Academy of PHYSICAL MEDICINE

Transcript

Treating the Runner
With Colin Papworth

APM - We're going to be talking this evening about running technique and treating the runner. Not just treating elite runners, but treating all sorts of runners and what we as clinicians can pick up in our own clinics and either deal with ourselves or refer onwards. And my guest this evening is Colin Pap worth who describes himself as a biomechanical podiatrist. He's been in practice for almost 20 years now, started as many do with the NHS but has moved into private practice and runs a couple of clinics up in Sheffield and Chesterfield. He's treated a lot of people in that time as you can imagine, including the elite of the UK boxing team and table tennis teams, so it's not just about runners that we'll be discussing this evening. Anyway, I'd like to welcome him to the studio, Colin, great to have you with us.

CP - Good evening, thank you.

- I've talked a bit about the range of your patients; do you want to tell us some more about the scope of your practice?

- Well it mostly is runners, and it's everyone from people just starting off wanting to look at technique, making sure that they're doing it correctly right from the beginning, which we strongly advise, because a lot of people come into it too late. All the way through to I suppose elite runners. But the majority of it is just general club runners who are picking up injuries, who are having problems with recurring injuries or people that are wanting to improve performance. They're trying to get quicker, they're hitting a block, they just

can't get past that point, and eventually they say is it something to do with my technique. And we have a look at that, and see it's the way they're moving, they way that they're running is actually stopping them.

- So you actually running yourself?

- Yes, I've done little bits in the past. Mainly sort of slow hill running rather than road track running, much prefer being out in the hills and the mountains.

- But I know you said you deal with ultra distance runners as well as trail runners, don't you, rather than the more glamorous pursuits of 100-meter sprinters.

- That's right.

- So what do you think we're gonna cover this evening? You talked a little bit there about running technique in your intro, but I know you also do bespoke orthotics for runners, you do rehabilitation for runners. And what we're interested in of course is identifying the sort of injuries that come into our clinic which could be traced back to problems with running form or gait mechanics altogether. How do you reckon we should proceed with this?

- Well, we'll have a look around, we can look at what's good running technique, have a look at some examples, what we're looking at through the different stages of the gait cycle, have a look at some exercises, some basic sort of exercises that you do in the clinic, some exercises that you can show people to do out when they're running, to do some running drills. And we go a little bit there about some injuries and how to treat them as well. So we can look at orthosis, a little section about footwear as well, because most people find that's a bit of a minefield at the moment. So we've just got some examples of different types of footwear and how they can dramatically influence what's going on as well.

- Well I think you told me earlier on that your own business really kicked off, this business that you do running coaching clinics, running workshops for practitioners rather than for members of the public.

- Or for public as well.

- Or for the public as well. But you really kicked that off when the barefoot running craze started, didn't you? When probably a lot of problems arose with runners, as well as a lot of problems solved. But let's talk about good running technique then, what's good running technique, is it the same for everybody?

- Definitely not, no. We tend to stick to some basic principles. And a lot of it's based around posture, foot position, arm swing, contact position with the feet, how you're generating power through that push phase as well, through the propulsion. With the barefoot running, a lot of it came about with looking at trying to reduce the amount of impact through the shoes, or the amount of wear through the shoes, and trying to get people running to more natural movement pattern. And the argument being that a lot of shoes actually block that natural movement pattern. So how can we get people running again in the preferred movement path, is the terminology that's coming out now. And not allowing shoes to block that movement. But that puts different strains on the bodies, people are not running as we did when we first evolved, and we've got more sedentary jobs, and we're running on harder grounds, rather than chasing animals across the open plains, where we're designed for.

- I'm always a little bit suspicious when I hear people say this isn't what we were designed to do, because obviously design changes over the millennia, and actually we are on a different surface, we've got upright posture, and so who knows what is actually the right posture for our bodies now when we're running? Well hopefully you do, because you're gonna tell us.

