BORN TO RUN 2

Running Injury guide

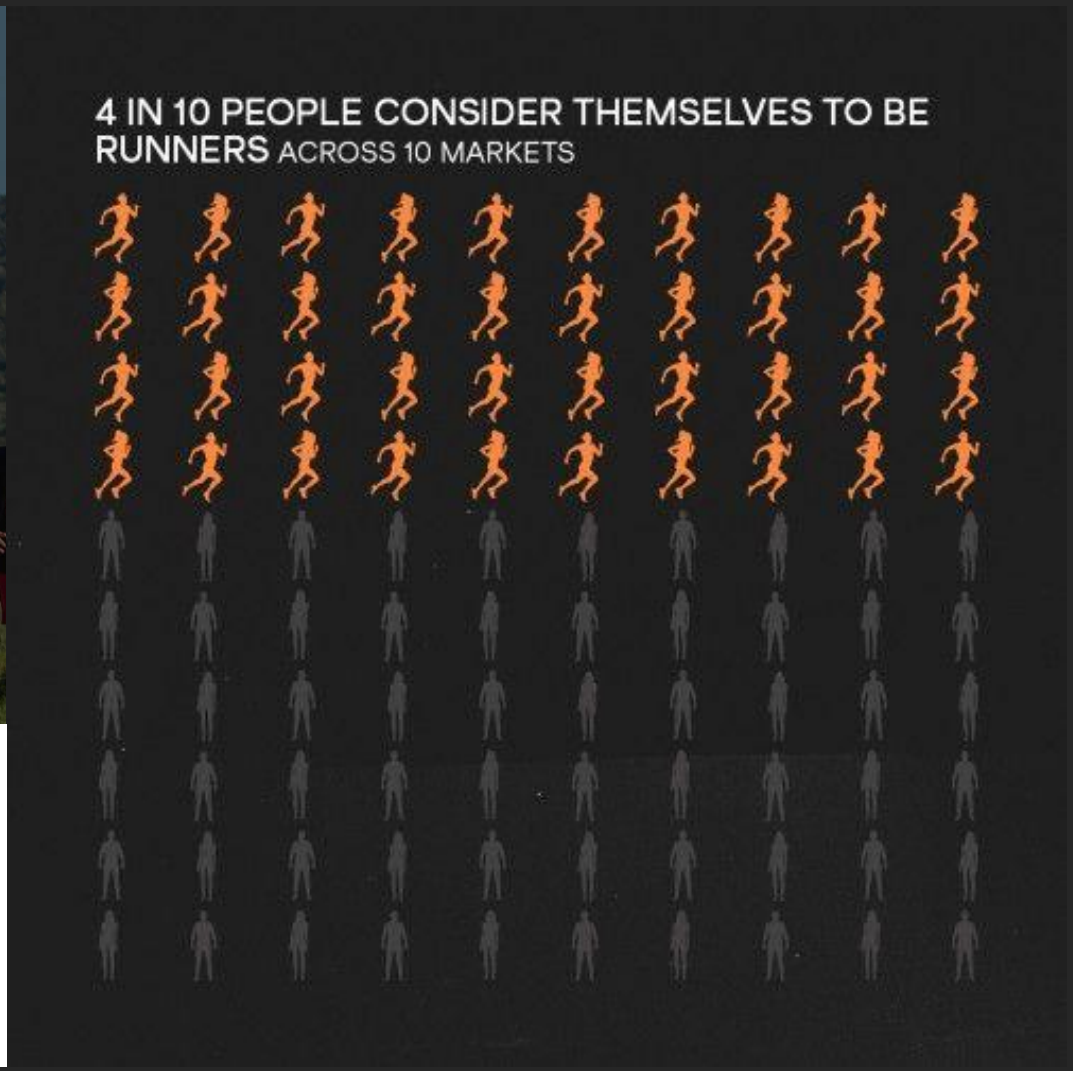
Dr. Junggi Hong

Last lecture...

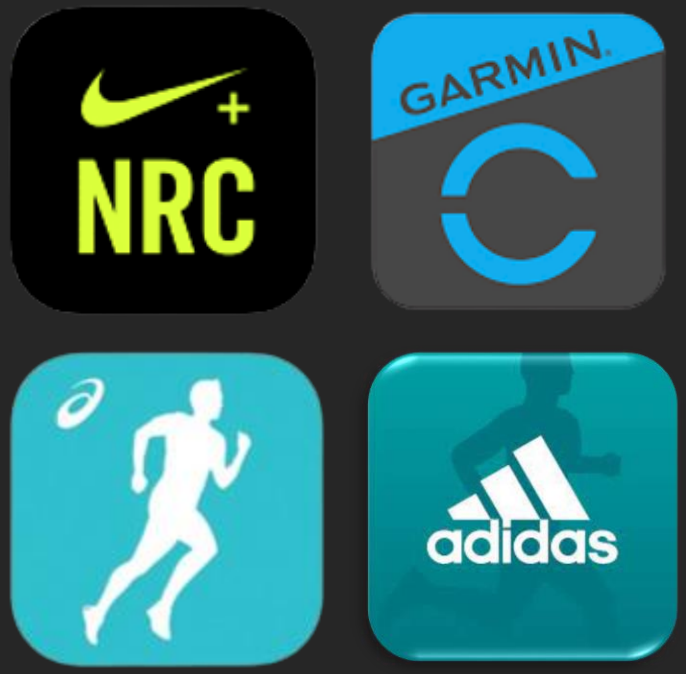
- What is running?
- Why did we have to run?
- 9 reasons humans were born to run
- Running cycle
- Running science (MTU, Kinetic chain, Stride pattern)
- How to run faster? (Posture, Breathing, Eyes, Feet)
- Prepare for running (Assessment, Training)

Covid-19 led to running boom

- Data is based on 8414 interviews collected across 10 countries:
  - Australia, Colombia, France, India, Japan, Kenya, Mexico, South Africa, UK, USA
- Data collected between 26th March – 15th April 2021



Running Data : 2020 Runner`s world



2020년 러닝 앱 데이터 사용 횟수 증가 → 65%

2020년 실내 vs '야외' 달리기 횟수 증가 → 34%

2019년과 비교해 2020년 '느려진' 러닝 평균 속도, 신규 러너 및 복귀 러너 유입으로 추정 → 8.5%

Runner`s injury rate

COLLECTION REVIEW

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

Maarten P. van der Worp[1,2,3]*, **Dominique S. M. ten Haaf**[2], **Robb[illegible] Cinger**[4], **Anton de Wijer**[1,5], **Maria W. G. Nijhuis-van der Sanden**[3,6], **J. Bart S[illegible]al**[2,3]

1 Academic Institute, University of Applied Sciences Utrecht, Department of Physical Therapy, Utrecht, the Netherlands, **2** HAN, University of Applied Sciences Nijmegen, Institute Health Studies, Nijmegen, the Netherlands, **3** Radboud University Medical Center, Radboud Institute for Health Science, Scientific Institute for Quality of Healthcare, Nijmegen, the Netherlands, **4** Sport Medical Center Papendal, Arnhem, the Netherlands, **5** Radboud University Medical Center, Radboud Institute for Health Science, Department of Oral Function & Prosthetic Dentistry, Nijmegen, the Netherlands, **6** Radboud University Medical Center, Radboud Institute for Health Science, Department of Rehabilitation, Nijmegen, the Netherlands

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79% ~ 94.7%

Epidemiology of running-related injuries in the Korean population: a cross-sectional survey of 1046 runners

Hye Chang Rhim[1], **Sung Jong Kim**[1], **Jin Sung Jeon**[1], **Hyuk Woo Nam**[2], **Ki-Mo Jang**[1,3]

1. Korea University College of Medicine 2. Nam's Orthopedic Clinic 3. Department of Orthopedic Surgery, Korea University Anam Hospital

1. AIMS

Running is the oldest form of exercise in human history and the most popular exercise in the world.(1) While running can improve physical fitness and reduce chronic health problems such as obesity and cardiovascular disease, it is also associated with injuries in lower extremities.(2) However, because there is no consensus definition of running-related injury, the prevalence and incidence of running-related injuries have been reported to vary between 19% and 92%.(3) Moreover, epidemiology of running-related injuries in Asian populations has been rarely investigated. Therefore, this study was first to use the consensus def[illegible]ng-related i[illegible] published in [illegible]ves[illegible]ed [illegible] epid[illegible]logy of running-related injuries in Korean population. Running-related injury was defined as "Running-related (training or com[illegible]tion) m[illegible]uloskele[illegible]n the lower limbs that c[illegible]es a [illegible]riction [illegible]oppage of running (distance, speed, duration, or training) for at least 7 days or 3 consecutive scheduled training sessions, or th[illegible]ire[illegible]unne[illegible]on[illegible] a physician or other h[illegible]n profes[illegible]".

