From pit to hip”

Load Management and Return-to-Running Protocols

- Long-term monitoring strategies
- Acute:chronic workload ratios
- Progressive overload in rehabilitation
- Monitoring tools and techniques
- Communication with coaches and athletes

WEEK	MON	TUE	WED	THU	FRI	SAT	SUN
1	Rest or run/walk	1.5 m run	Rest or run/walk	1.5 m run	Rest	1.5 m run	30 min walk
2	Rest or run/walk	1.75 m run	Rest or run/walk	1.5 m run	Rest	1.75 m run	35 min walk
3	Rest or run/walk	2 m run	Rest or run/walk	1.5 m run	Rest	2 m run	40 min walk
4	Rest or run/walk	2.25 m run	Rest or run/walk	1.5 m run	Rest	2.25 m run	45 min walk
5	Rest or run/walk	2.5 m run	Rest or run/walk	2 m run	Rest	2.5 m run	50 min walk
6	Rest or run/walk	2.75 m run	Rest or run/walk	2 m run	Rest	2.75 m run	55 min walk
7	Rest or run/walk	3 m run	Rest or run/walk	2 m run	Rest	3 m run	60 min walk
8	Rest or run/walk	3 m run	Rest or run/walk	2 m run	Rest	Rest	**5-K Race**

Know Your Numbers. Pre & Post Session



Pain 0-10

Fatigue 0-10

Soreness 0-10

Effort 0-10

PERCEIVED EXERTION

GOPHER Teach-nique

RATING	EXERTION LEVEL	TALK TEST	% OF MAX HR
10 9	DIFFICULT TO CONTINUE, ABLE TO MAINTAIN ONLY 10-30 SECONDS	CAN'T TALK, GASPING FOR BREATH	86% - 100%
8 7	UNCOMFORTABLE TO CONTINUE, BUT ABLE TO MAINTAIN FOR 5-10 MINUTES	BROKEN SENTENCES, HEAVY BREATHING	76% - 85%
6 5	EXERCISE IS TOUGH, BUT ABLE TO MAINTAIN FOR AT LEAST 30 MINUTES	ONLY ABLE TO COMPLETE 1-2 SENTENCES, MODERATE SHORTNESS OF BREATH	61% - 75%
4 3	COMFORTABLE TO MAINTAIN FOR AT LEAST 60 MINUTES	TAKES MORE EFFORT TO TALK, SLIGHT SHORTNESS OF BREATH	51% - 60%
2 1	COMFORTABLE TO MAINTAIN FOR AN EXTENDED PERIOD OF TIME	NORMAL TALKING AND BREATHING	40% - 50%

TABLE 3 Soreness Rules*

Criterion	Action
Soreness during warm-up that continues	2 days off, drop down 1 level
Soreness during warm-up that goes away	Stay at level that led to soreness
Soreness during warm-up that goes away but redevelops during session	2 days off, drop down 1 level
Soreness the day after lifting (not muscle soreness)	1 day off, do not advance program to the next level
No soreness	Advance 1 level per week or as instructed by healthcare professional

**Reprinted with permission from SAGE Publications: Fees M, Decker T, Snyder-Mackler L, Axe MJ. Upper extremity weight-training modifications for the injured athlete. A clinical perspective. Am J Sports Med. 1998;26(5):735. Copyright ©1998 SAGE Publications.*

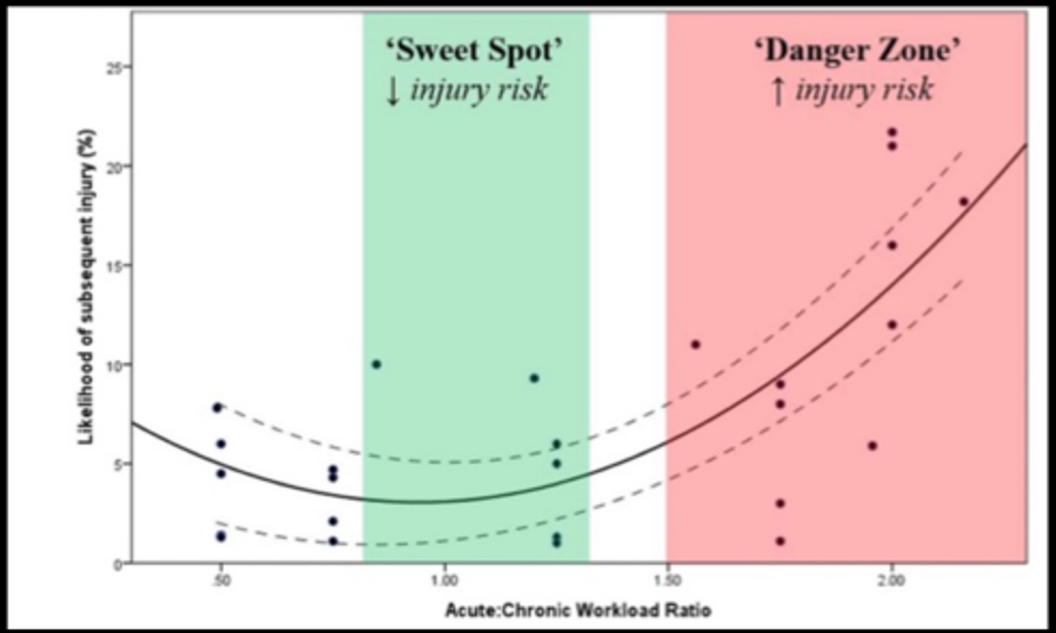
BJSM Online First, published on January 12, 2016 as 10.1136/bjsports-2015-095788

OPEN ACCESS

The training-injury prevention paradox: should athletes be training smarter *and* harder?