-Well yeah, it comes back to those basic principles, and people will fit into that. Some people are gonna fit it into some aspects of it very easily, some are gonna really struggle with certain aspects of it. And also, depending on how you're running. So if you're doing track work, fast speed, you're gonna have a different posture than if you're doing long, slow, multi-day events. So again, adhering to the basic principles of trying to get the body to work as efficiently

as possible, trying to get the most out of the body, and just trying to manage those damaging loads, basically. That's what we're about.

- But I know you have worked with chiropractors and osteopaths in the past. And I think you said you've got chiropractors in one of your clinics in Chesterfield, is it?

- Osteopaths we've had in more recently.

- Osteopaths. But if you picture a typical osteopathic or chiropractic clinic, most are not set up to do running analysis. So maybe I'm getting ahead of myself here, because we haven't really talked about the detail of good running technique, but a lot of what our audience will want to know is when someone comes to our clinic, obviously they're gonna tell you that they're a runner, or they've been running, or they felt the injury when they were running, but how is it we're going to be able to detect the flaws in their running technique in a normal one-room clinic?

- It is a problem. You've really got to try and look at someone running. People come in and we'll do the assessment, we'll look through tightness of the muscles, we'll see them standing, we'll see them walking, and often we'll get a really good idea about what's gonna happen when they run, and they start running and it's completely different. So sometimes at that point I've got an idea about where this treatment's gonna go, what we're gonna need to do, and they'll start running and it's like okay, that's really changed the whole idea of that. So that is a problem, if you're gonna be treating runners and you're gonna be doing it regularly, then ideally you need somewhere to look at them. So even a treadmill in a corner is often enough, you don't need huge amounts of space.

- Treadmill's good enough?

- Treadmill will be okay. Some people really worry about running on a treadmill, and if they're never gonna run particularly well on it. The body works slightly differently running on a treadmill as well, so you have to take that into consideration, but when we're looking at the big movement patterns and the

overall posture and the contact position and the way they're generating propulsion, we'll generally get a pretty good idea. There's also I hope some of the video we've got.

- Can I take you back a stage? You said the body works differently on a treadmill, why is that, just because it doesn't have to propel the track?

- Yeah, basically the ground's moving away underneath you. So people will often try and get off a little bit quicker, you tend to have a little bit more of a forward lean, and just the way the muscles are reacting as well. Just because you hit the floor, the belt's moving, it tends to create different tension, especially through the quads and the hamstrings.

- Right.

- So you've gotta factor that in.

- Curiously, I've always thought this is very curious, I have a lot of patients, and I'm sure lots of the audience have patients whose idea of exercise is to have bought a treadmill and run on that treadmill, and I've never understood why you shouldn't just go outdoors and run, because it's cheaper. Admittedly tonight it would be pretty unpleasant because it's dark and wet and horrible out there. But does treadmill running typically produce its own type of injuries?

- Not particularly, you can get any injury. Running injuries are repetitive strain injuries, and if you're loading the same muscles, or the bones, in exactly the same way continuously, then eventually at some point they're gonna break down. Or if you're on a treadmill you've got less variety. So if you're running outside on the road, a little bit more variety. If you're outside and you're on trails, or up in the hills, then obviously you're using the body very differently. So there's a chance of reducing the repetitive strain injury you're often better off getting outside rather than just slog it out on the treadmill.

- But the fact that as you said you're getting off the foot more quickly on a treadmill, that doesn't tax different muscles in a different way?

- Yeah, but some people will often run like that on the road as well. It's often the case that if they're not particularly strong, or poor technique, they'll be getting off the foot quickly. So there's a lot more emphasis through the hip flexors and actually pulling the leg through rather than driving the foot back behind you through your hamstrings and glutes.

- Okay, shall we start from basics and talk about the phases of the gait cycle? I'm gonna be led by you on this, because you're the expert and I'm not. Although I do gait analysis, but probably not as well as you.