METHOD

In cross-sectional design, an online survey was circulated among various running communities in Korea. Professional runners were excluded from the study, and various age groups were targeted. The questionnaire contained information on the following variables (see table below) which may be associated with running-related injuries. A human-body illustration was used to help survey participants to choose the area of pain location. All questions were in multiple choice except for height, weight, and age. For questions such as weekly running mileage and pace, certain range was given since this range would be used in statistical analysis.

Sex	Age	BMI	Pain location
Pain duration	Pace	Running mileage/week	Running intensity
Warm-up	Cool-down	Foot strike	Type of shoes
Exercise experience	Orthotics	Running surface	Reasons for running

<Statistical Analysis>

- Logistic regression analysis was used to explore the relationship between the risk of running injury and exposure variables of interest.
- Initial model included all possible exposure variables
- Some categorical variables such as participation in high intensity training, participation in warm-up or cool-down, history of participation in other sports prior to running were collapsed to two levels for increased power.
- Odds ratios with 95% confidence intervals (CI) were reported for the multivariable analysis with a critical probability level of 0.05.

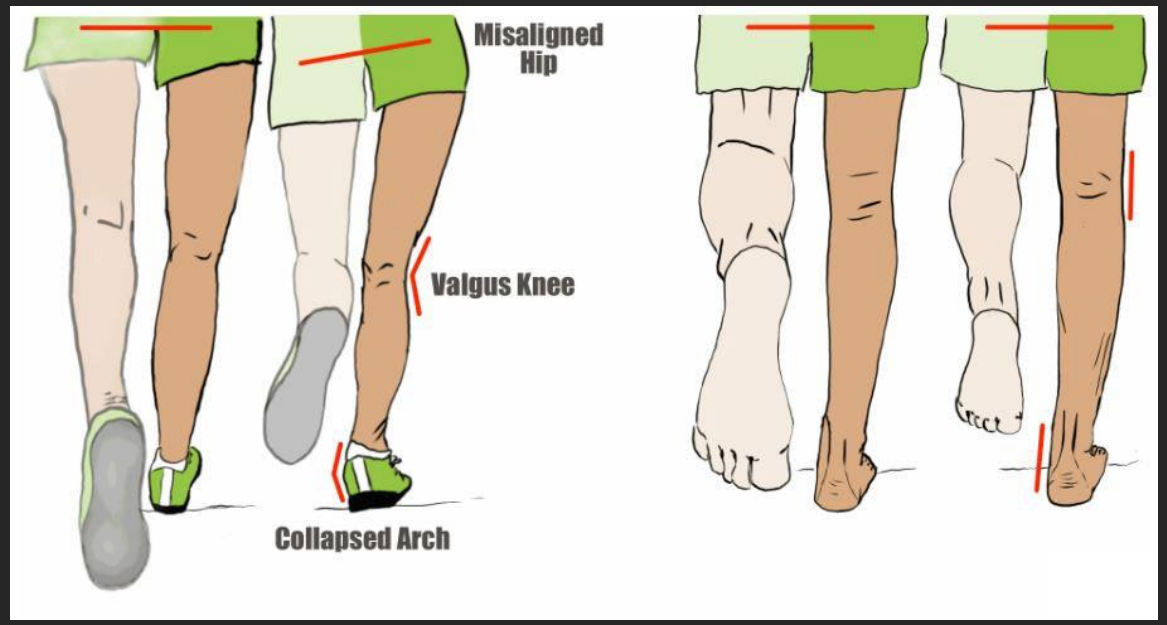
Cause of running injury

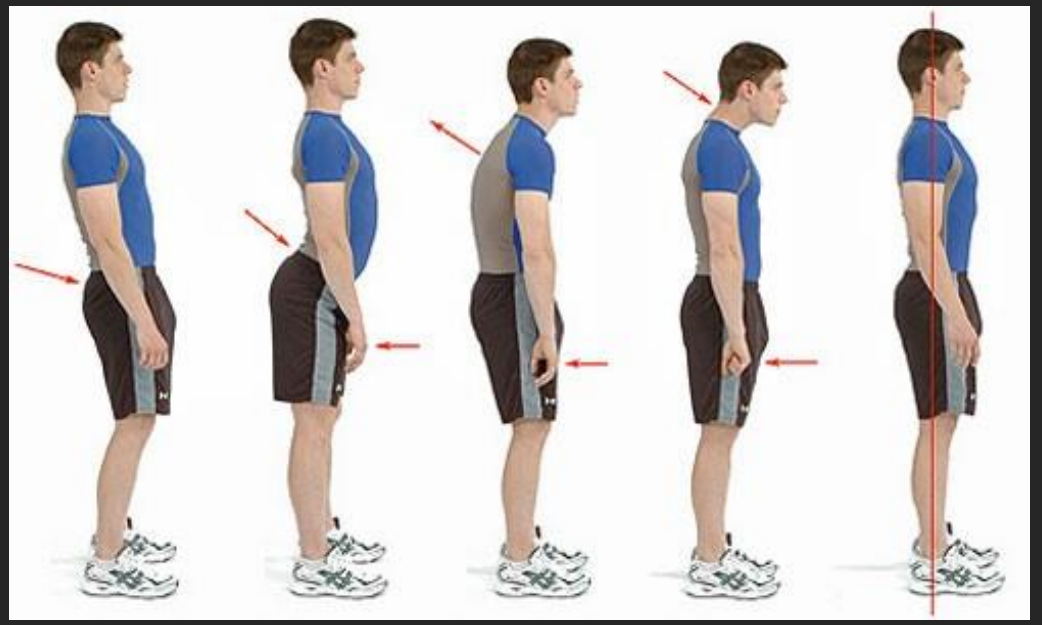
- Personal factors
- Running & Training Related Factors
- Health & Life-Factors
- Other Factors

