

A Functional Approach to Improving Ankle Dorsiflexion

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Today's article is a guest post from Keith Thornhill, current team physiotherapist at Munster Rugby (Ireland).

In my experience the foot and ankle are almost as forgotten as the wrist and hand when it comes to physiotherapy assessment and treatment. However, in my opinion unlike in the wrist, any deficit in function of the foot/ankle can have a greater impact on any individual. For instance, limited ankle dorsiflexion will have a much larger and more detrimental impact on the individual than the same issues would typically have when occurring on the wrist/hand.

Think of it like this, the foot/ankle are the foundations that we are built upon, if there is an issue with the foundation then with every step this issue is carried forward and effects every single step we take, typically causing a compensation occurring further up the kinetic chain – the body always finds a way to adapt to what it is presented with. Even though you might be in pain with every step, this is still the body's way to function at 100% of what it is given, it always tries to make the best out of the scenario it is presented with.

This adaptation may not be an issue in the short term for recreational athletes but at some point this foot/ankle deficit will undoubtedly reach a threshold that will create a hotspot which is going to be impossible to ignore. For example reduced ankle dorsiflexion due to an anterior impingement – locally this block will repeatedly be irritated as the individual works through their limited range creating increased bony stresses which promote development of osteophytes – a more permanent issue limiting ankle range. However, the body will attempt to adapt to ensure you notice the lack of dorsiflexion -Doesn't seem like much of an issue does it?

Knock on Effects

In order for your body to adapt to limited dorsiflexion it results in an earlier toe off on the affected side and consequently results in earlier initiating of swing phase and heel strike on the opposite side – now this cannot be symmetrical! As with all asymmetries in the body – something must be overworking and something else underworking. So what? You can function so well you don't notice it and you do not have any pain – there must not be an issue! Well that's not how it works unfortunately. Something has to compensate for the underlying issue unfortunately as the foot/ankle is an important aspect of the gait cycle the underlying issue is always present, **it literally follows you around!!**

This may not have much of an impact on the recreational athlete but in the elite environment this can have a big impact. The earlier toe off on the affected side means that there is incomplete hip extension occurring which means that the powerful hip extensors are not functioning properly. Think of it like this; the more range available in a joint, results in more range available for a muscle to contract – thus providing a longer force-time curve. Remembering that if any muscle does not need to function it will atrophy to meet the demands placed upon it. An inhibited gluteal results in a host of issues such as increased risk of lumbar and pelvic dysfunction, anterior hip pathology, patellar maltracking and hamstring strains.

In Layman's terms look at it like this, if we say for this example the ankle/foot dorsiflexion range has a numerical value of 1 but reduced dorsiflexion of one ankle means this value is .95. This 5% difference may not seem much but for an elite athlete this 5% may result in acute injury or may limit them reaching their maximum speed scores necessary in their sport or for the weekend warrior the 5% may result in longer term degenerative changes occurring as a result of repeated wear and tear due to muscles/joints acting in order to compensate for the minor deficit. The weekend warrior may not note a short term issue as they are not reaching the top ends of performance and their bodies limits, but for the elite 'finely tuned' athletes this 5% may result in a short term issue such as a calf tear, repeated calf cramping or hip flexor tear usually on the same side (remember the compensation that occurs). Look at it this way, if one side is working at 95%, something else has to make up for the shortfall. This may for instance mean the hip on the same side is working at 105%, or there are a few different muscles and joints on both sides working at over 100% (eg left knee and hip at 102% each, and Right lumbar spine at 101%). The body will find a way to function maximally with what it is faced with, but unfortunately it does not know what the issues is and it cannot treat it – it just adapts to what it's given.

Basic Biomechanics of Gait Cycle

So now that the importance of ankle range has been highlighted we now need to look at what happens in the foot/ankle during gait in order to see how this treatment approach works.

On heel strike of the right leg, the calcaneus is forced into eversion, this causes the talus to rotate internally. This talar internal rotation drives internal rotation of the tibia, which causes the femur to also internally rotate.

Effectively, the eversion of the calcaneus on heel strike has caused the right hip to internally rotate – who would have thought the foundation would have such a big effect further up the kinetic chain (the effect goes further up the chain, have a think of what would happen to the lumbar, thoracic spine and the shoulders, arms and even the head – all this from one small bone moving a few degrees).

Traditional Manual Therapy Approach

Traditionally, reduced ankle dorsiflexion is treated with Maitland Mobilisations. This involves placing the joint in question in a specific position to favour a certain movement and stress specific structures while stabilizing one bone and forcing another bone in a specific direction in order to improve the joints range. Typically grades 3-4 are used as standard and usually are performed for 3-5 reps of 30 seconds each (although typically therapists tend to base timings on how fatigued they become). All this just for one joint and focused on one isolated movement.

For the ankle we would have to focus on 3 main joints – talocrural, subtalar and mid tarsal joints with each having varying degrees of plantar and dorsiflexion, inversion, eversion, abduction and adduction occurring. If we believe that each action causes, leads to or is assisted by another movement we probably need to mobilise all the above joints to ensure all components of the kinetic chain can function properly – which translates to a lot of time and energy spent hammering joints to improve movements. During heel strike to toe off the

subtalar joint undergoes dorsiflexion, eversion and abduction, the midtarsal joint goes through dorsiflexion, inversion and abduction while the talocrural joint experiences dorsiflexion, eversion and adduction. This translated to treatment time –mobilising each of the 3 main joints in all 3 planes (frontal, sagittal, transverse) for a conservative treatment of 3x30seconds with Maitland mobilisations for each movement this equates to about 13 ½ minutes of heavy labour on your behalf. That’s a lot of treatment time spent hammering at something that moves only slightly and is highly dependent on how much force you can generate and how long you can sustain it. I’m not sure about you, but I get pretty tired pounding away on a joint with this much force for even one set, and to make it worse the patient is just lying back taking a break! The more I expanded my knowledge the more I began to think how does this isolated approach transfer to function? Is a one dimensional treatment approach really the optimal way to solve a 3 dimensional problem? Surely there is an easier and more functional way which doesn’t require me to do as much.

