Supplementary file 9 Perceptions of evidence and appropriateness of running retraining

9.1 Perception of evidence and guide for future directions

Perception of current evidence base	
Limitations of current evidence base	"we don't have much. It's starting to grow ….. we need more research for sure." (1) "It is really a trial and error type sort of approach rather than anything, soley based on science." (5) "There's not a lot of research. There's probably just three studies which were all case series on patellofemoral pain. And then there's one case series on anterior exertional compartment syndrome and that's about it, so there's not a lot of evidence for it." (6) "So we have absolutely nothing except indirect evidence ….. I will say its flimsy evidence. " (10) "my impression of the evidence is that it's weak and it's early. And I don't think that it's been definitively shown yet that any one biomechanical variable correlates causally with any injury." (13) "There's no good evidence on this and every individual is gonna respond differently to these things." (14)
Lack of research to evaluate efficacy	"I'm not sure that there's strong evidence for any injuries right now." (8) "I think there's certainly a lack of efficacy studies at the moment." (9) "at the moment, it's very theoretical. We know that change is loading. We don't necessarily know if it changes pain and pathology." (12) "the evidence that making changes through gait retraining has strong clinical outcomes is also very early and very weak." (13)

	"I look at anterior knee, medial shin, I will probably use for ITB-related syndromes as well and anterior shin. I think they're the strong groups ….. (but) we don't have – Certainly don't have good prospective trials around that yet, that the case-based studies tend to be relatively small in numbers, that they're not particularly controlled" (15)
Existence of theoretical evidence Making an evidence based case for running retraining implementation	"you can make a logical argument for including it in treatment for patellofemoral pain, iliotibial band syndrome, stress fractures, tibial stress fractures." (8) "There's more theoretical, you know, if we do this, if we change this parameter of running then we couldn't, then we can expect this change in the tissues or the, you know, the forces being applied. And then we apply that theory to the conditions we see." (9) "I mean, there's still not a huge bulk of research out there ….. it's still very much in its infancy, but there's a quite a lot of theoretical stuff out there" (12) "we use it on every patient so, you know, just because there's not evidence for it, to me as a clinician, doesn't say we shouldn't try it in our other patients ….. I think it's for anyone who has biomechanical problem that you think, you know, is there's a strong rationale for it being associated with the injury." (4) "you can make a logical case for using gait retraining as an adjunct to rehab for a number of injuries." (8) "I prefer to modify the stuff that I know there's seems to be some – at least some research that shows that change is loading in some way or shows it could potentially influence pathology." (12) "we can demonstrate that we can modify stress on that tissue by changing the way we run which is good." (14) "I think the running modification literature probably supports that there are things that we wanna change in people with patellofemoral pain." (16)

	"I think the evidence also suggests that if it's something we wanna change in gait, we need to change it in gait by addressing gait." (16)
Future directions	
Evaluate clinical efficacy	"I think one or two of the existing centres probably need to focus more on longer term interventions ….. and put together a kinematic and kinetic study." (7) "And like you said, it needs to be evaluated from a persistency perspective as well. How long do the modifications last?" (8) "the next step for the research is to look at and see what happens with gait changes in terms of actual pain and pathology." (12) "I mean given that the evidence is so weak around causally relating any biomechanical defect to an injury. It's – I mean, if you're gonna look at it from a pure scientific perspective, that really needs to be sorted out before you even look at ethics of your gait training, but I guess the flip side is, if you can do some decent gait retraining studies, targeting some of the key injuries and you can show a difference, then you can go back and look at the mechanism of that." (13)
The need to identify conditions and individuals running retraining is likely to be effective in	"different pathologies. Right now, we have patellofemoral pain, we have anterior compartment syndrome which we don't have other pathologies." (1) "look at actually what works, I think, that would be a good first step—looking at what works for what conditions ….. The efficacy of adding a running program into another protocol." (9)