Cause of running injury

- Personal factors

1) Alignment

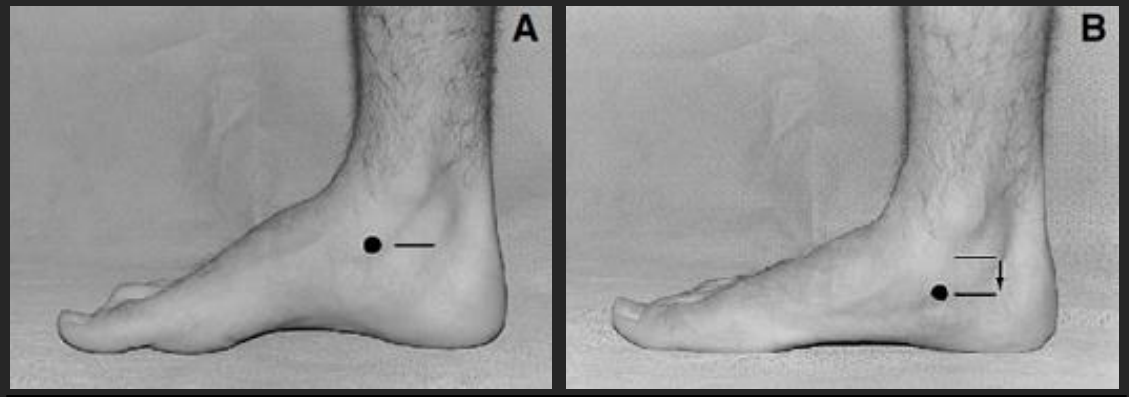




Cause of running injury

- Personal factors

2) Navicular drop

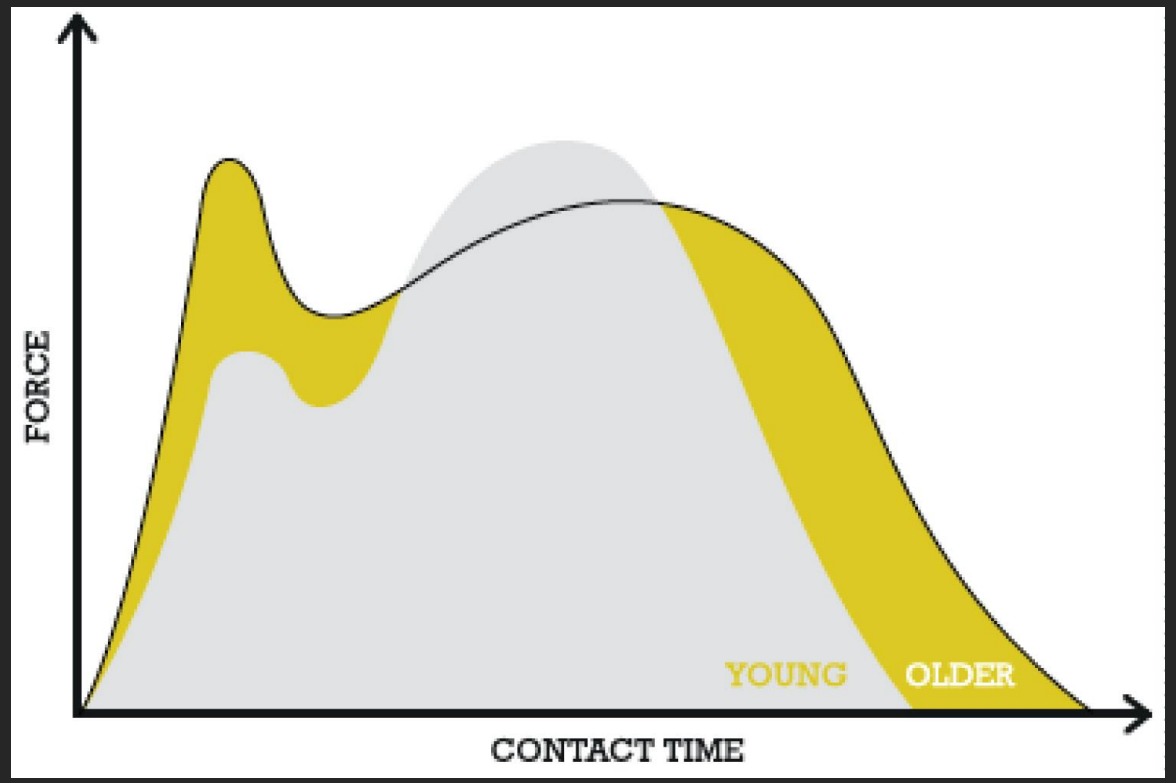


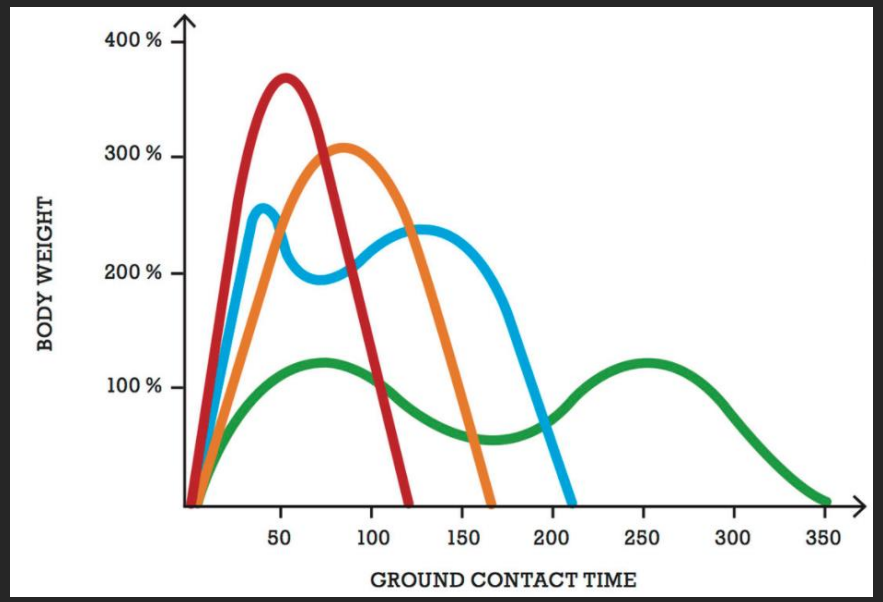
Supinated foot	Neutral foot	Pronated foot
<5mm	6-9mm	>9mm

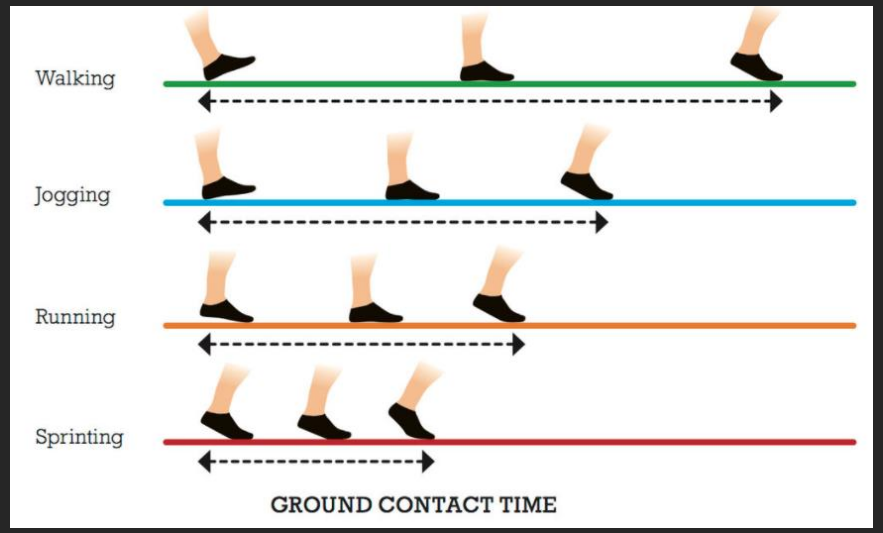
Cause of running injury

- Personal factors

3) Force distribution pattern







Cause of running injury

- Running & Training Related Factors

1) Sudden change in technique

Sports Medicine
https://doi.org/10.1007/s40279-019-01238-y

SYSTEMATIC REVIEW

What are the Benefits and Risks Associated with Changing Foot Strike Pattern During Running? A Systematic Review and Meta-analysis of Injury, Running Economy, and Biomechanics

Laura M. Anderson[1,2] · Daniel R. Bonanno[2,3] · Harvi F. Hart[2,4] · Christian J. Barton[2,5]

© Springer Nature Switzerland AG 2019

Changing foot strike pattern may be appropriate in anterior compartment syndrome, chronic degenerative knees and Achilles tendinopathy.

Avoid extremes of both rearfoot and forefoot strike.

- BJSM

- The relationship between strike pattern and injury risk could not be determined.
- Research evaluating changes in running economy following a period transition from RFS to NRFS was not identified.

Cause of running injury

- Running & Training Related Factors

2) Training time & Distance

- 6 times a week was a significant risk factor for running injury.

- mileage increases from 20-30km to 30-40km were associated with significant increases in running-related injuries.

Cause of running injury

- History of injury

- A history of running injuries was reported to be a significant risk factor for the occurrence of running injuries shortly before or during the marathon.

- Injury at another location (hip, groin, thigh, knee, ankle and foot) was a risk factor of running injuries.

- This could suggest a possible role of unfavorable individual structural and biomechanical characteristics of injury-sensitive runners, or an insufficient healing of the primary lesion, or both

Cause of running injury

- Other Factor_ Shoes

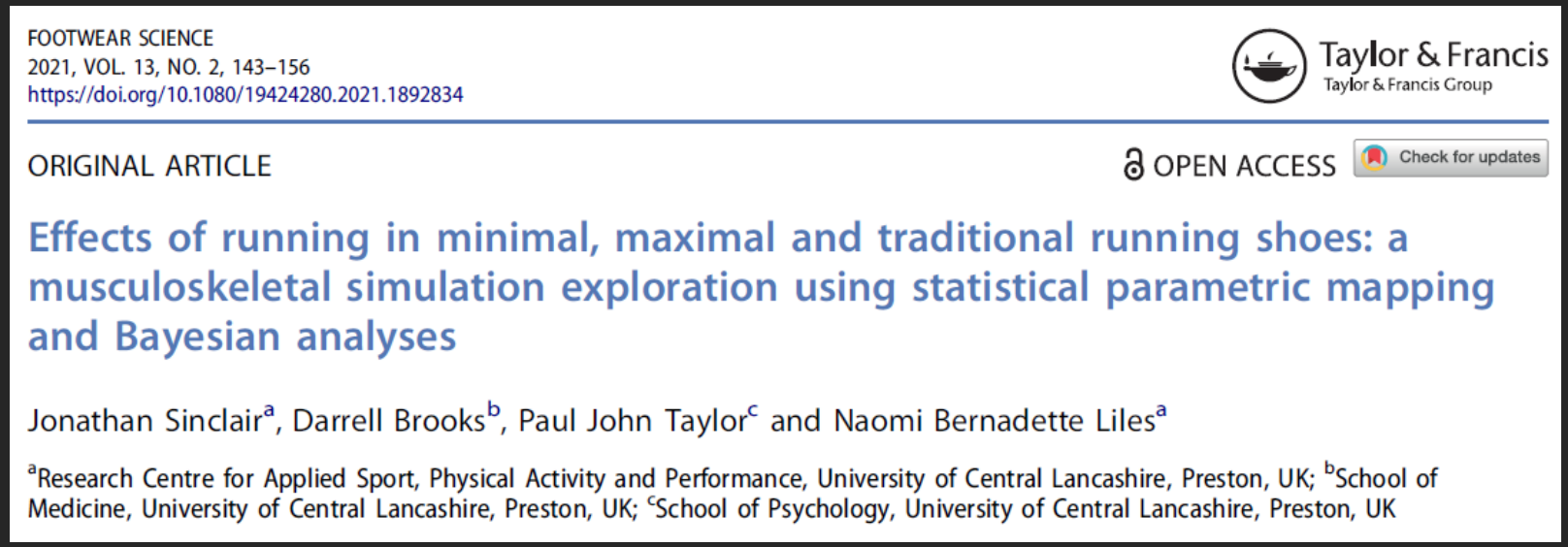
Cushioning shoes vs Minimalist shoes?

