



Building Robust Athletes

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Outline

Injury prevention and performance improvement;

- Load management
- Biomechanics
- Mobility work
- Muscle strength
- Tissue capacity
- Recovery

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What do we mean by robust athletes?



STRONG



HEALTHY

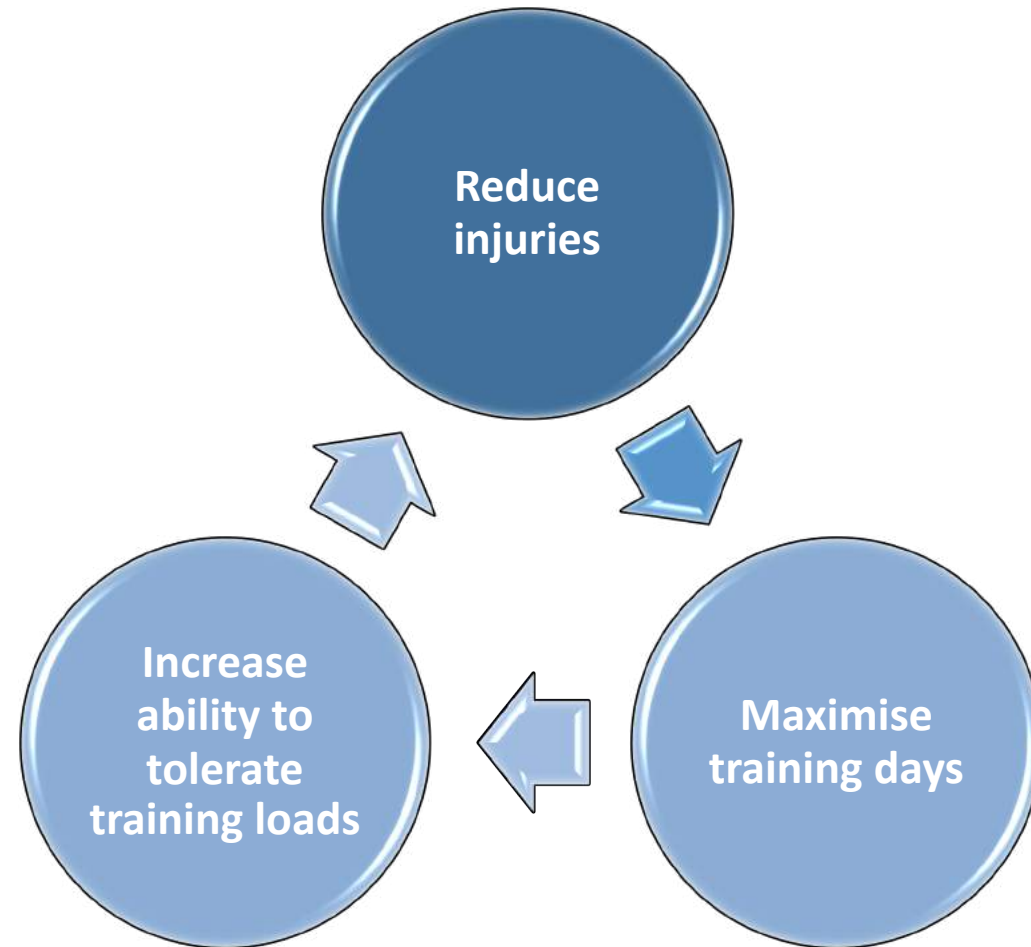


STRONGLY
CONSTRUCTED



STURDY

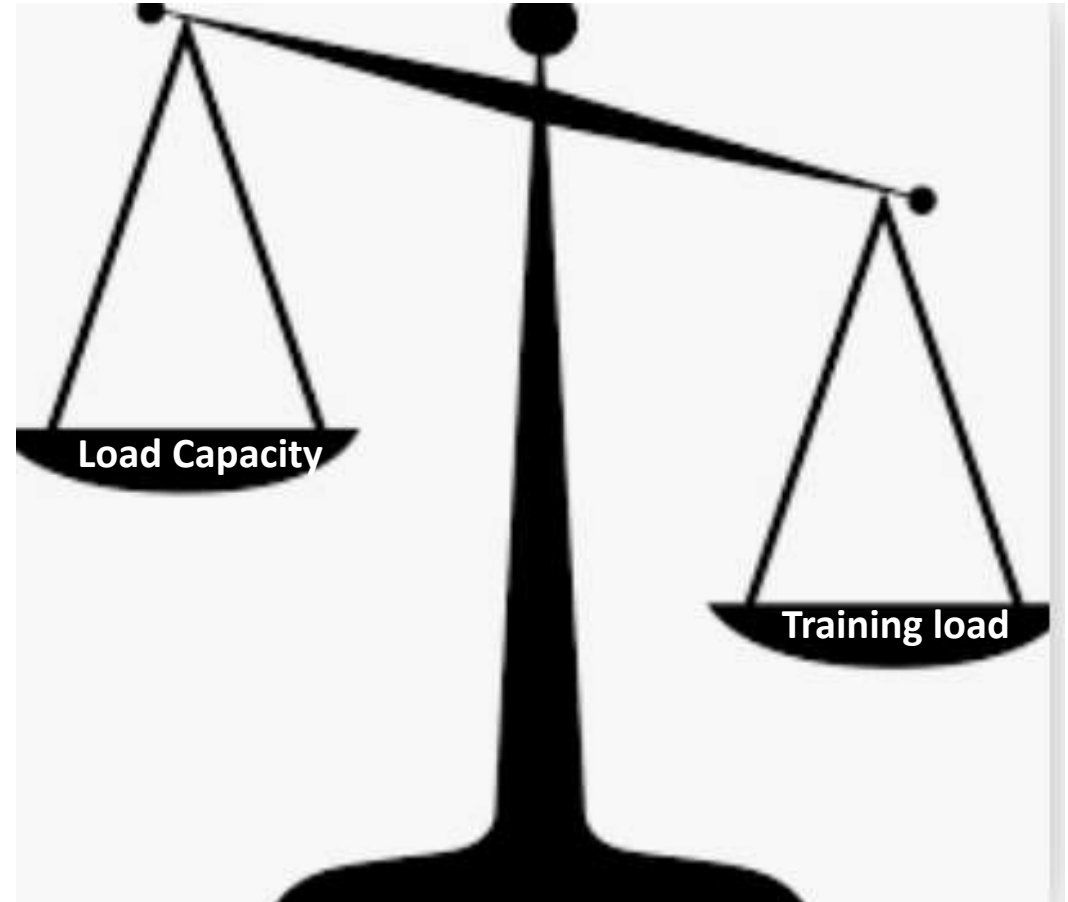
Why do we want to build robust athletes?