- Yeah, it's the starting point really of it all, to look at what's happening. So generally we tend to look at the overall posture of someone, where are they? Are they leaning forward from the hips, where's the arms coming across the body? We'll look at again a contact position, what's happening with the foot, again how they're generating that power behind. And they're the main sort of ideas behind it. So where you start, it you're looking at people running you've almost got to get a set idea yourself about how you're gonna look at somebody. You've almost got to look at them all as a whole, but you've got to be able to look at the individual things as well. Which is the bit that people often find quite hard. There's a lot talk about the contact position, or which bit of the foot hits the floor first. But I'm not too concerned about that. But where it is in relation to the rest of the body is really important. So whether you've got an over-striding heel strike or an over-striding forefoot strike, it doesn't particularly matter which bit of the foot is hitting the floor first, because it's the over-stride that's the problem.

- Over-striding means reaching too far in front with your foot.

- Yes, hitting the ground in front of your center of mass. That creates a large amount of braking force. So as you're moving forward and your foot's in front of you, you've got to get past that foot somehow, and that force is gonna come back into the body. So the closer that contact position is to you, the less of a braking force you're gonna have. And also the other side of that is the quicker you can power into that push phase as well, whereas half the time

you're on the floor is actually reducing the impact, you're gonna have less time to generate power. Whereas if you have a much shorter contact time, you've got much more time to generate a lot more power behind you.

- I remember reading during a gait analysis study period that most of your speed is created by momentum rather than by muscle generating that force. Is that true?

- Yeah, through swing phase. We call that the swing phase.

- So hence that over-stride is gonna block that momentum.

- Yeah, absolutely it's slowing you down. So ideally you're generating the speed, and you can generate more speed by elastic recoil of the muscles, so almost the longer you can get the leg coming out behind you, more stretch through the hamstrings, through the quads, the hip flexors, the glutes, off that stable body. You even get some opposite side shoulder rotation going on, so you're almost winding the body up. Think of the golfer with that swing where they're really taking the arms behind and swinging it through. Exactly the same position when we're running. The more generation we can generate through that, potential energy through that eccentric load through the muscles, the faster that swing phase speed is and also the closer the foot is up behind you as well, which is important. You see the elite guys on the track, the heel comes right up and almost kicks the bum. And that's just basic physics, and that very short lever arm is generating a lot of speed. Because if you've got a foot on the end of a long lever with a low ground clearance, it's a very heavy weight to try and control, like a pendulum on a clock. You know a little pendulum that's really quick, long one really really slow. And it's exactly the same principle. But you can generate a lot of speed by having that swing phase speed, but you have to generate the power to get that, basically. So it becomes a bit of an improving cycle of events.

- This is unusual, because we're only 10 minutes in here, and we've got our first question. So thank you whoever sent the question, but unfortunately I don't know your name because you didn't tell us. But this person says, I've had a new patient who reports having suffered from plantar fascitis for two years and has seen various specialists to no avail. But she says it's been brought on by being

barefoot over a summer period. Why might this be if being barefoot is theoretically better?

- Yeah, this is often where the barefoot theory falls down a little bit. You're putting a lot of stress through structures that may not have been used to taking it. So the body, as we all know--

- Well let's have a look at a foot, shall we? And you can perhaps explain exactly what is gonna go wrong with a barefoot walk.

- Well generally because the foot has a lot more movement. If it's moving around a lot more, then it's a lot more dependent on the soft tissues. So again with the plantar fascia, which is coming off the toes, over the metatarsal heads, inserting onto this lump on the heel here, every time you hit and load the foot it's gonna stretch out and move a little bit, and the theory being that you're putting a stretch through here, and you get a functional block through the first MTP joint which is not reestablishing the windlass mechanism.

- Why do you get a functional block?

- Because as the foot drops in here, we get almost a passive dorsiflexion of the first metatarsal, which doesn't allow the hallux to extend above it. This is the basis of the windlass mechanism if people are familiar with that.

- And the windlass mechanism, goes back to ship's windlasses, is that the plantar fascia tightens as the foot comes down and tightens further as it's stretched by the hallux.

- Yes the hallux extension, the toe extension, which then tightens up the windlass which then pulls, re-forms the arch, basically. This is how we create that stable foot as we go through that propulsive phase. Which is almost the resupination bit. So we hit the floor, the foot stretches, and ideally then, as we move forward over the foot, we're gonna reform the arch. If that doesn't happen and we're

trying to be propulsive, or if our foot's still in the flat position, what tends to happen is we can almost get a passive dorsiflexion through the mid-tarsal, so the plantar fascia is elongating at that propulsive phase rather than shortening.