Tim J Gabbett[1,2]

Load # = RPE x minutes
3000-4000 per week (?)



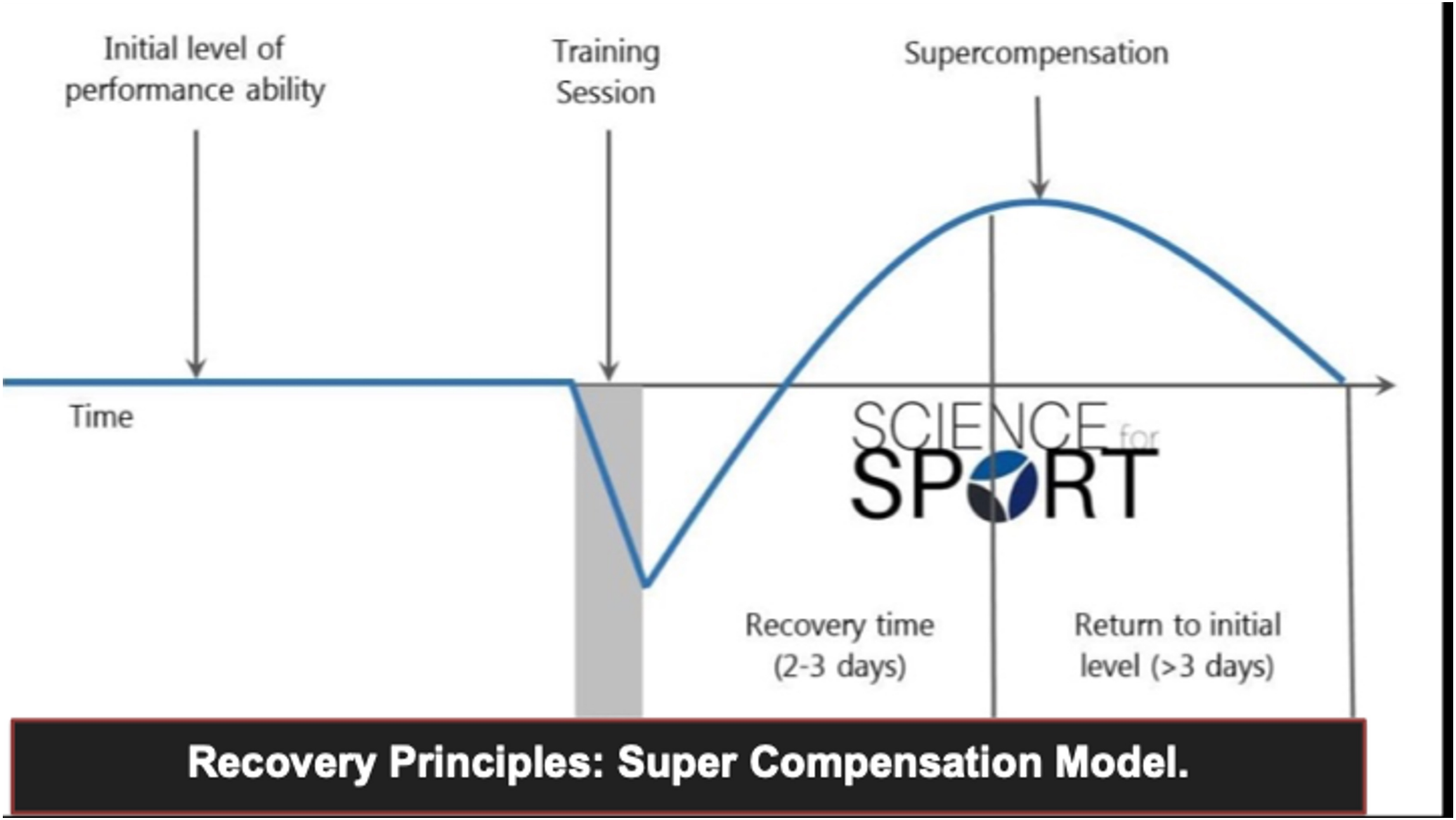
30 run min / 25 run min = 1.2
Acute:chronic workload ratios ≥1.5 represent the 'danger zone'.

Running

How to Safely Increase Your Mileage

J Orthop Sports Phys Ther 2014;44(10):748. doi:10.2519/jospt.2014.0506

RUNNING-RELATED INJURIES. A sudden increase in weekly running distance by more than 30% over a 2-week period may put runners at increased risk for developing patellofemoral pain (runner's knee), iliotibial band syndrome, medial tibial stress syndrome (shin splints), patellar tendinopathy (jumper's knee), greater trochanteric bursitis, and injury to the gluteus medius or tensor fascia latae.



Recovery Principles: Super Compensation Model.

Interactive Problem-Solving

- **Small Group Activity**: Teams of 3-4 participants
- Case presentations
- Integration of assessment, intervention, and progression planning
- Group discussion and solution sharing

Wrap-Up and Next Steps