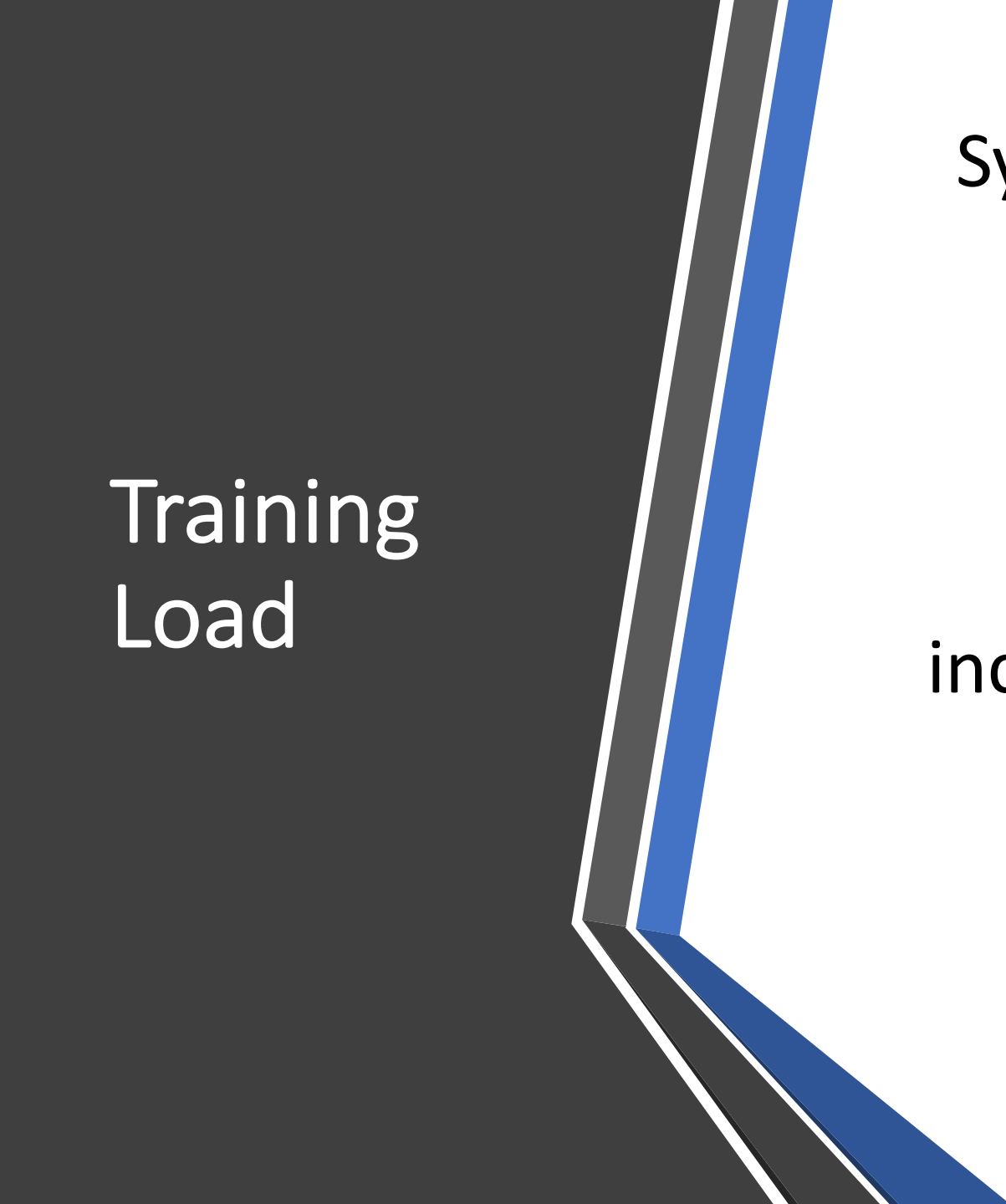


Also leads to improved performance 🏆

Training load management

Workloads that maximise positive adaptations while minimising fatiguing effects will help make athletes more robust to injury.





Systematic increase in training
load over time + adequate
recovery = performance
improvements

A spike in training load can
increase risk of injury within the
next 7 days

(Hulin *et al.*, 2014; Haugen *et al.*, 2019)

Training
Load

Biomechanics

How you move – run, jump, throw etc.

To achieve optimal biomechanics we need optimal :

- Mobility
- Control
- Strength





What is 'mobility'?

Mobility = the ability to move freely

Muscle flexibility = How much can a muscle lengthen?

Joint mobility = How much movement there is at a joint?

Active –V- Passive

Why is mobility important in athletics?

- Athletics (T&F) and running are full body activities requiring synchronous movement of multiple joints.
- It is important that each joint can move through the range required for the overall movement, comfortably and repetitively.
- Example: a minimum of 10 degrees ankle dorsiflexion is needed for walking, while 50 degrees of big toe extension is needed for sprinting.
- Note: the body will self-organise.



Mobility for running

Adequate mobility needed at:

- Ankles
- Hips
- Thoracic Spine

This can be achieved by:

- Stretching (dynamic or passive)
- Joint mobilisations
- Dynamic movements

AAI MOBILITY PROGRAM

Flexibility refers to the range of movement available at a specific joint, whereas mobility is the range that a joint can work through during dynamic activities such as running. Having adequate mobility particularly around the ankles, hips and thoracic spine is important for runners to ensure that a sound posture can be sustained during the gait cycle. This program aims to enhance mobility across these areas using a combination of Active Stretches and Dynamic Mobilisations.



1 KNEE TO WALLS

Aim: Stretch the anterior and medial malleoli of the ankle joint.
Technique: Stand facing a wall. Place one leg forward with your foot 12-15cm from the wall. Keep your heel on the ground and push your knee forward towards the wall.
Hold for 3-4 sec.
Repeat x 10 each side.



7 LUMBAR ROTATIONS

Aim: To mobilise the lumbar spine.
Technique: Lying on back with knees bent up and arms out at 90 degrees. Keeping knees together drop them to the side.
Hold for 3-4 sec and then return to starting position.
Repeat x 5 each side.



