Running injuries & assessment

Performing a running analysis/gait assessment with runners is vital for good treatment outcomes. It is important to remember that static posture and static measurements do not relate to running mechanics or injuries.

Communication tips

Communication is one of the most important aspects of your session with a runner. Find out what is driving the person running - competitive runners may be most interested in the distance they run per week, whereas a social runner may be more inclined to follow your advice on cross training.

Remember, often running is a large part of the person's self identity. Avoid saying "Maybe running isn't for you", "is running really that important?", "that's what you get for running" or using terms like "miserable malalignment".

Tell the runner "You have a lot of good things going on" or "You have a nice running style", and follow up with "the aspects that I have noticed in your running that fit my clinical hypothesis on why you are getting this injury are...."

Questions to ask runners

- How consistent are you with your running
- Are you sticking to a running program
- What intensity do you perform most of your runs at
- Are you using a polarised training approach to your running speed -

Running intensity

Ideally a runner should perform 20% of training at anaerobic threshold and 80% of training volume at low intensity. During low intensity runs they should be able to say the alphabet without hyperventilating. Training in the middle ground/speed (slightly below threshold - at a good steady running speed) will increase fatigue.

Fatigue leads to increased impact forces, hip adduction during the stance phase. These factors are associated with tibial stress fractures, PFJP and other injuries. Running in the middle training intensity may also inhibit your immune response.
Research shows that polarised training approach allows you to run harder on your hard runs, as not as fatigued from easy days.

Runners should feel refreshed after finishing 80% of their runs. If they are not refreshed, they are running at too high an intensity for most of their runs.

**Recommendation for intensity:** Perform 80% of training volume at low intensity, 20% at high intensity.

**Technology**

Wearable devices that provide helpful measurements for runners include the Garmin 620 & Run Scribe. These allow calculation of cadence, step length, running volume, chronic training load and vertical oscillation/displacement. Run Scribe also allows calculation of impact forces, pronation velocity, dorsiflexion and plantarflexion velocity.

iPhone apps including RunCadence can help to identify and monitor cadence.

**Forces during the running cycle**

Tibial loads eg in patients that have had tibial stress fractures - impact forces seem to matter more than peak loads. Vertical oscillation is not as important for patients with bone stress injuries.

Patella-femoral joint pain (PFJP) - vertical oscillation and amount of knee flexion are closely related to joint loads. If you run slower, you tend to go into more knee flexion, which may load the PFJP, patellar tendon etc. Slow jogs may not be the best speed for patients with chronic knee pain.

Achilles tendon and plantar fascia loads may be higher with higher speeds

**Important factors when treating runners with PFJP**

Load management and running mechanics are important to address before talking about running speed.

**Important factors when treating runners with Achilles Tendinopathy**

Discuss training loads and running shoes, and identify if they are performing a lot of speed work, which will also increase Achilles load. Increased dorsiflexion (DF) through the stance phase will increase the load on the Achilles.

**Biomechanical terms**

- Peak loads - highest loads someone may have. Occur in mid stance
- Rate of loading - how quickly get to peak load. Running with a quicker rate of loading sound loud. You can look at rate of loading for the knee or achilles
- Cumulative load - loading cycles eg 40-50,000 steps/loading cycles in a marathon
**Gait/running assessment**

Use a standard high speed video camera, with a frame rate of 100fps or more. Recent iPhones have a high frame rate, so may be ideal for gait assessment.

Avoid perspective error by positioning the camera level with the joint/area of interest eg camera level with the knee if you are assessing the knee.

**Rear view**

Main aspects to identify with a rear view include:
1. Trunk/pelvis
2. Arm carriage. Do they keep their arms away from their sides to maintain their balance, potentially making up for balance issues lower eg hips and knees
3. Pelvis - pelvic drop, hip adduction, hip IR
4. Hip IR can be hard to judge - popliteal crease can indicate this - if they are facing back towards you, or if they are facing outwards (hip IR). Eggbeater gait - legs kicking out to the side can indicate hip IR during the stance phase
5. Knee window - Look at the femoral condyles - if they are close to touching during the swing phase, this is a good indication the patient is going into hip adduction, which is related to PFJP, ITBS and tibial stress fractures.
6. Rear foot motion - are they crossing over (leg past midline) - looking like they are weaving down the road - increases load on the knee, toeing out
7. Footstrike pattern
8. Frontal plane kinematics eg pronation

**Foot mechanics**

Runners with a crossover gait (feet across the midline) will have to have a lot of pronation to get the foot flat on the ground, thus shoe or orthotic prescription is not as straightforward as looking at the footstrike pattern or foot mechanics, without looking above.

**Links of interest**

Rich Willy on Twitter
Webinar with Tom Goom on Bone stress injuries
Cervical spine assessment & treatment online course
Run Cadence app
Garmin 620
Clinical Edge
Clinical Edge free trial
David Pope on Twitter
David on Facebook Live video