- So this particular patient that our audience member is talking about, have they got a fault in their foot which is causing this to happen?

- Not necessarily, it could be that they've just done too much too soon. And the body has just not been able to adapt to the load that's been placed upon it.

- They didn't actually say they've been running, what they said they've been going barefoot, but they could've been just walking.

- Yeah, and it's something we see quite often at the clinic, people who've been away on holiday, they've gone in sandals, they've done a lot more walking around, they come back in and the heel started hurting, just because they've put that little bit of pressure through it. Often the problem is people have stayed then in flat shoes because their foot's sore, and they think I've gotta stay in flat shoes. Whereas often we're telling people to get back into a little bit of a heel. Because back of a heel will naturally just stabilize the arch a little bit as well.

- Yes, glad you said that. Because I tell a lot of my patients, particularly if I think they've got a forefoot equinus or any sort of equinus at all, that actually they might be more comfortable in a heel. And they've all said well actually I am, but I've always thought I shouldn't wear them.

- Yeah.

- So your first response to this patient with plantar fascitis brought on possibly by barefoot running would be to wear a bit of a heel. It was a she, so they can wear a heel without too much adverse comment.

- Yeah, during day-to-day work, yeah. Just to give that foot that little bit of rest.

- And if that's not doing the trick, given that this person's seen lots of experts, what's next in your--

- At some point with plantar fascia and all these injuries you've got to reduce the damaging load, at some point. So we've been using other modalities. Insoles can help in the short term, if you have to give that arch that little bit of help, just to stop the amount of stretch that's gonna go through the plantar fascia. And hopefully the insole is gonna start to reestablish that windlass mechanism. This is the key to trying to get the load off the plantar fascia insertion, is getting the foot to work a little bit more effectively.

- Right. Now you used the term insoles there rather than orthotics, foot orthotics. Do you differentiate between the two?

- Not particularly, but a lot of people understand what an insole rather than orthotics is.

- Right, of course we're talking to practitioners now. But when I use those two terms in clinic, if I'm talking to patients, normally I use insoles if it's something that comes off the shelf in Boots as opposed to orthotics which are generally at least semi-bespoke.

- Yeah, so again, with an insole just off the shelf, one often works really well with plantar fascia sometimes. You don't anything too complicated often, you just need to give the foot that little bit of help, little bit of support underneath it. And if that doesn't work we can go down that fully bespoke orthosis route. But for a lot of people you've just gotta get the foot as comfortable as possible quickly, so they can almost start working. Especially if it's something that's been going on for two years, there's good evidence to show treat this like a normal tendon injury and actually get it load as much as it's able to take. The body's got to be able to tolerate that load, basically.

- And indeed, we had Professor Tim Watson on the show several months ago now, perhaps over a year ago, and he was saying that shockwave therapy is a very good modality for plantar fascitis. Which is of course loading the tissues, isn't it? Because it's actually providing the stress there. Do you have any experience--

- Yeah, we shockwave in the clinic. So again, really good results with those horrible chronic plantar fascia problems. In conjunction with the other treatments as well. So using orthosis in there. We do a lot of mobilization work as well. So I mobilize feet and I'll do the soft tissue work. A lot of it is just educating the patient, they've got to reduce the load to a certain extent, they've got to get the body healing up. Once that healing process is underway, then we can start loading the tissues again as much as possible.

- When you say mobilizing the feet, what do you mean by that?

- Mobilizing the joints.

- I speak because you're a podiatrist, and I'm an osteopath, so.

- Well we'll mobilize all the bones, so we'll mobilize talus, or the navicular, all the joints, just basically go through there. The metatarsal even, just basically try and isolate, or mobilize all those joints. Just to get the foot working a little better. It's one of those chronic problems, the foot's just got really stiff, it's just not working very well, and we've got to just free up that, just to get all the tissues working again. They're too solid and we've just got to free everything up. And often people come in if they haven't done mobilization just to get hands on to it, loosen it all off. Either tape it, into some insole, some support, they tend to go out feeling so much better straight away.