2 INCH WORMS

Aim: To stretch through your self, hamstring and lower back.
Technique: Begin in a press up position. Walk your feet forward slowly, after raising your left and your right, ensuring you step your feet towards the floor with each step. As you do so, bend back at the hip, keeping your legs straight. Keep your torso parallel to the ground. As you walk, when you have reached the position of your maximum stretch start walking your hands forward returning to the press up position.
Hold for 3-4 sec.
Repeat x 5.



8 CRUCIFIX STRETCHES

Aim: To stretch Glutes and Lower Back.
Technique: Lying on back with arms out to side and legs extended. Pull your right knee up towards your shoulder while to the left keeping your knee to floor.
Hold for 3-4 sec and return to start position.
Repeat x 5 times each side.



3 HAMSTRING STRETCH – STRAIGHT KNEE & BENT KNEE

Aim: Stretch the hamstring muscles.
Technique:
Straight Knee: Lie on your back. Using your right leg to assist the stretch, place your leg towards you ensuring you keep the knee straight. **Hold for 3-4 sec.**
Bent Knee: Lie on your back and pull your knee to your chest. Using your right leg to assist the stretch, try to straighten the knee while maintaining full hip flexion. **Hold for 3-4 sec.**
Repeat x 10 each side.



9 PIGEON STRETCHES

Aim: To stretch glutes and lower back and mobilise the hip joint.
Technique: From a kneeling position, place your right leg extended 90 degrees. Then place your left leg over the right leg extended 90 degrees. Push your right knee to a wall position to stretch the leg.
Hold for 3-4 sec and return to start position.
Repeat x 5 times each side.



4 QUADRICEPS & HIP FLEXOR STRETCH

Aim: To stretch the quadriceps & hip flexors.
Technique: Adopt a kneeling lunge position. Place one foot on a bench or chair. **For Quadriceps:** Pull your posterior foot & push backwards bring your back foot to your front. **Hold for 3-4 sec.**
For Hip Flexors: From a kneeling position bring your front foot to the floor and push your front forward and down. **Hold for 3-4 sec.**
Repeat x 5 each side.



10 KNEELING LUNGE THORACIC ROTATION

Aim: Mobilise the Thoracic Spine.
Technique: Adopt a kneeling lunge position on facing a wall. With your left knee forward bring your right hand forward to touch the wall.
Rotate the thoracic spine by bringing your left arm backwards to your arm are in line.
Hold for 3-4sec and then return to starting position.
Repeat x 5 each side.



5 CHILD POSE

Aim: To mobilise ankles, hips & thoracic spine.
Technique: Adopt a 4 point kneeling position (on your hands and knees). Keeping your hands in contact with the floor, bring your buttocks to rest on your heels.
Hold for 3-4 sec and then return to 4 point kneeling position.
Repeat x 10.



11 WALL ANGELS

Aim: To improve thoracic and shoulder mobility.
Technique: Begin against a wall ensuring your back is flat against it and your arms down by your side. Bring your arms up to the 'W' or 'Y' position. From here extend arms against the wall keeping them in contact with the wall at all times.
Hold for 3-4sec and then repeat the movement in reverse.
Repeat x 10 times.



6 ADDUCTOR STRETCH

Aim: Stretch the Adductor muscles and mobilise the hip joint.
Technique: Adopt a half kneeling position. Bring one leg out to the side. Maintaining an extended knee on the side extend the leg at least up to your head, using your arms to support your upper body.
Hold for 3-4 sec and then return to the starting position.
Repeat x 5 each side.



12 BENCH ROCKERS

Aim: To mobilise the thoracic spine and shoulders.
Technique: Start in a kneeling position with your arms extended and resting on a bench or table. Lower your shoulders and thoracic spine by bringing your trunk downwards towards the floor.
Hold for 3-4sec.
Repeat x 10 times.

https://www.athleticsireland.ie/downloads/other/AAI_Coach_Injury_Prevention.pdf

Area Targeted	Exercise
Lower back	Cat/cow → cobra → child's pose
	Lower back rotations (or iron cross or scorpion)
Mid back	Thread the needle (add foam roller)
	Kneeling thoracic rotations
	Bench thoracic extension
Shoulders	Book opens (with arms bent)
	Kneeling lat stretch
Hips	90/90s + side leans
	Pigeon stretch
	Hip flexor stretch → quad stretch → hamstring stretch
	Hamstring stretch variations lying supine
	Sciatic nerve sliders
	Adductor stretch (+/- thoracic rotation, in sitting)
Lower legs	Calf stretch x 2
	Knee to wall mobilisations
	Sit onto heels - tib ant stretch
	Peroneals foam rolling
	Plantar fascia foam rolling
Combined movements	Kneeling lunge Tx rot
	Brettzel 2.0