	"there's got to be some more guidance as to, for clinicians and coaches to say, "This person has this type of flexibility profile, this type of strength profile. They're going to be not a good candidate for forefoot running in particular." (5) "We need to come up with some guidelines about what conditions it can be used for and what things we need to change and how to go about changing them and then from there, once we've got some guidelines, we can go about testing them both in laboratory terms, looking at biomechanical changes, but then also importantly, comparing to other interventions and comparing to controls, etcetera, to see if they are actually effective in the real world." (6)
Developing technologies to provide efficient feedback and valid clinical measurements	"we need to figure out what the best kind, in terms of gait retraining, what the best of feedback is. I mean we're using visual, maybe auditory is better. Maybe there's a way to tie auditory to, even to alignment. We might wanna use EMG." (4) "If we can work out some simple clinical measures that can be applied to measure different ranges, joint angles, etcetera, during running and we know that that's a risk factor then we can change them. I think it's gonna make life a lot easier - especially for you grad clinicians coming out trying to do things." (6) "I think we have a long way to go to understanding different treatment or different interventions for gait training, frequency, dose, duration; all of those things are really wide open areas in my opinion for gait retraining. Even the nature of the feedback is fairly elusive." (8) "most clinicians don't have access to force plates 3D analysis. They have access to video on a treadmill. So we need to give them tools that they can use in the clinic, put that – The tools that they're using either in assessment intervention are clearly linked back to what we found of more, say, life-based data for example." (11)

	"I'd like to see some more research looking at what happens with handheld cameras like we use in the iPhone or iPad." (12)
Mobile monitoring and compliance	"mobile monitoring really, I think that's what we really need to go ….. try to do the gait retraining outside, outside the clinic situation." (2) "mobile monitoring, and then are they really doing it out in the field ….. it'd be really nice to be able to get people some kind of feedback so they can check themselves and also so we can check them to see that they're really doing what we want them to do." (4) "I think compliance is a big interest." (7) "It's a good way of getting them to make those changes, so they can see what's happening." (12)
Understanding how running retraining interacts with other interventions	"is it really valuable for runners with patellofemoral pain, for example, to give them exercises out of their running training or is it more of a gait retraining stuff that we help to decrease the load ….. I use exercise; I have no idea if it's changing something or not in the gait pattern." (1) ""I think gait training needs to be added to the standard of care or a multi-modal approach and evaluated." (8)
Further biomechanical evaluation	"I think one or two of the existing centres probably need to focus more on longer term interventions ….. and put together a kinematic and kinetic study." (7) "there are other aspects of gait that are under-researched in that area in terms of looking at the tibial rotation, like the rotation around the transverse plane. Again, that starts dorsiflexion angular acceleration rather than just vertical tibial accelerations." (9)

	"it would be really good to have some stronger data on what happens when we change people's running techniques. What happens with the kinetic data? We know what happens, really, with the kinematic data, I think, but what happens with the kinetic data when we use particular cues with particular groups of people?" (11) "If we think that there's an ideal way to run, we should get those variables down, like with numbers, and then we should get the mitigating variables. 'Cause we'll say, "Well, that's not right for that person." Well, what are the variables that changed those variables? So how do we make it more specific to the person? And so, hammer at the risk factors and then figure out how they should be changed in people." (17)

9.2 Appropriateness of running retraining

Patients and populations likely to benefit	
Individuals with chronic or recurrent injuries are likely to benefit	"I believe that if that person was not injured for a long period of time, and it's a new injury, that may not need the gait pattern that's responsible. That's probably mostly a load issue or training errors." (1) "people who are beginner and people who have recurrent injuries, they would like to change their gait pattern." (1) "the guys that are just coming into running and they're saying, "I've been doing this for three months. My shins are killing me."" (3) "If every time when you do a hill session, your back is killing you the next day or something like that. There's a distinct pattern there." (3)
Runners with clear modifiable biomechanical deficiencies	"where they have injury history before you changes somebody's running mechanics or somebody has really excessive mechanics then maybe change, but I think you really need to know what you're doing" (2) "I think there's a role for gait retraining in any case where someone has an overloaded tissue that appears to be related to an abnormal gait mechanic ….. any kind of abnormal gait pattern that we believe have as a biomechanical association with their problem." (4) "I think it works with any conditions where there is a significant motor pattern issue that is not related to an unchangeable, underlying biomechanical problem." (5)