- **Cushioning shoes vs Minimalist shoes?**

  - Despite decades of shoe technology developments and the fact that shoes have become increasingly cushioned, aimed to ease the impact on runners' legs, running injuries have not decreased.

  - The greater impact loading with the maximalist shoes to stiffer leg during landing compared to that of running with the conventional shoes.

- Cushioning shoes vs Minimalist shoes?



FOOTWEAR SCIENCE
2021, VOL. 13, NO. 2, 143–156
https://doi.org/10.1080/19424280.2021.1892834

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ORIGINAL ARTICLE

OPEN ACCESS Check for updates

Effects of running in minimal, maximal and traditional running shoes: a musculoskeletal simulation exploration using statistical parametric mapping and Bayesian analyses

Jonathan Sinclair[a], Darrell Brooks[b], Paul John Taylor[c] and Naomi Bernadette Liles[a]

[a]Research Centre for Applied Sport, Physical Activity and Performance, University of Central Lancashire, Preston, UK; [b]School of Medicine, University of Central Lancashire, Preston, UK; [c]School of Psychology, University of Central Lancashire, Preston, UK

- Minimal footwear increased gluteal, medial tibiofemoral and hip forces during the first 10% of the stance phase and Achilles tendon forces from 20 to 40% stance compared to traditional running shoes.

- Maximal footwear enhanced ankle eversion from 10 to 30% of stance compared to both minimal and traditional running shoes.

- Cushioning shoes vs Minimalist shoes?

FOOTWEAR SCIENCE
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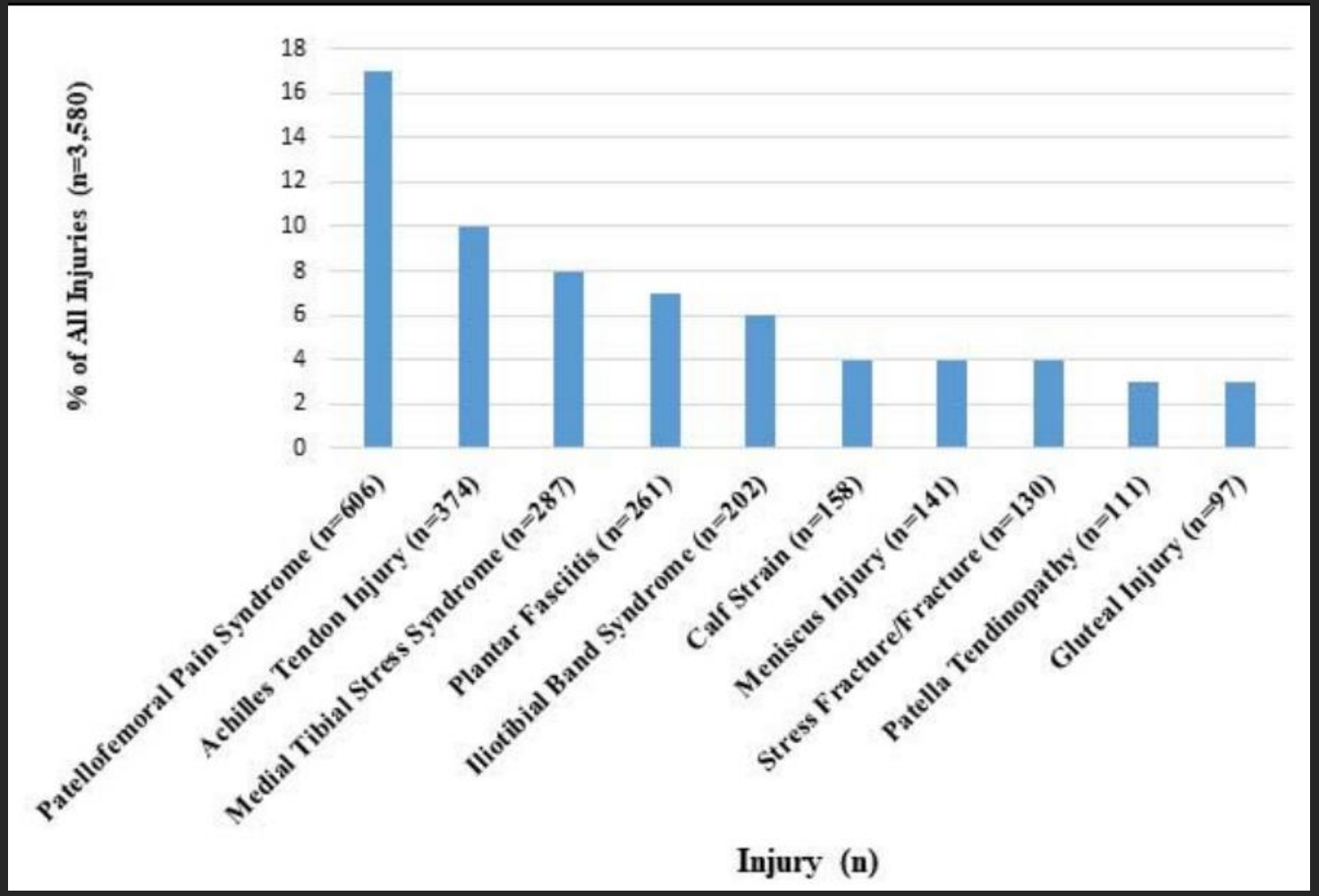
[a]Research Centre for Applied Sport, Physical Activity and Performance, University of Central Lancashire, Preston, UK; [b]School of Medicine, University of Central Lancashire, Preston, UK; [c]School of Psychology, University of Central Lancashire, Preston, UK

This study therefore shows that minimal footwear may place runners at increased risk from impact related chronic injuries yet attenuate risk from patellofemoral and lateral tibiofemoral pathologies compared to traditional running shoes.

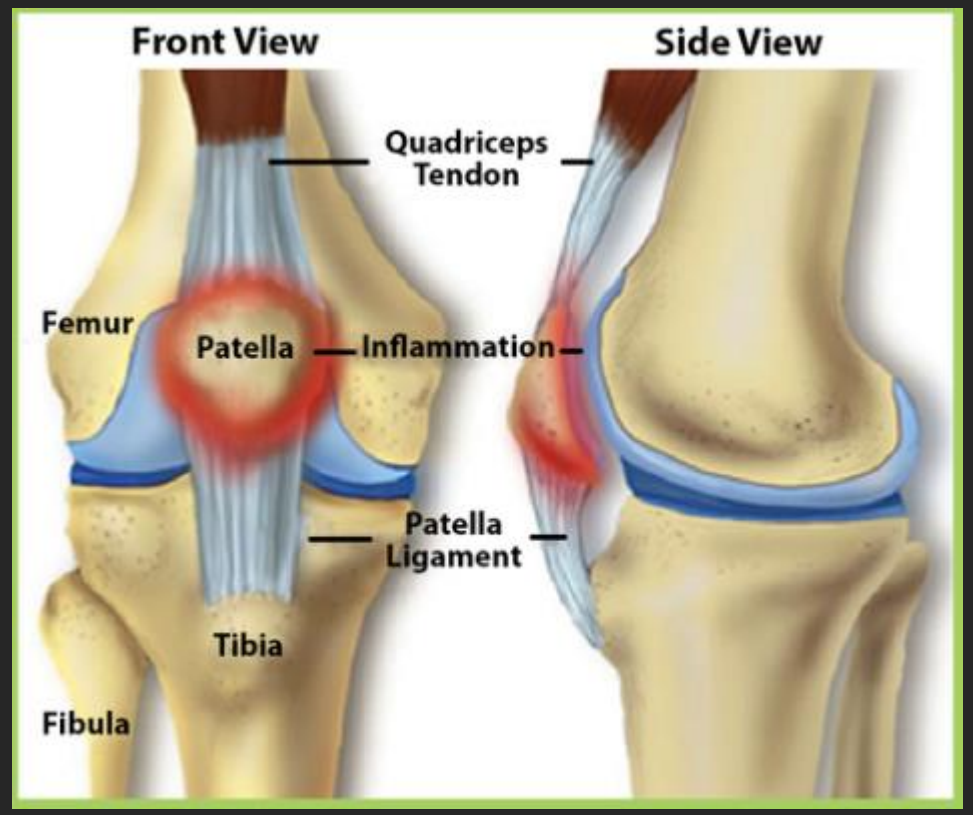
In addition, owing to increases in ankle eversion, maximal running shoes may enhance risk to the aetiology of medial tibial stress syndrome compared to minimal and traditional running shoes.

Top 10 Running injuries



Top 10 Running injuries

1) Runner`s knee (patellofemoral syndrome)



- Runner`s knee(patellofemoral syndrome) is a general term that refers to pain in the front knee or around kneecap.