Neuromuscular control

- Control of joint movement through full range.
 - Co-ordination
 - Balance
 - Proprioception
-
- Will develop neuromuscular control first rather than pure strength (eg first 6 weeks of programme)



Muscle strength and tissue capacity

- Reduced strength is a risk factor for many injuries common in athletics eg hamstring strain injuries, Achilles tendinopathy etc.
- Therefore strength training is a possible way to address this risk factor and help prevent injuries.
- Studies have shown that strength training can be effective at reducing sports injuries (Brukner, 2015; Bahr *et al.*, 2015; Al Attar *et al.*, 2017; Buckthorpe *et al.*, 2019).



Tissue Capacity

How many of X exercise/
movement can you do?

- Calf raises
- Single leg bridges
- Single leg squats

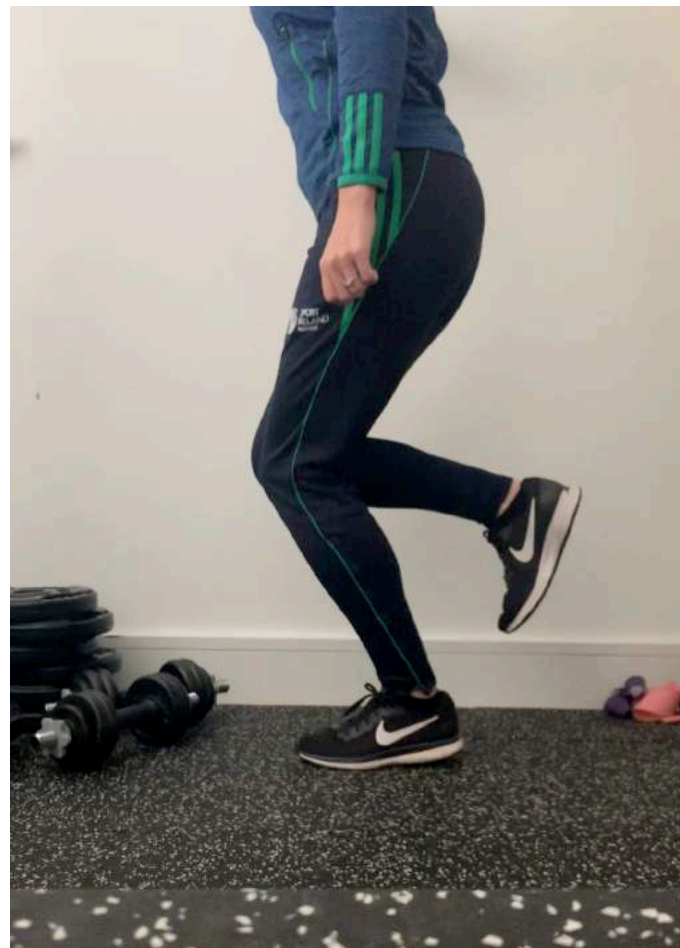
Muscle Strength

How much load can a muscle
tolerate for a given number of
reps?