- Tape it, what sort of taping?

- Basically sort of low Dye taping, that's what it's called. So just sort of criss-cross through the bottom of the foot, round the sides, and then the straps over the top.

- I ought to know this, why is it call low Dye taping?

- I think it was a Mr Dye or something.

- Dye is the name of the person who first came up with it?

- And there's a low Dye and there's a high Dye. One stays in the foot, and one comes up the leg.

- And do you use kinesio tape at all, or rock tape?

- Yep, we'll do a little bit as well. Not an expert on that, but there's a couple of sports therapists in the clinic where we work and they're much better. But I'll have a dabble around.

- Get some good results with it?

- It seems to be. I'm not completely convinced myself on how well it works. Again, it's a tool to be used with lots of other things.

- What's the evidence for low Dye taping, then? You're presumably seeing results in clinic. Have you got good evidential results for its effectiveness?

- I mean it's one of those sort of treatments that's been around for years and years. Using cocci strapping, so it's a rigid tape strapping on it, and it does hold the foot, it locks it, it's just short term. That's the thing. So again we're just trying to get that initial off load.

- Right. Actually our first questioner has now identified themselves. Tish, thank you for the question. Tish says that the patient that she was talking about is pretty mobile naturally, as in hyper-mobile, she says. Is hyper-mobility something you have to take a lot into account when you're treating?

- Yeah, we'll have a look at that. It's gonna put more strains through the body, through the soft tissues. And again, if they're going a lot to exercise, or doing a lot of activity, they need to have a slower build-up so the body can get used to that. If we're using orthosis, or even an insole, the foot's still gonna move, this is a problem. And we can't just block all that movement by putting an orthosis underneath that. So we've got to modify the description slightly or look at where we can control the joints most effectively. And that's the important thing, it's not just a standard insole that's gonna work for those sort of feet. Because often the foot is still gonna move. If there's no natural structure within the foot, we've almost got nothing to work with with an orthosis. So sometimes those feet are a little bit better, being able to move a little bit more, and actually just get them used to taking that load.

- This question is getting ahead of us again, because it's talking about forefoot running. Whoever it is, and I'm sorry that I don't know your name, says there's a lot of research to suggest that forefoot running is the preferred type of running style, do you agree and if so why?

-It puts a different strain on the body. So there's a lot of evidence now that's coming out say for shin splints, medial tibial stress or anterior knee pain, which put a lot of load on those structure when we're heel striking. To change onto a forefoot running is going to immediately take the pressure off those structures. But it's gonna put more pressure through the forefoot, through metatarsals, and then through the calf and through the ankle. So sometimes we're swapping a knee injury for a metatarsal stress fracture, or those type of things. So we've got to be aware there. The important thing is posture on top of that as well. We see a lot of people from an over stride, that over-reaching, poor heel strike position, and all they've changed is now they're doing that but with a forefoot strike, so they've changed nothing else.

- So would they be better staying as a heel striker but just shortening their stride, do you think?

- Yeah, that's gonna reduce the impact, definitely. So there's different ways that you can do that. What you've got to look from a practitioner point of view is what we want to do with this patient. Do we want to reduce that initial impact load, do we want to generate a bit more power? Whatever you want to do, you've go to then use your gait retraining or your body positioning as a tool.

- So how do you make that decision?

- I suppose a lot of it is experience, by seeing people and seeing how they respond to it. And looking at the evidence as well. You know that basic question, if your over-striding the heel strike, there's massive impact forces coming through the body.

- Yeah, but you said you made a decision you want to generate more power. But if actually you know that over-striding is bad for you then you know that you want to shorten the stride, does it matter whether you will reduce impact by doing that? Will you then generate more power as well?

- Not necessarily. Because again you may not be able to then develop the right muscles to generate that power behind, so you may just have a shortened stride, and then you have to overuse your hip muscles to actually pull the leg through a little bit quicker, and you may start doing a little bit more body rotation. So again you're gonna put that strain on some other parts of the body. And it's sort of equalizing it throughout the whole of the body to get the whole of the body working more efficiently rather than putting one load from one position onto another structure, which at some point is potentially going to break down again.