- Common causes :
  Hip adduction, stride-to-stride knee-joint variability, running on harder surfaces and downhill running

- Treatment :
  - Short-term pain reduction through taping, bracing
  - A temporary reduction training load.
  - Professional gait retraining may help if you have a biomechanical risk factor.
  - Static stretches and strength exercises that target the hip and thigh muscles.

- Returning to training

Top 10 Running injuries

2) Achilles tendon injury (tendinitis, tendinopathy)

- Achilles tendinitis refers to inflammation of the tendon or around tendon.
- Achilles tendinopathy refers to a combination of pathological changes affecting the Achilles tendon usually due to overuse and excessive chronic stress upon the tendon.

- Common causes :
  Repeated tiny injuries , High braking force, low arch, Training load, changes in footwear

- Treatment :
  - Reduction of training load
  - Dynamic calf stretches and strength training for the Achilles tendon
  - Foot training for arch condition

- Returning to training

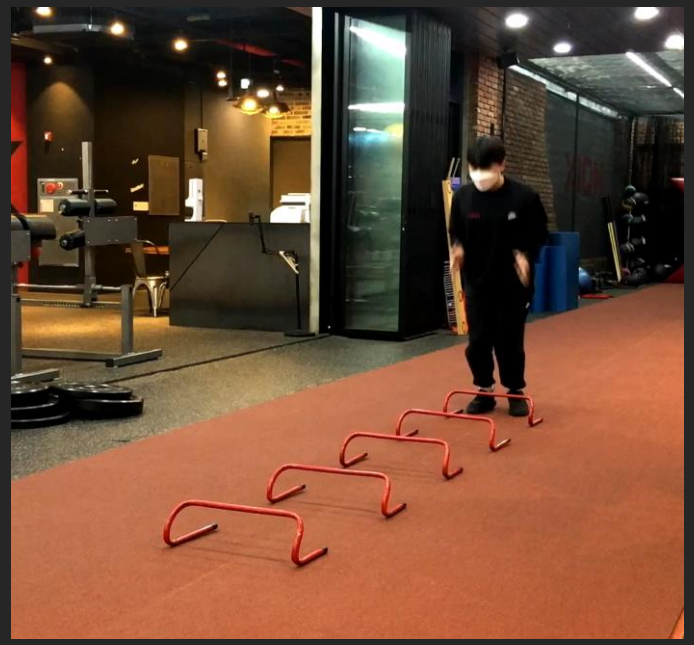
Stage1

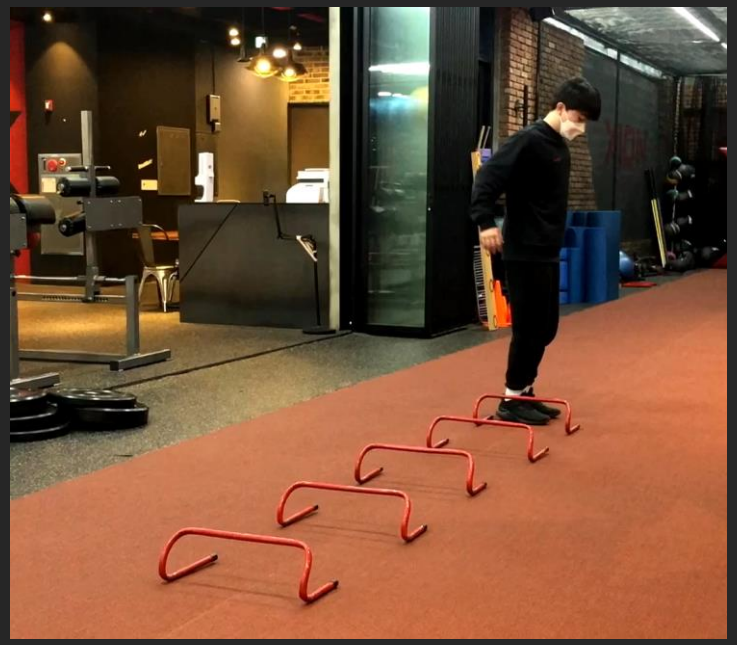
- Returning to training

Stage2

- Returning to training

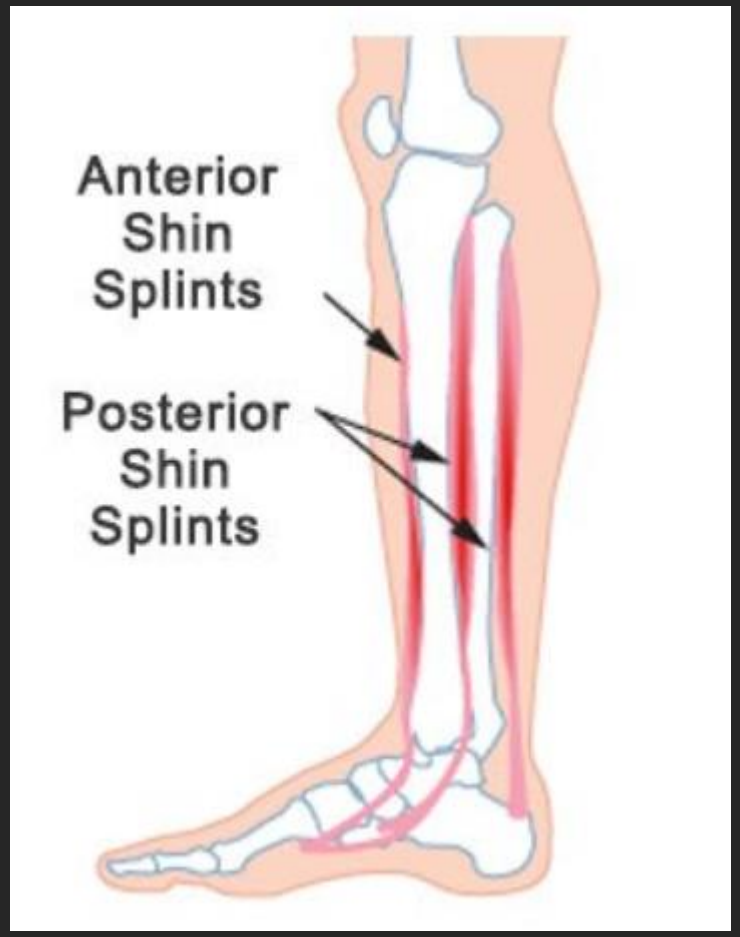
Stage3





Top 10 Running injuries

3) Medial tibial stress syndrome (Shin splints)

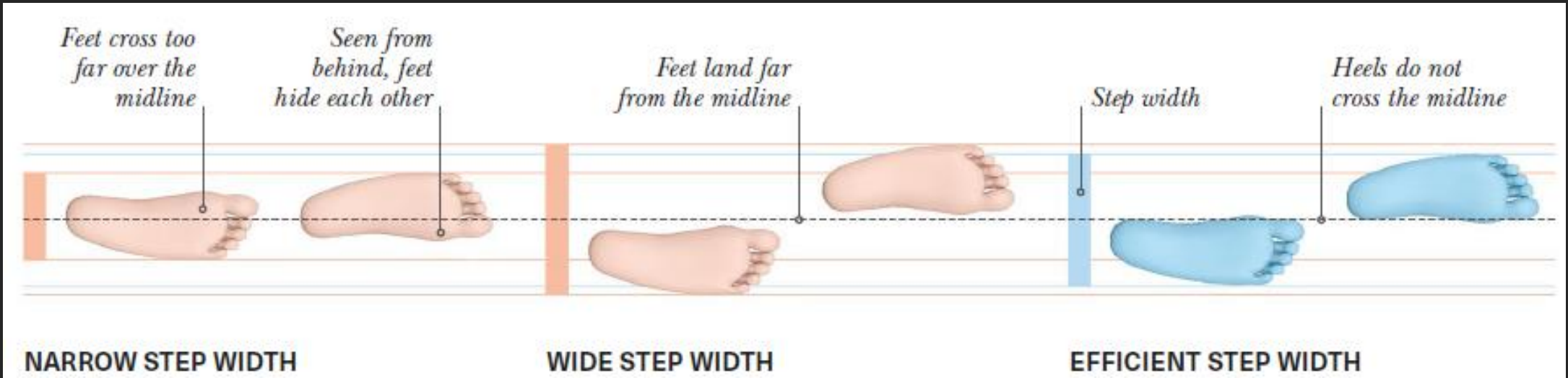


- Medial tibial stress syndrome (MTSS) is an overuse injury or repetitive-stress injury of the shin area.

- Common causes :
  Increase running volume, Running on hard surfaces, pronation or foot abduction, narrow step width, lower cadence

- Treatment :
  - Reduction of training load
  - A program of graded loading exposure
  - Strength training for the soleus and tibialis posterior
  - Foot training for arch condition

- Step width



- Narrow width increases the amount and velocity of pronation.