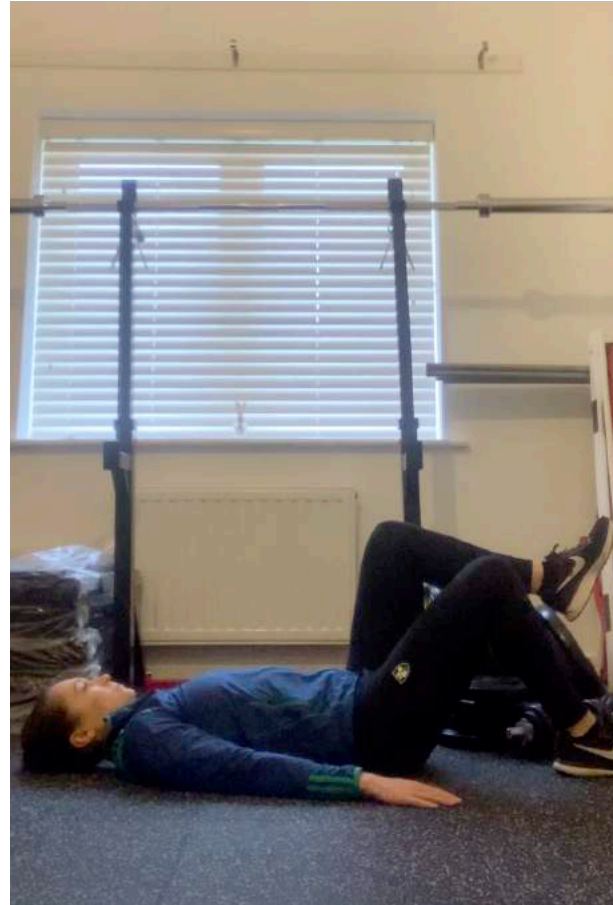
- 1RM
- 3RM
- 10 RM etc



Calf capacity testing



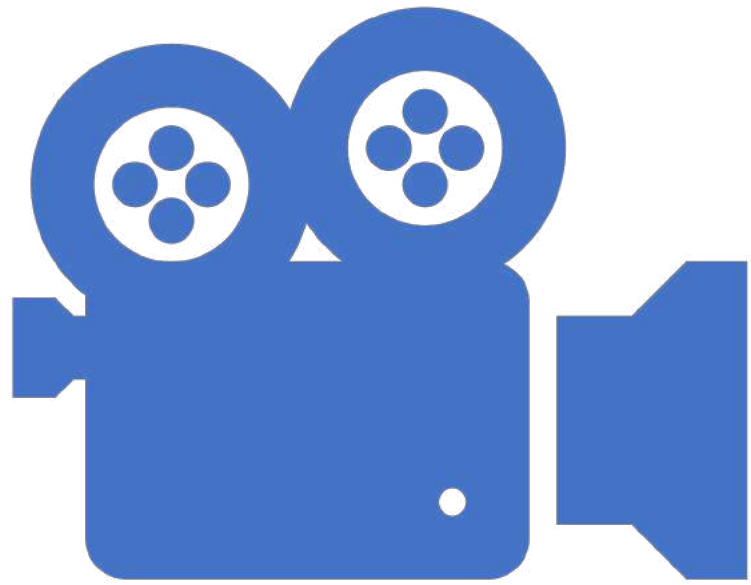
Hamstring capacity testing



Movement patterns

- Squat
- Lunge
- Hip hinge
- Calf raise
- Trunk control
- UL push
- UL pull
- Etc





Videos of movement patterns

Improving tissue capacity and strength

- Progressive overload – build up gradually over time
- Challenge athlete in different ways (speed of contraction, ROM etc.)
- Gym work – S&C, don't forget single leg work
- Warm up – opportunity to do specific work multiple times a week
- Accessory sessions – mobility, control, foot prehab etc.

Foot Core Training to Prevent Running-Related Injuries

A Survival Analysis of a Single-Blind, Randomized Controlled Trial

Ulisses T. Taddei,* PhD, PT, Alessandra B. Matias,* MSc, PT, Marcos Duarte,† PhD, and Isabel C.N. Sacco,*‡ PhD

Investigation performed at Faculdade de Medicina, Universidade de São Paulo, Brazil

Background: Running-related injuries (RRIs) are a pervasive menace that can interrupt or end the participation of recreational runners in this healthy physical activity. To date, no satisfactory treatment has been developed to prevent RRIs.

Purpose: To investigate the efficacy of a novel foot core strengthening protocol based on a ground-up approach to reduce the incidence of RRIs in recreational long-distance runners over the course of a 1-year follow-up.

Study Design: Randomized controlled trial; Level of evidence, 1.

Methods: The participants, 118 runners, were assessed at baseline and randomly allocated to either an intervention group (n = 57) or a control group (n = 61). The intervention group received an 8-week training course focused on the foot-ankle muscles, followed by remotely supervised training thereafter. Assessments consisted of 3 separate biomechanical evaluations of foot strength and foot posture and a weekly report on each participant's running distance, pace, and injury incidence over 12 months.

Results: The control group participants were 2.42 times (95% CI, 1.98-3.62) more likely to experience an RRI within the 12-month study period than participants in the intervention group ($P = .035$). Time to injury was significantly correlated with Foot Posture Index ($P = .031$; $r = 0.41$) and foot strength gain ($P = .044$; $r = 0.45$) scores. This foot exercise program showed evidence of effective RRI risk reduction in recreational runners at 4 to 8 months of training.