	"You have to try to identify the factors that as a professional you feel are most linked to the injury ….. it just depends what the clinician thinks is the underlying cause of the individual's injury and if that can be modified." (14) "need to link the gait variable with the pain syndrome that 'm seeing there needs to be some logical link there, I need to keep my cues simple, I need to save my feedback, I need to sort of work somewhere between two and six weeks." (15) "Anything where I think there's a mechanical component ….. I don't think we can always change mechanics, and I don't think it's always necessary." (17)
When should runners seek assessment? Affecting goals; Consistent pain; Pain outside of running	"If they're starting to really feel like, you know, I can't run as far as I want to and because I'm having this pain. I'm having to either change the way I run or I'm having to cut back on my running, I think they should seek attention." (4) "anyone who is broken, anyone who's got pain." (5) "I think if you're getting a continual issue where it's affecting your ability to run or affecting your ability to do things after your running in terms of pain and it's not settling and you've had it on three or four consecutive occasions, and I think once it's beyond two consecutive occasions, you definitely should get it checked out." (6) "I think if you've reached a certain level of tolerance so you've been running maybe 5K three times a week and then you're trying to change that program, to try to add to or extend or maybe target a 10K or half marathon as a race and then you develop symptoms which prevent you maintaining or extending that program, then I think that's the warning sign." (7) "when it's just affecting your happiness, if it's becoming a real – if it's interfering with your goals and your goal setting and – that's a sign to have it looked at." (8)

"If pain is getting worse, sooner rather than later. If pain is more than a mild discomfort, sooner rather than later. If symptoms are lasting more than a week or two, sooner rather than later." (9)

"if you've got someone with a very transient niggle that they get for a couple of days it never rears its head again, I'm not too concerned about that. If there's something that's been a bit more consistent, I'd expend that for a few runs. Maybe, it's been there for more than a week or two and it's not getting better." (12)

"Looking out for other key signs of injury – obviously, things like bruising, swelling, restriction in range of movement, any of your kind of red flag type signs, obviously. And also, a big thing, I think, is looking out for pain when you're not running. I think that's often a sign that there's something more than just a niggle happening." (12)

"if in doubt, do get it checked out. Because it's better to do that than wait two or three months until it gets to a stage where you're really restricted and can't run. You're better off going and seeing someone and getting peace of mind and maybe a little bit of advice sooner rather than later, I would say." (12)

"if they go and they run a day and they get pain that's bad enough that makes them stop and take the next day off, and they try again and they still have that pain and it causes them to stop and they take the next day off, and on the third day, if they try again and they still have pain and they take the next day off, they need to seek help. So that means no more than a week should they wait if they've tried three times within that week to run and it doesn't get any better, it's time to go see someone." (14)

"If you're getting involved with two out of ten in the visual analogue scale that's happening every single run, it might be good to start to have things checked out." (15)

"I would tend to use a green, amber, red argument that green – Everything's fine, no problems. Amber – There's some degree of post-running soreness that lasts a few days at that stage. Back off four or five days, if things settle down then pick up and go again, that's great. If after that week, things haven't settled down, then go and seek advice at that point with particular vigilance around anything that potentially is tendon or bone." (16)

Caution may be needed in the presence of acute injury or when not injured at all	“when it’s an acute injury, it’s not a good idea. Sometimes we can exacerbate the problem.” (1) “If you're running comfortably and there's no injury, and you’re finding everything is going swimmingly then while I’d argue that there’s always room to get an informed coach to have a look and make suggestions that absolutely don't feel there’s a need to make changes for the sake of making changes. If it ain't broke, don't fix it to an extent.” (3) “There's some intelligence wanting to find that next little goal, that next little breakthrough. And they’ve actually screwed themselves up significantly through changing something which was probably too big a change.” (3) “if it’s an acute one, then I want a period of overload. I’m conscious of pathology at that stage and that this might just need to calm down.” (16)

9.3 Specific conditions

Which Injuries	
Most lower limb injuries likely to benefit	"it's probably all overuse injuries actually." (6) "Anything really lower limb related." (7) "I think, really, you can almost say that as a role for gait retraining and virtually any running related pathology, in the sense that we can use it as a way to change the load is going through the tissues ….. it does have a role for things like proximal hamstring tendinopathy, for gluteal tendinopathy, for pain or certainly around the hip. But I've not seen any evidence directly showing that it can affect those things. Also perhaps to some degree, for Achilles tendinopathy." (12) "ITB, patellofemoral, shin splints, stress fractures. I think they're the ones which – It appears to be most benefit from Achilles problems, maybe. I'm a little bit less certain about that." (13)
Foot and Ankle	
Evidence and suggestions for anterior compartment syndrome including step rate, foot strike, and reducing over stride and impact loading	"anterior compartment syndrome, that's really quick; that's a quick fix. (1) "one of the areas that there is a bit of evidence is in the compartment syndrome area ….. It may just make a lot, a lot, a lot of sense to retrain someone who's got a compartment syndrome, A, because nothing else works and B, because once you start getting the calf working, they're going to absorb loads much better." (5) "if it's anterior compartment syndrome, again, it's usually over-striding, usually heavy heel strike 'cause they're overusing their tib ant to control that foot slap ….. So, just looking to try and reduce that overstride, getting weight more onto their body, getting them to come often to a very almost heavy forefoot strike to start with just