- I remember being taught myself about gait analysis, it must be over 20 years ago now, but actually then it was nice and conveniently defined as you know your heel strike phase, your mid-stance phase, your propulsion phase. Is that now almost irrelevant given that some people are now making their initial contact with the ball of their foot?

- No not at all, we still have a contact position, it doesn't matter whether it's ball of the foot, midfoot or heel of the foot, it's still the contact position. It's for all those things still really important. And then how do you transfer into the mid-stance phase, what's happening as the body is absorbing that load. And that's the thing with the foot, we've gotta have that initial shock absorption to start with, gotta absorb that, and then we've gotta generate the power through the propulsion.

- So we're gonna talk about, contact phase is whatever hits the ground first.

- Yup.

- Mid-stance, in mid-stance, are we talking about the foot effectively being flat on the floor when heel and forefoot are down?

- Yes.

- And does that happen with forefoot strikers?

- Not always. I tend to look at mid-stance phase as when the foot is underneath the hips, or both knees are together. So the swing leg is level with the standing leg, and that will generally be once we're over the hips as well, so that's mid-stance, depending on, for some forefoot strikers the heel won't be down at all. Especially if they're running quickly, it's that contact phase, they don't have time to get the heel down on the ground.

- Yeah, okay. So there are, therefore, it must be very variable what percentage you allocate to contact, mid-stance propulsion, because it's gonna depend on your decision on what constitutes mid-stance. You said it's when your foot's underneath the body, but actually that's a fleeting fraction of a second, isn't it?

- Absolutely.

- So is it a useful measurement, knowing the percentage of time spent in these phases?

- Probably not knowing the percentage of time. You could I suppose if you're trying to look to change somebody. So if we have a very long contact phase and we want to reduce that, if there's some way of measuring that. Either through counting the milliseconds on a camera, position, which would be useful to show the patient, and then generating more power. So the timings are useful if you want to go down that sort of level of detail. Or the interview pressure systems will show that a little bit. You've got to identify on the pressure plate where that is. I think video's more useful because you can visually see it. But if you're combining the two together you're getting the best of both worlds.

- Well I use a pressure plate, and admittedly most of my patients are walking normally, so they're heel striking. And I presume when your runners are walking, do they heel strike rather than forefoot strike? Or are they taught to forefoot strike when they're walking as well?

- No, generally you'd be heel striking. Unless you've got a dance background.

- So on the force phase it's fairly easy to define length of time in the contact phase as opposed to mid-stance, because it's a nice easy progression. More difficult, I imagine, when somebody doesn't run the same way they walk, to prescribe corrective orthotics, because the whole pattern is different.

- It is different, yeah. Then again that's why the video analysis is useful on that so we can actually see what we're trying to do. But again, with the orthosis they've gotta be prescribed as we prescribe them, they're actually given a specific job to do, which is the important thing. Whereas I think the problem with a lot orthoses is they're just given out. Someone sees someone's got a flat foot, they look at the pronation aspect, and just think that that's sort of, give that foot a little bit of help. Which in some instances will be enough. Sometimes it's not enough, we've got to give that job, the orthosis something to do. So is it making that windlass mechanism work, is it controlling the speed of the initial contact? There's a whole variety of different things you could use it for as well. But they work more effectively when we know exactly what we're trying to do with them, give them a job.

- Well you've raised a good point there. I didn't want to go down this route, because lots of people buying running shoes will go to a shoe shop, and the running shoe shop will say ah, you're an over-pronator, you need this kind of shoe. Or you're a supinator, very rarely they'll say that, because I think statistically they're more likely to be right if they say you're an over-pronator. And they'll prescribe a set of shoes. What's your experience, not in the shops where you've actually done some work, but in general what is the degree of reliability or effectiveness of gait analysis in a running shoe shop?