Conclusion: Recreational runners randomized to the new foot core strengthening protocol had a 2.42-fold lower rate of RRIs compared with the control group. Further studies are recommended to better understand the underlying biomechanical mechanisms of injury, types of injuries, and subgroups of runners who might benefit maximally.

Registration: NCT02306148 (ClinicalTrials.gov identifier).

Keywords: running; sports injuries; exercise therapy; foot; strengthening; biomechanics

AAI FOOT & ANKLE CONDITIONING PROGRAM

The action of the foot is integral to all modes of gait from walking to sprinting. Despite this, training to develop this critical link is often overlooked by athletes and coaches. The analogy has been made that this situation is akin to a mechanic servicing a race car's engine but neglecting the tyres. With optimal running efficiency, energy leakage or areas of "collapse" are minimised at the hip, knee and ankle. Plyometrics and Technical Running Drills are methods commonly used to improve running efficiency. The goal of this program is to ensure that the muscles of the foot and ankle are sufficiently conditioned to withstand more advanced training such as plyometrics or running drills.



1 FOOT POSITIONING

This is the starting position for all subsequent exercises. Feet shoulder width apart and pointing forward. Slight bend in knees. Neutral Spine. Ensure equal weight distribution across the following 3 points of contact:
(1) the heel,
(2) the lateral upper portion of the foot or outer ball of the foot in line with the baby toe;
(3) near the medial portion of the foot toward the base of the big toe.
Hold for 10 sec.
X Repeat for 1 min.



2 TOE EXTENSION & FLEXION

Adapt the "Foot Setting" position.
Extend all 5 toe joints by lifting toes of the ground.
Hold for 3-4 sec.
Flex all 5 toe joints by curling all toes into the ground.
Hold for 3-4 sec.
X Repeat for 1 min.



3 ISOLATED BIG TOE EXTENSION & FLEXION

Adapt the "Foot Setting" position.
Extend the Big Toe joint by lifting it off the ground, while flexing the other 4 toe joints by curling them into the ground.
Hold this position for 3-4 sec, then reverse by flexing the Big Toe joint by curling it into the ground, while extending the other 4 toe joints by lifting them off the ground.
Hold this position for 3-4 sec.
X Repeat for 1 min.



4 TOE FLEXION BY 1/PIANO TOES

Adapt the "Foot Setting" position.
Extend all toes by lift them off the ground.
Starting with the little toe, flex the toes one by one by returning them back to the ground.
X Repeat for 1min.



5 TOWEL CRUNCHES

Adapt the "Foot Setting" position with your feet positioned on a towel.
Try to crunch the towel up by flexing and extending your toes.
X Repeat for 1 min.



6 TOE WALKS

Stand on your tip toes at a line.
Keep knees straight and maintain this plantar-flexed ankle position.
Step forwards & backwards across the line.
X Repeat for 1 min



7 HEEL WALKS

Stand on your heels with toes of the floor at a line.
Keep knees straight and maintain this dorsiflexed ankle position.
Step forwards & backwards across the line.
X Repeat for 1 min



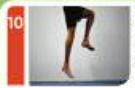
8 TOE TAP WALKS

Stand on your tip toes at a line.
Keep knees straight.
Step forwards & backwards across the line.
As you step pull your toes up to stretch the calf.
Point your toes down again before making contact with the ground.
X Repeat for 1 min



9 DOUBLE LEG POGOS FORWARDS

Stand tall with your feet hip width apart.
Quickly bounce up and down on the balls of your feet.
Keep legs straight and pull toes up during the jump phase.
Small jump heights and minimise ground contact time.
X Repeat x 10-30 sec.



10 SINGLE LEG POGOS - LATERAL

Stand tall on one leg.
Quickly bounce up and down on the balls of your foot.
Keep leg straight and pull toes up during the jump phase.
Small jump heights and minimise ground contact time.
X Repeat x 10-30 sec.

Training Recovery

Planning NB

Sleep

Nutrition

Relaxation

Mobility

Recovery



HOW MUCH SLEEP IS ENOUGH?
DO YOU GET ENOUGH SLEEP?



WHAT ELEMENTS OF NUTRITION
ARE IMPORTANT FOR RECOVERY?



WHAT DO YOU DO TO RELAX /
SWITCH OFF?



Questions?