	so you completely unload tib ant is often the best way to go and then eventually working them back towards a midfoot strike pattern." (6) "the evidence so far, I think, demonstrates that it's beneficial for anterior compartment syndrome." (7) "For example, if somebody presents me the very acute anterior compartment syndrome, then I'm gonna want to switch into a forefoot position pretty quickly." (11) "the evidence is probably strongest around anterior compartment syndrome." (13) "I think the ability to, in my head, reduce those anterior compartment demands can be really effective. It can be effective really quickly, so I would look at gait retraining almost as a frontline first port of call for anterior compartment syndromes ….. a number of these people have general swing phase mechanics characterised by a lack of hip-knee flexion, so they run with a relatively long lever and it almost looks like an extension of the walk-run transition rather than something that's a more classical running gait ….. My approach tends to be to try and change the kinematics of that whole leg with an outcome hopefully of changing Tib ant activity at footfall. I don't start by saying, I want you stop landing on your heel and running on your toes." (16)
Managing plantar fasciitis, considering over-stride, impact loading, step rate, strike pattern, footwear and proximal mechanics Very poor agreement amongst experts on whether gait retraining can be effective and if so, the best way to implement	"we know that Plantar Fasciitis has been associated with higher impact forces, but if you switch to a more forefoot strike, then you'll increase the load on the plant fascia, so might not be the best option on the short term." (1) "I think it has a quite a big role and I think when we're talking about plantar fascia ….. I'd say that if you've got someone who's got a significant overstride, then I would be looking at ….. Most commonly, you don't often see someone and think, "Oh god, that's a terrible forefoot strike pattern." We need to change that. It's often that it'll be at the other end of the spectrum. It's terrible that overstride, heel strike, we need to change that." (5) "plantar fasciitis, you often see, again, it's that often heavy heel strike ….. we know from the research that if you go from a heel strike to a forefoot strike, that's gonna reduce your loading rates and that's something that's been linked to plantar fasciitis, so that's something you look at trying to change." (6)

	"I know there's some evidence on loading rates and plantar fasciitis but I guess in the extent that maybe step rate effects loading rates, maybe that would help ….. but I'm not really convinced that there is a real strong rationale there." (8) "Plantar Fasciopathy or plantar heal pain particularly is more of an impact related condition rather than a stretch related condition. So if we can reduce the impact on the sensitive tissue or the heel in particular, then you know, that's one of the first thing we try to do if we've got a runner with Plantar heel pain." (9) "I will say I will promote better impact moderating behaviour for chronic one. It means, first of all, increase cadence, doing less noise and more minimalist shoes ….. if it's not enough, I can play with the foot position, decrease the heel strike." (10) "what I do with fasciopathy, biomechanical correction and that links more to – Again, starting to look proximally and the relationship between hip extension and early heel rise and how that links in with resistance in the windlass mechanism. " (11) "Plantar fasciopathy is a tough one and I've not had good response to gait retraining on that one." (14) "I've treated plenty of people with plantar fasciitis without modifying their gait tremendously" (15) "I think plantar fasciopathy is a tough one ….. I think that's hard because the majority of gait modification strategies probably tend to lead to a more calf, Achilles plantar fascia loading strategy to try and offload from it, to try and offload knee, shin, structures, so I think that's a hard one. I probably personally would rarely use gait retraining as a starting point for plantar fasciopathy." (16)
Achilles tendinopathy - Considering over-stride, strike pattern, increasing stiffness and hip extension	"I don't agree (sic) changing from an Achilles runner or from a heel strike to a forefoot or a flatfoot ….. I would be looking at other interventions and normalising that overstride rather than actually going to a forefoot run." (5)

"those crazy runners who have decided that barefoot running is for them and they've decided that they're gonna forefoot strike and they'll come in and they'll literally be toe striking ….. In which case, you just need to get them back to rearfoot striking and often they'll get a lot better." (6)