- Well I think the issue with it is, it's usually just of the rear foot position, at the back of the leg, which from my point of view isn't a gait analysis, that's just looking at what the rear foot's doing. And it'll just give you one factor of what's going on. And whether that's linked, there's a lot of evidence now showing that how much that rear foot moves has very little bearing on overall injury problems, what's happening above on the rest of the body as well. So all our gait analysis, most of it is from the side view, because we can see a lot more in the sagittal plane. We will look at the back foot, we're not just looking at the heel position. So I suppose in some respects, you're gonna get a good, I suppose a better idea than not having that gait analysis, but it's not gonna work for everybody. And the running shops, they'll tend to just be looking at that pronation as well. Whereas often the problem we're seeing with people, it's on the other side, it's not pronating as much. So if the running shop is prescribing a shoe for the pronation side, and the other side isn't pronating as much, we've got a lot of asymmetry going on with a lot of people, then that leg is often over corrected, and so we're looking at something like iliotibial band problem, which is lateral, and we wanna try and get that foot off the lateral side now, but the running shop's just picked up the pronation on the other side, then we're actually going to make the problem worse. So we'll see that a little bit.

- I know you're going to talk about specifics of various types of shoes later on, but in general running shops prescribe either neutral, motion control, or stability shoes. And as I understand it, the control is all about how hard they make the inside half of the sole, is that right?

- That's a big factor in it, yes. So there is an angle often, through the shoe as well, so the inside of the shoe will be thicker than the outside of the shoe.

- Is that the insole or the shoe itself?

- The midsole. The midsole if often canted in very slightly. There's often flares put through out as well, so the forefoot will flare out slightly. So instead of it being a straight midsole, it'll angle in slightly. So again you'll find that on the medial side of the shoe, on the inside of the shoe. There's density that you can use in there. Often the companies now are using the midsole geometry as well. So things like the boot square, you've got those little pods, the sort of EVA that are built in. Some of them are thicker on the inside, through on the other side, it's the profiling. So there can be a lot more done with shoes to try and help that pronation.

- But it is a one-size-fits-all remedy, isn't it? Because if the pronation's coming from the front of the foot instead of the rear foot, then your correction of the rear foot is likely to be either ineffective or aggravating.

- Yeah, aggravating, that's the main issue. So again, the running shoe shops often won't pick up where the pronation's coming from. And also, why is the foot pronating, why is it doing that in the first place? It could be that it's a reason for something else. It could be that they are just really tight through hamstrings and calf muscles, and actually can't get the leg behind them, so they've gotta stay in that pronated position.

- Okay talk me through that again. So I'm a normal heel striker, so I'm through my contact phase, I'm in mid-stance, my hamstrings are tight.

- Or tight because of the functional block through the foot. So if you're not able to get that windlass mechanism working and you can't get that leg out behind you, then the muscles are gonna be tight. So a lot of people will come and say my hamstrings are tight but often you look at them running, they're not extending at all, running off a bent knee. So they're not getting that extension, and that could be because the foot's not working properly, or they're tight through the hip, or whatever's going on.

- Why does that pronation?

- Because then the foot's gotta stay in that pronated position.

- Because of the lack of windlass.

- Yeah, because of that. And it's almost easier for the body to stay in a pronated position and lift up through the hips and through the body, and then rotate through the body and through the hips rather than generating that power through the foot and the hamstring. So the body's gonna find the easiest way to keep moving forward. And if you're asking it to run, and that's your general makeup, it will run as it needs to, basically. And then you pretty much get stuck in that movement pattern.

- So where would we look to find what the correct degree of knee flexion is at the various stages? Because you're saying that some of the functional block, a hallux that doesn't work, is possibly gonna bend the knee more and slacken the hamstrings. What should the knee be doing at the different stages? You're not supposed to land on a straight leg, obviously.

- No, no the contact we obviously want that knee to bend a little bit through here, and stay bent through the mid-stance phase, and then start to extend as you come out behind you. That's gotta be the important thing. So the more extension you can get behind you, then the more of that eccentric load, so then ideally

the quicker your swing phase'll be, because we're gonna get elastic recoil through that potential energy. And we've got the better balance between hamstrings and quadriceps, those muscle imbalances that often we see. So just generating some more power, really.