- Narrow step increases strain on the lateral hip, associated with various injury risks.

- Wider step increases the amount of energy expended in the running cycle.

- Anterior / Posterior shin sprint

Anterior Tibial Stress Syndrome

- Anterior shin splints are positioned on the front part of the shin bone and include the tibialis anterior muscle.
- Tibialis anterior muscle lifts the foot during the swing phase of a stride and slowly lowers the foot to adjust the foot for the support phase

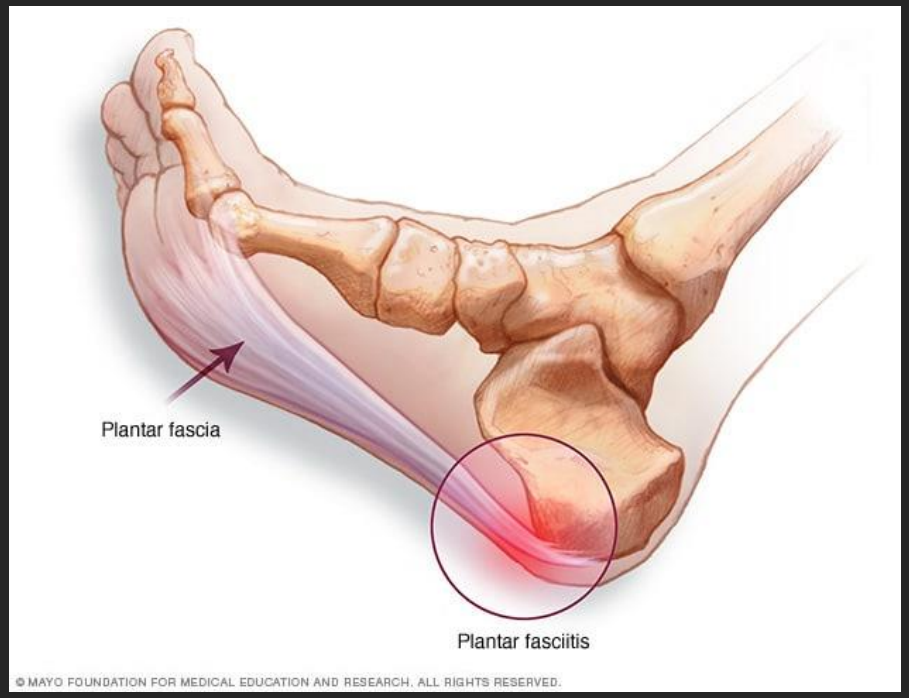
Posterior Tibial Stress Syndrome

- Posterior shin splints are positioned on the inside medial part of the shin bone and affect the tibialis posterior muscle.
- The tibialis posterior muscle lifts and controls the medial aspect of foot arch throughout the support phase.
- Tibialis posterior is weak or lacks strength your arch collapses , which produces torsional shin bone stresses.

- Returning to training

Top 10 Running injuries

4) Plantar fasciitis

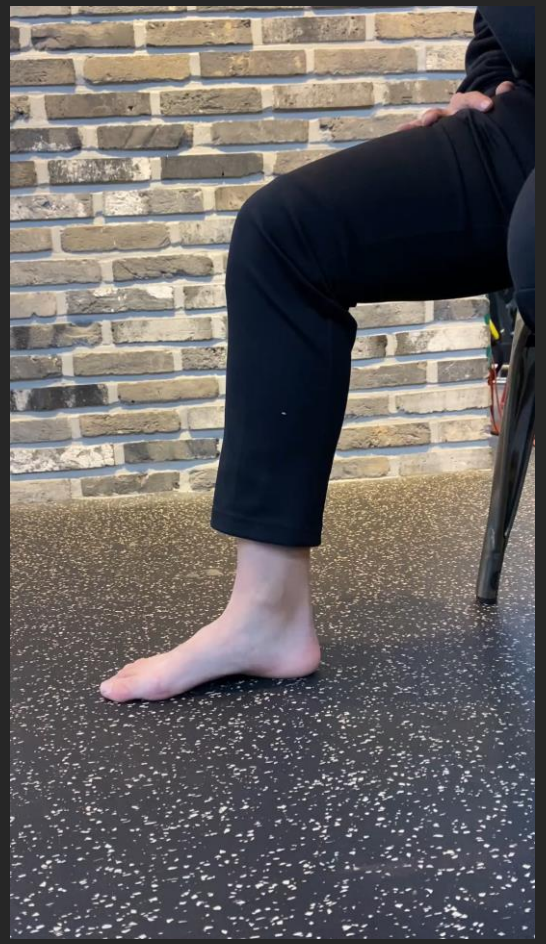


- Plantar fasciitis is an inflammation or pain of tissue (the plantar fascia) that extends from the heel to the toes.

- Common causes :
  Increase running volume, flat feet or high-arched feet
  Wearing new or unsuitable foot wear

- Treatment :
  - Reduction of training load
  - Wearing supportive shoes or off-the-shelf orthotics
  - program of calf stretches and strength exercises targeting the plantar fascia and intrinsic foot muscles

- Returning to training



Top 10 Running injuries

5) IT band syndrome

- IT band syndrome is an overuse injury of the connective issues that are located on the outer thigh and knee.

- Common causes :
  Contralateral pelvic drop, Increased hip adduction
  Compression of structures deep to the IT band,
  Narrow step width

- Treatment :
  - Reduction of training load
  - stretching to release the tensor fasciae latae (TFL) muscles (the IT band itself cannot be stretched or released)
  - Strength training for the hip abductors

- Returning to training

Top 10 Running injuries

6) Calf Injuries

- Gastrocnemius injuries typically localizes at the distal insertion of the medial or lateral head into the proximal Achilles fascia
- Soleus injury is palpated deep and often distal to the muscle bellies of the gastrocnemius

- Common causes :
  Increase running speed, Fatigue , Over training

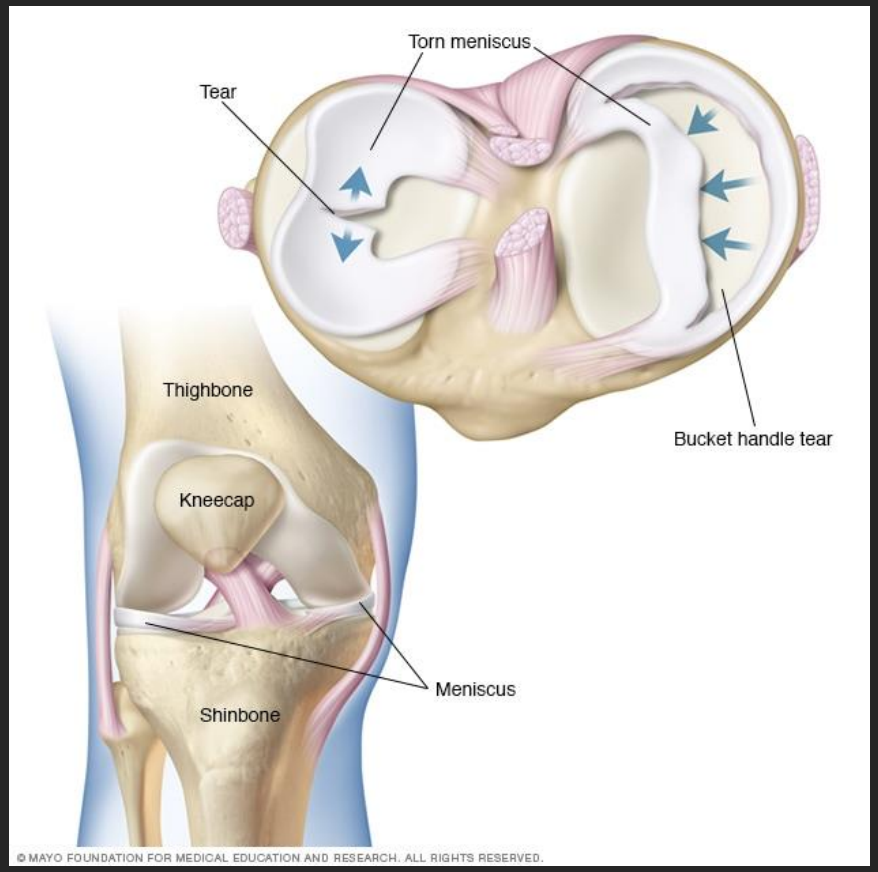
- Treatment :
  - Reduction of training load
  - Progressive loading exercise

- Returning to training




Top 10 Running injuries

7) Meniscus injury



- Meniscus injury as a result of a forceful twisting, pivoting, and suddenly changing direction. When running wrong movement of the knee can rupture the meniscus.