"The other thing is you often see they lack hip extension. So, they're actually, in my theoretical mind, they're having been forced to use their gastroc-soleus a lot more aggressively in order to get propulsion ….. if you can facilitate in increase hip extension, ….. then that will make a big difference." (6)

"Some emerging work does suggest actually for Achilles tendinosis it can be of some benefit, but it's very emerging work." (7)

"Clinically, we find that when you stiffen people up, we get a very good result in terms of their pain and their recovery with Achilles tendinopathy ….. I think it's related primarily as reducing the dorsiflexion moment ….. If we stiffen up the knee, reduce the knee flexion and then start to immediately reduce ankle dorsiflexion as well." (9)

"I've seen some Achilles pain and posterior rear foot type pain, posterior tib, and Achilles type pain respond to some gait retraining." (14)

"Trying to work on stiffness in the knee, and one of the things that I focus on by – To start to increase stiffness in the knee is closed chain hamstrings because I think people focus way too much on the quadriceps. But in a closed chain, the hamstring is gonna act as an extensor of the knee and provide co-contraction around the knee." (14)

"I targeted hip extension in my people who have kind of calf Achilles problem." (15)

"Not as a primary intervention (gait retraining) ….. I would look at insertional Achilles as something that I need to rehabilitate and then through a graduated return to running-load management process to deal with." (15)

"Sometimes, I'll even switch them to a heel strike, like you mentioned the Achilles thing. I'll just do like that gentle heel strike rather than mid and forefoot." (17)

	"I might even look at someone who has a long, long stride in their foot, stays on the ground for prolonged period and then maybe, they have too much dorsiflexion, so they stay in that compressive component for a while" (17)
Calf pain – strength and conditioning rehabilitation, and considering strike pattern and step rate	"we believe there's perhaps too much contraction of the calf muscle or it's happening too quickly ….. we're trying to activate the big muscle there, the quads, hamstrings, etcetera and reduce the load." (9) "They often have strength deficit, particularly strength and endurance deficits initially. And then when you look at, along the line of their – The formation of their SSC calf ability, it's usually not great and that leads to their recurring injury problems." (11) "with those ones, I'd get best results from just really strengthening that calf up, lots and lots of calf raises and a type of gastroc and soleus – get them pretty strong and then maybe do some plyometric stuff as well. So, you're improving the muscle's ability to handle force. Maybe rather than necessarily changing their gait too much." (12) "If they are a forefoot runner and it is a recent change, should we just bring them back to heel striking or midfoot striking if they were doing that anyway? I think it's a tricky one because if they've always been a forefoot runner and loading their calf up, I'm not sure I'd wanna whisk them back into heel or midfoot." (12) "Have they got an over pronounced forefoot strike addressing that? Are they running with a very low, slow cadence? Picking that up, getting them faster." (13) "I reckon most of that stuff is just people who've trained in a way that's not sensible and have refused to stop, slow down and actually rehabilitate the injury properly." (13) "I think there's a role (for gait retraining), but again, I think it's a little bit like those insertional Achilles issues that you talked about. There needs to be a basic capacity within that calf-tendon complex to deal with loading-reloading forces, so I use a lot of skipping-based exercises and a lot drill-based things." (16)

Medial tibial stress syndrome considerations including aiming to decrease impact, alter strike pattern, reducing over-stride, reducing hip adduction/IR and cross over gait, reducing foot pronation, and increase hip extension	"I think it (running retraining) works pretty well within the medial tibial stress syndrome, to work on decreasing the impact force. Again, that's not a condition that I would push on a forefoot strike pattern because of the tension in the soleus ….. I would consider that mid-foot strike would be the best option on the short term." (1) "You'll get overstriding because it's gonna really increase your impacts, your loading rates, also cross-over gait pattern. ….. Excessive hip adduction can really increase the bending moment in the tibia so that's the other mechanic that I really consider in addressing." (2) "Sometimes they'll present and they do have a big overstride." (5) "Particularly MTSS, they tend to lack normal hip extension. So, it's usually more to do with the propulsive phase, rather than landing phase sometimes, so, it's a combination of both." (6) "If they're getting a lot of hip adduction, internal rotation, that's gonna increase torsional stress more distally so looking at trying to control that, if that's existent and that sometimes just changing hip mechanics, getting them to tighten their glutes, think about reducing hip adduction will also reduce the load." (6) "You wanna decrease the vertical loading rate and for that you see, we increase the cadence and you change your shoes." (10) "if we consider medial tibial stress syndrome, then it would make sense if you reduce bony stress, then it would make a difference. So some of the interventions that have been suggested that might do that, simply like by reducing stride length in trying to get initial contact happening a little bit closer to centre of mass." (12) "So stress fractures, I tend to think about impact. Medial tibial stress syndrome, I would think about maybe soft tissue, potentially as a controlling pronation." (14) I don't take the line that a stress factor or medial tibial stress syndrome is the result purely of poor running mechanics. I think there's a physiological loading component to that ….. The chronic group one – So those people who are coming in and giving you a three or four-year history of medial tibial stress syndrome ….. I'll use gait training reasonably early and reasonably constantly and I think, with some degree, success as well." (16)