Functional Manual Reaction – The 3 Dimensional Approach.

After coming across Gary Gray (www.anatomyinmotion.co.uk) and his approach to the foot and ankle I think I’ve found the Holy Grail for ankle range and functional treatments! Seeing his Functional Manual Reaction (FMR) of the foot and ankle in action I had a eureka moment – the logic behind it was so simple but made so much sense, it was one of those moments you think to yourself ‘how didn’t I think of this?’.

Basically, FMR is a functional approach to the ankle – it requires the patient to be stood upright with the restricted ankle either in front (heel strike – midstance) or behind (midstance-toe off). Then the patient is instructed to drive the lead knee forward and inwards as would occur naturally during gait and the therapist merely assists and promotes movement through the various joints.

No longer do you have to generate superhuman forces pushing and pulling on bones while you try not to sweat too much during your ‘workout’ – the patient does the hard work for you. Think of it like this – as the patient is standing they have 2 major forces acting upon them, firstly gravity is pushing down which doesn’t have much effect when they are lying on the treatment table, and secondly their own body weight is acting upon the joints as they move. I work primarily with rugby league players (weighing up to 120kg) – I know I will never be able to generate the same forces during a Maitland Mobilisation than they can generate themselves just by standing upright with the addition of gravity. Unless the patient is pretty small I’m convinced I cannot generate and sustain the same forces on the treatment table as they generate themselves in a weight bearing position, even if I could, I think that Maitland mobilisations are too specific, labour intensive and time consuming and most importantly lack the functional movement patterns that would occur naturally during an FMR approach. Also with the FMR approach I will be able to functionally mobilise all joints by performing 2 simple techniques.

In FMR the therapists actions are based upon what happens during gait, when the affected ankle is in front (heel strike – midstance) the subtalar joint dorsiflexes, everts and abducts, the midtarsal joint dorsiflexes, inverts and abducts while the talocrural joint dorsiflexes, everts and adducts. Simply the calcaneus everts, talus internally rotates, the midfoot pronates, the tibia, femur and hip will as a result internally rotate. All I need to do is

promote this movement with my hands while the patient provides the driver (shifting weight onto the lead foot, moving the knee inwards and forwards in relation to the big toe).

Treatment Video 1: Heel strike – Mid stance

Click [here](#) for the video

Video 1 notes;

Placing a wedge under the heel to encourage calcaneal eversion.

A wedge can also be used on the midtarsal joints to promote/prevent further pronation in order to change with joint you wish to focus the treatment on.

An additional wedge can be used under the calcaneus to promote calcaneal eversion.

Restriction of the anterior glide of the fibula/lateral malleolus, effectively opening up the ankle mortise to promote dorsiflexion.

Submaximal lunge with the effected leg placed further towards midline to promote eversion.

Addition of a midtarsal wedge to promote inversion of the on the inside of the foot to focus on the midtarsal joint.

Treatment Video 2: Mid stance – Toe off

The same treatment approach can be transferred when the affected side is placed behind in the stride stance position (mid stance- toe off). In this position the opposite occurs, the calcaneus inverting, the talus externally rotates causing the tibia to externally rotate and the midfoot will begin to supinate. Again, once you understand the actions occurring during this movement you simply use your hands to facilitate this.

Click [here](#) for the video

Video 2 notes;

Addition of a wedge to promote calcaneal inversion.

A wedge can also be used for the midtarsal joints to facilitate supination.

Promotion of posterior glide of the distal fibula/lateral malleolous during tibial external rotation.

Addition of opposite arm swing to promote hip extension thus increasing kinetic chain interaction.

In Practice

From using this in practice I have found that it can be very effective with improving ankle dorsiflexion when there is an anterior restriction. I typically use a simple knee to wall test to objectively measure ankle dorsiflexion, if the area of restriction is the anterior ankle and there is a large discrepancy between side (eg range and area of restriction). Typically, I have experienced quite large gains on retesting after treatment just a few minutes of work. The important things I have found is to ensure that the patient is positioned well and is performing the lunge correctly. For the patients who are the 'motor morons' and the ones who struggle to 'let go and relax' it can be tough work. If you feel like you are physically having to push them into end range during the lunge you need to encourage them to allow the action to happen more smoothly, this may mean getting them to practice the movement for a few minutes under direction prior to commencing treatment – time spent early on with these patients is well worth it down the line when you see the results you can gain.



About the Author

Keith is currently working with Munster (rugby union) in Ireland with the first team as team physiotherapist. Previously, Keith was with the Leeds Rhinos (rugby league) and is a graduate of the University of Huddersfield where he gained a BSc (Hons) Physiotherapy in 2007. He has recently returned to the UK from several years living in Australia where he worked primarily in private practice which enabled him to complete a Certificated in Orthopaedic Manual Therapy from Curtin University, Perth. Keith has worked with a variety of sporting environments, including Gaelic Football, Hurling and Soccer. He is currently employed by Leeds Rhinos Rugby League Club which involves working full time to provide physiotherapy care to all first team and academy squad members. This includes diagnosing, providing hands on treatment, rehabilitation and injury prevention strategies to all players. Keith is currently on track to complete a Masters in Strength & Conditioning, from Edith Cowan University, Australia, later this year. Keith can be found at @keith_Thornhill