- Common causes :
  Fatigue , Over training, Increased hip adduction

- Treatment :
  · Stop running
  · Proper treatment

- Meniscus extrusion

Knee Surgery, Sports Traumatology, Arthroscopy
https://doi.org/10.1007/s00167-018-5303-x

KNEE

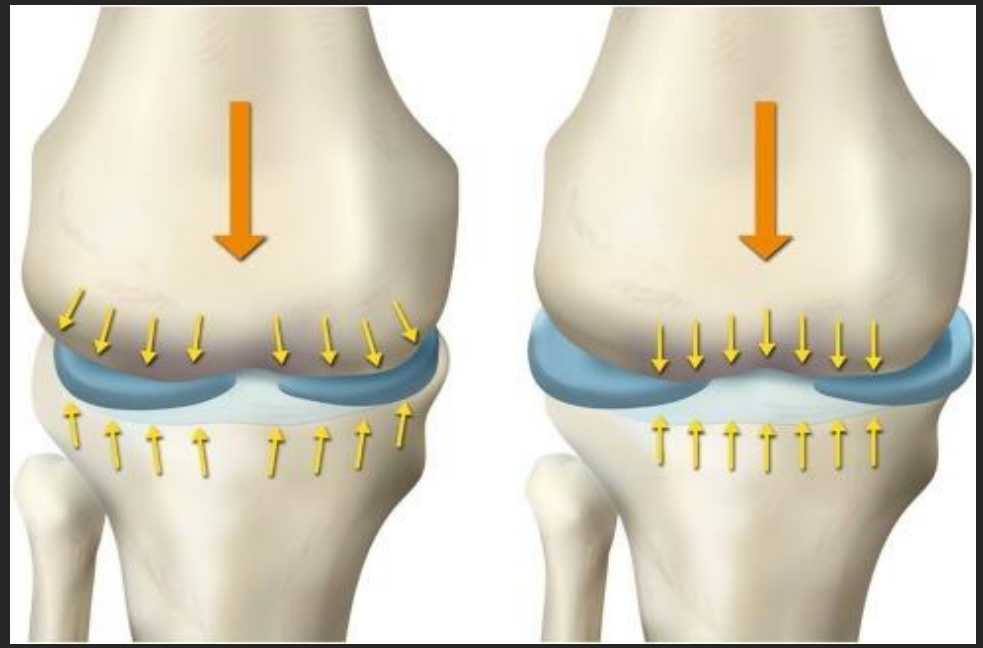
Mountain ultramarathon results in temporary meniscus extrusion in healthy athletes

Theresa Diermeier[1] · Knut Beitzel[1] · Laura Bachmann[1] · Wolf Petersen[3] · Katrin Esefeld[4] · Klaus Wörtler[2] · Andreas B. Imhoff[1] · Andrea Achtnich[1]

Received: 20 August 2018 / Accepted: 14 November 2018
© European Society of Sports Traumatology, Knee Surgery, Arthroscopy (ESSKA) 2018

Abstract

Purpose In recent literature medial meniscus extrusion (MME) was demonstrated as an age, BMI and load dependent physiological phenomenon in healthy knees. The aim of the present study was to evaluate the influence of mountain ultramarathon running on the medial meniscus extrusion (MME) in healthy athletes.



-The mean MME(medial meniscus extrusion) increased significantly compared to baseline measurements.

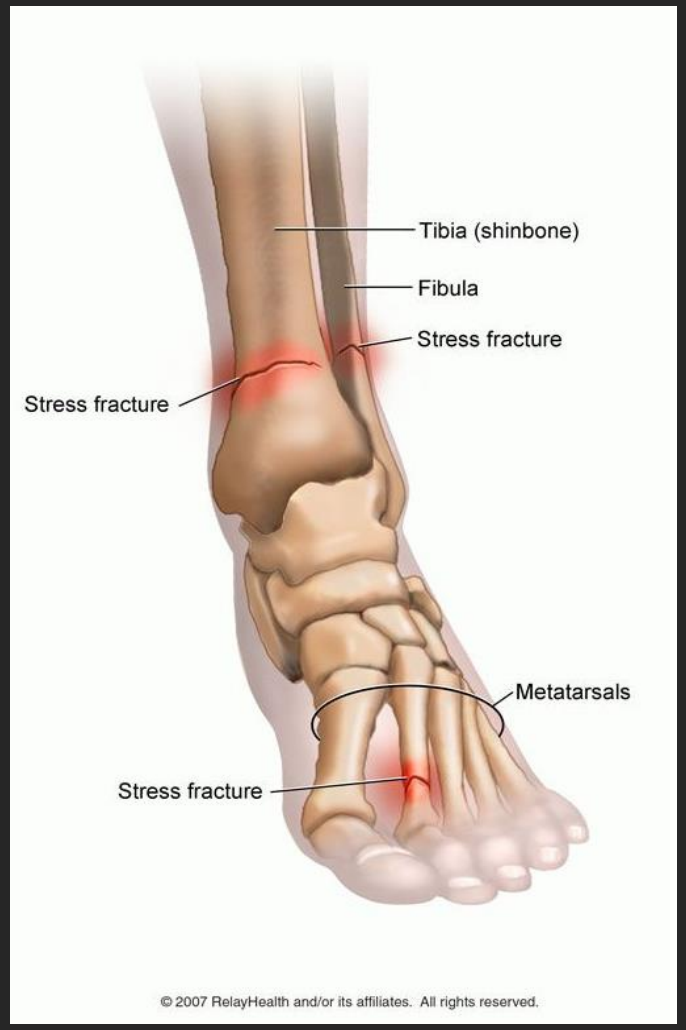
-After race the mean MME in supine position was 2.7mm ± 0.7 mm and 3.1 mm ± 0.6 mm under full weight bearing.

-After 2 weeks of recovery medial meniscus demonstrated a complete reversibility of the extrusion to normal.

The meniscus has viscoelastic capacities showing short-term adaptions to high loads, which are completely reversible over time.

Top 10 Running injuries

8) Stress fracture



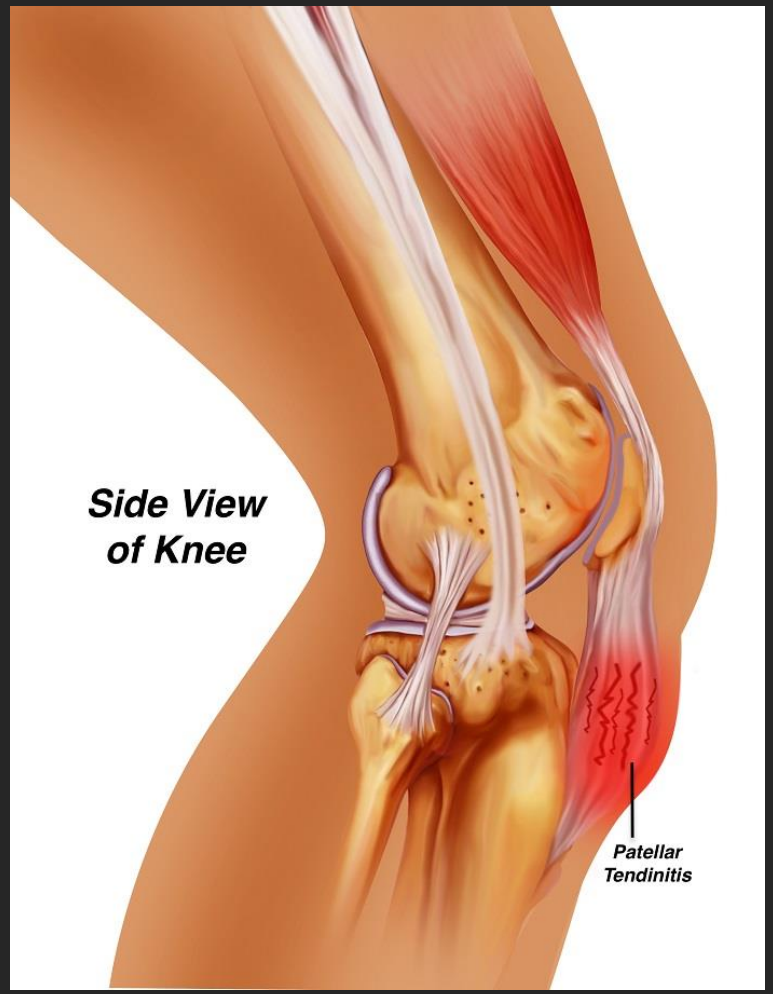
- Stress fractures are fatigue induced cracks in the bone that develop due to overtraining and inadequate rest.