Knee	
Patellofemoral Pain – Strongly advocated with consideration to over-stride, hip adduction/internal rotation, trunk and pelvic position	"Most common thing with patellofemoral would be overstriding and also medial collapse, particularly the females ….. Then the third one would be the one that I would call the very upright running posture with the trunk. The runners that tend to run like that, they tend to have very low hip moments and very high knee extensor moments. So for those folks, we'd work on some anterior trunk lean." (2) "Patellofemoral pain, often there is a sort of femoral adduction environment to it. There might also be a knee quads component to it in terms of weakness in the quads and – So therefore, I think for both of those sagittal coronal issues ….. If it's an underlying weakness that might explain it, then I'd try and strengthen them first, but if it's a gait issue where there's no weakness underlying it, then I'd go for the gait retraining." (5) "Probably two major things which will lead to patellofemoral pain ….. there will be excessive hip adduction, internal rotation. So, that's something you often look to change. And the other thing will often be that the runner will be overstriding and landing with a particularly heavy heel strike." (6) "With patellofemoral, again we found that by changing those sagittal plane kinematics, we noticed a change in frontal plane kinematics as well ….. some of that knee valgus and hip adduction was reduced as well." (9) "there is evidence that increased hip adduction or internal rotation on impact can be associated with patellofemoral pain, and therefore, it makes sense that if we change that, it would help treat that pain." (12) "The one area that has the most evidence would be patellofemoral pain ….. if you see them banging really hard, over striding and hitting with those high impact forces, then you might try to soften those impact forces. But if you see a hip that's internally rotated, mal-aligned, that's sort of taken the – Put the patella in a bad position laterally then, and you look at them standing and during landing and do a couple of clinical tests and see that they're internally rotated abductor that they have, then you might address the hip. " (14)

	"Patellofemoral pain, I've seen a lot of hip contributing factors so far gait retraining and they have hip problems that's probably what I would focus on in the treatment." (15)
ITB – addressing hip adduction and cross over gait is important	"The pathomechanics ….. that would be medial collapse mechanics, excessive hip adduction and the other one would be cross-over gait pattern." (2) "we have success with people who have not had any success with the typical strengthening of their glutes and stretching of the IT band and rolling, form rolling. It's amazing! And all we do is we get their hip adduction out." (4) "we reduced tension within the ITB by, with a wider stance of gait. And sometimes I think you know, that does help ….. I found that the biggest change to ITB has been activating those big muscles. Again coming back to that high knee lift which then results in a greater activation, I think, of hip extensors of the opposite side." (9) "muscles in their quadriceps, and their hamstrings, are getting tight and they are overused because they're back out there running and the pulls on the IT band, tightens the IT band up and they get the friction syndrome. And probably because they've lost a little bit of strength, or a little bit of strength in their hips over the winter season. So with IT band, it tends to be more dealing with the problems rather than the gait retraining component of it ….. I can think of a couple of patients that were – That crossed over and they got IT band. They would get IT band syndrome because they crossed over. And then in those cases, you do think about maybe a little bit wider stride or trying to get some flexibility in their hip adductors or something, but I don't think about gait retraining too much for IT band syndrome." (14)
Patellar tendinopathy – Changing sagittal plane mechanics, step rate and footwear	"I think the coronal plane has the potential to have a role in all tendinopathies except for the patella segment." (5) "patellar tendinopathy, you often find these individuals very different to patellofemoral pain where you'll get a greater hip adduction. They often have good hip control, but they do have the overstride pattern where they're landing quite heavy on the heel. And essentially, they're just not absorbing any shock to their foot and ankle, it's all going straight to the knee, which means you're gonna load up the patellar tendon." (6)

	"Patellar tendinopathy ….. My first part of the treatment will be to protect the tendon if it's acute, I will say to the patient, okay, just increase the cadence, lowering the shoes so more minimalist shoes in acute condition, and be sure that you don't cause another problem in another place at the same time, less noise, and if it's not enough, forefoot striking." (10)
Hip and thigh	
Hamstring – Aim to reduce over stride and increase step rate, reduce impact, encourage more upright trunk posture, and reduce anterior pelvic tilt	"we see that mid-belly hamstring pain with the runners who overstride. The prime one that I see is the runners with upright trunk." (2) "Yep and I often see overstriders ….. I often see kinematically that they are, have got a very stiff knee strategy. (5) "Hamstring is always a classic overstride pattern. You could almost guarantee it as soon as you assess them clinically, and that's what you've found, is the hamstring tendinopathy ….. just changing that and getting them to try and often think about landing more softly, so that they land a lot more onto their body." (6) "we found that when we put them in a more upright stance and an increase use of the hip extensors particularly the, I guess, the glut max." (9) "these guys at the foot strike position were leaning forward a bit too much and over-extending the knee. So if we reduce the knee extension at the foot strike and straighten the body up as well, perhaps that reduced the stretch or the tension within either the hamstring or some of those neural structures." (9) "I tend to look quite a lot at people's ability to extend through the contralateral hip because that tends to lead to an odd striking pattern on side of symptoms ….. if we look to particularly high hamstring tendinopathy, it links to inadequate hip flexion activity, and the relationship that has when people almost eccentrically slingshot the tibia forward rather than taking the knee up into high hip flexion and then almost placing the leg down with a more vertical tibia versus overstride in slingshot in the tibia forward." (11)

	"hamstring strains where people have an active hamstring tear, or hamstring strain, and you try to shorten up their stride or change their stride frequency to take some of the strain off the hamstring ….. high hamstring injuries are really, really the toughest injury that runners get because I think it really has to do with an inherent loss of motor control around the trunk and core so that balance between abdominals, gluts, hip flex or tightness or – And low back position or even an anterior pelvic tilt position" (14) "I would be looking for anterior pelvic tilt, control of anterior pelvic tilt, and then maybe control of even internal rotation of the hip." (14) "when people have recurrent hamstring pain I would often do a lot of strengthening of the gluteal and then sort of more internal cues, try to find the gluteal or whatever you would call it. I didn't do any specific bio feedback techniques, just more of verbal cueing on maybe muscle activation recruitment at that time." (15) "I think the high hamstring group often tend to, again, have really poor swing phase hip mechanics ….. they're using a very long lever with quite a long contact on the ground, which I think is a fair bit of hamstring force ….. My starting point with that group won't necessarily be modifying gait. It might be modifying some of the training volumes so decreasing speed, decreasing hills, short of runs flat. Can you do that asymptomatically? ….. but I would absolutely use gait retraining for that group. I think that's quite important ….. the running mechanic that I might wanna look to is actually trying to reinforce that capacity to have good hip-knee flexion during swing phase." (16)
Gluteal tendinopathy – addressing over-stride and step rate, hip adduction and internal rotation and contralateral pelvic drop	"(In gluteal tendinopathy) One would be overstriding and then the other one would be excessive hip adduction, specifically excessive pelvic drop ….. For the distal femoral stress fractures, you know it seems like I'm starting to see more and more of those with runners who have a lot of cross-over gait pattern." (2) "Gluteal tendinopathies, I've seen a reasonable amount of them and it's very similar to patellofemoral pain in terms of mechanics. So, it's more just controlling that femoral internal rotation adduction and try to get them think about tightening their glutes, opening their knees up, and often that tends to make a big difference with them." (6)

	"I think that in terms of glute and knees tendinopathy then looking to the role about how to view this relationship with the lateral line stretch of the ITB and the control of femoral internal rotation, adduction moment in particular." (11) "I'm interested in what's happening through that sagittal plane, but I'm really interested in what's happening through coronal plane and rotational as well. So I wanna decrease that hip adduction-internal rotation that's potentially compressing that tissue and I will do that through rehabilitation and I will, again, because I don't think rehabilitation on its own changes gait, and I'll also do that through gait modification." (16)