- Common causes :
  Overload, Increased training volume or intensity, Running with forefoot strike pattern

- Treatment :
  - Stop running, reduce weight bearing
  - Proper treatment

Top 10 Running injuries

9) Patella tendinopathy

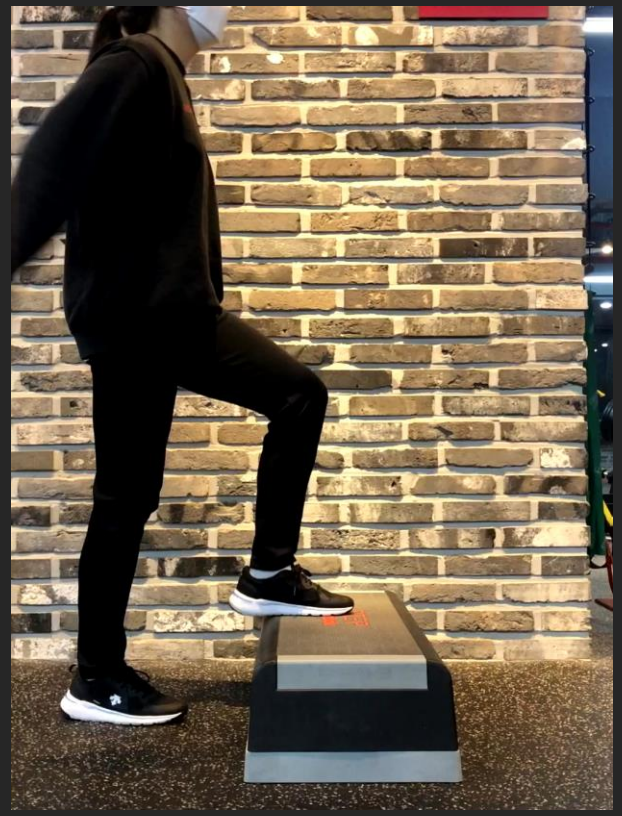


- Patellar tendinopathy is a chronic condition that has a high prevalence among jumping sports.
  Painful chronic injury of the patellar tendon that interferes with many athletes' sports career.

- Common causes :
  low arch, Poor hamstring and quadriceps flexibility, Poor explosive leg strength, Weak thigh muscles
  Training load

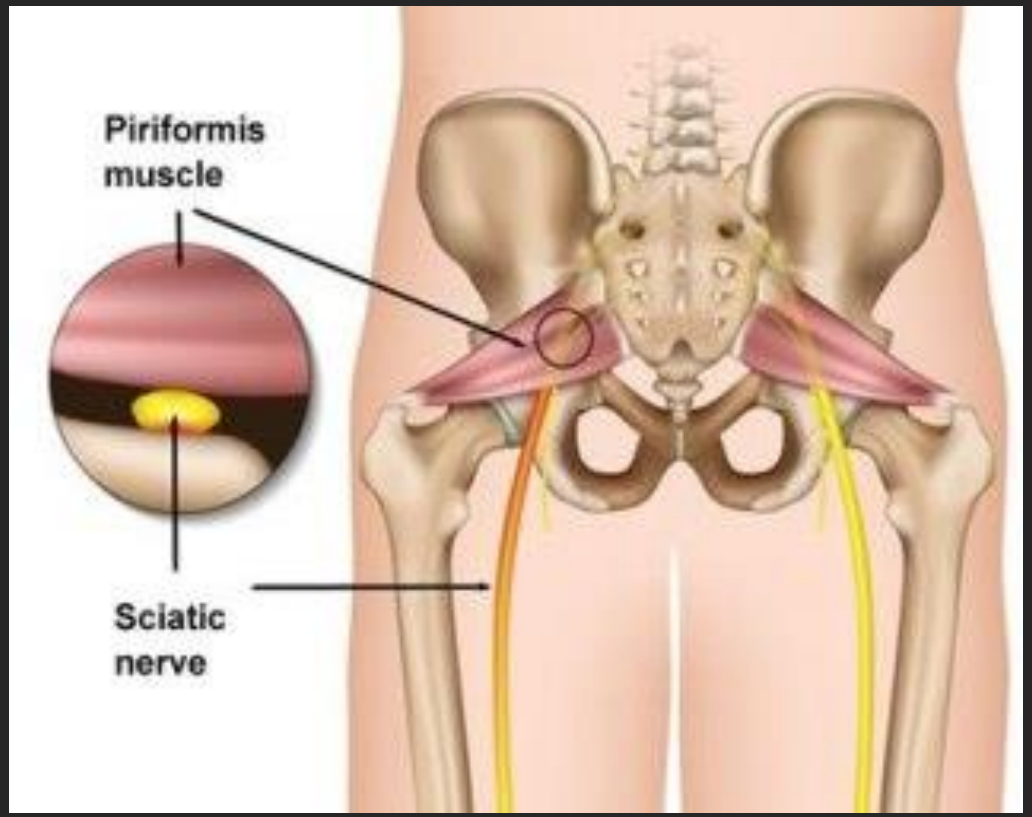
- Treatment :
  - Reduction of training load
  - Quadriceps and Hamstring stretches and strength training for the patellar tendon
  - Foot training for arch condition

- Returning to training



Top 10 Running injuries

10) Deep Gluteal pain (piriformis syndrome)



- This condition describes buttock pain caused by trapping or compression of the sciatic nerve within the hip

- Common causes :
  Running duration or intensity
- Treatment :
  - Sciatic "flossing" (nerve stretching) exercises
  - strength training exercises targeting muscles of the hip abductors
  - Reducing the time spent sitting

- Returning to training

How should we do running training?

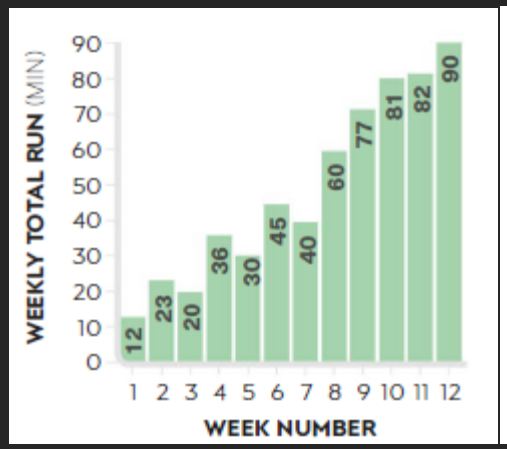
PROGRAMME PROGRESSION
Each of the 12-week beginner programmes (5 km, 10 km, half marathon, and marathon) progress from where the previous programme finished. It is possible to follow these 4 programmes through from a starting point of no running to completing a marathon within 48 weeks.

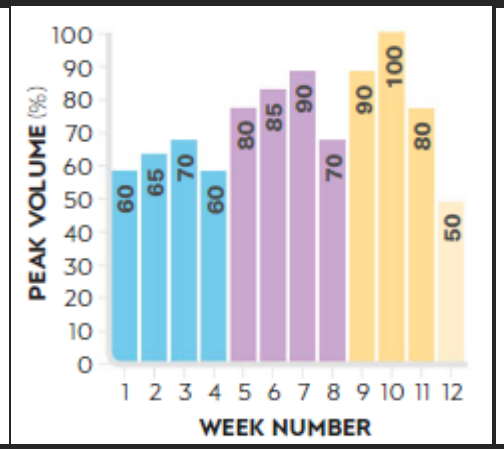
BEGINNER 5 KM PROGRAMME
WEEKS 1–12

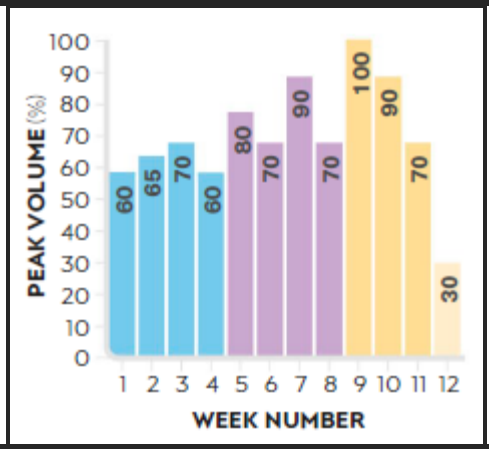
BEGINNER 10 KM PROGRAMME
WEEKS 13–24

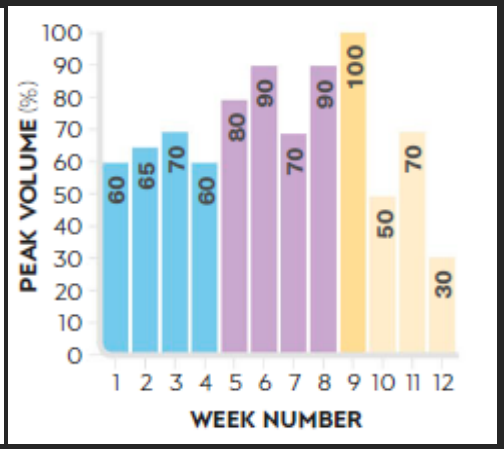
BEGINNER HALF MARATHON PROGRAMME
WEEKS 25–36

BEGINNER MARATHON PROGRAMME
WEEKS 37–48









(Nepier, C. 2020)

Optimum running training principle

1. Recover at least two days a week
2. Strength and plyometric training are included at least one day a week.
3. Do interval training 1-2 days a week
4. It takes 10-14 days to adapt to the training load, so you have to train gradually.

(Brotzman, S. B., & Manske, R. C. 2011)

THANK YOU!!