- I'm going to embarrass myself here, because I always struggle a bit when people say you've got to balance the hamstrings and quadriceps. They're entirely different muscles with entirely different structure and bulk, you know they can't be the same size, so how do we balance them?

- I think it's just, often we'll see the quads and the hip flexors are really overworking, so they're very strong, and that's a third way the body is gonna pull itself forward, by contracting or flexing through the hip. So the hamstrings often you'll find they're tight, and they're not actually, well they can be quite strong, but they're not actually being used functionally. So when we get them onto the videos--

- So it's a functional analysis, rather than look at the bulk and say they're not balanced because they're not the same size.

- Yeah, you can see they're just not getting to that point where you can see no extension through the hip, often the hip is staying in flexed position, the foot may be coming out behind, but often what we can look through on the video analysis, we've got high speed on there, is when the leg's extending, is it the ankle joint that's plantar flexing that's actually extending the leg, or is it the hamstrings which are pulling the knee back behind you to cause the extension? So we can break it down to that level of detail.

- Okay, I better ask some of these questions that are coming in, because I'll annoy people otherwise. Oh this is a good one. Sally has asked, what about some successful runners who have an awful pattern, and she mentions Haile Gebrselassie. I think the spelling was perfect, Sally, thank you very much for that.

- Yeah, there are lots. And one of the Ethiopian woman.

- Which I imagine Haile Gebrselassie is.

- Yeah, there's some you just look at them and you think how on earth are they running. But that's the way they've always run, and that's the way they get on. And you think is it worth interfering there? If we interfered with that and made them into more of textbook better runner, would they be even better. I mean that's the other side of it, they run really well, but they run in that style. But you've gotta work with what you're presented with. We don't have a set prescription, say everybody's gotta run like that, but we use those basic principles of just trying to get a little bit more out of the body. And if it's 5% more, you know we're not looking to try and change everybody into elite, track athlete type running style, but if you can get a little bit more stretch through, you can get a little more stability through the core, you can just reduce that impact a little bit, you can just reduce the contact time by a fraction of a second, over the period of many footsteps, especially on the people that are doing the ultra distance, it builds up to quite a big percentage underneath that. Yeah, but that's the important thing is knowing, not trying to change too much, and especially too much in one go either.

- Going back to the plantar fascitis, this question, and again unknown questioner I'm afraid, do you find plantar fascitis commonly associated with Achilles issues?

- I think not often both of them together. But one thing will lead on to the other. If we've got tight calf muscles, calf muscles aren't working right, we're gonna get more midfoot pronation, which will mean more stretch through the plantar fascia. If the plantar fascia is painful we're gonna get more work done through the calf muscles.

- Why do tight calf muscles, tight gastrocs, cause midfoot pronation?

- Because it's an easy way for the body to compensate. Again, we've gotta get that dorsiflexion component somewhere through that propulsive phase. And if we're not getting it through the ankle, then the midfoot will start to give. Bu the problem with that, if the midfoot starts to give, the calf muscle has to tighten to control that, and you're into that vicious circle very very quickly.

And often find that we'll get an anterior shift on the talus and the navicular will become blocked, first ray will all become blocked as well. So often we're having to release all that first ray mechanism, release the talus, do the soft tissue work, get the foot stable. So we're reducing the mid-tarsal joint pronation while then allowing the ankle to start working. And we've gotta get the calf muscles taking the load again. And that's one way to take a lot of strain off the plantar fascia, is to put it straight back in the calf. But we need ankle joint movement.

- I don't envy the job who do our summaries of this. There's so many technical terms coming out and they're all very quick. I imagine that writing the transcript and then the summary is gonna be a real challenge. A question here, do you get many supinators? If so, what sort of pains do they get?

- Yes, we do get a few, and there is an osteopath close to us who does seem to send me quite a lot as well. So I'm not quite sure if he knows quite what to do with them. So I do see quite a few.

- Well my understanding is there isn't much you can do for them other than cushion the foot. Is that wrong?

- No. Yeah often the supinating type foot, it's a little bit more of a rigid cavus type foot. There could be flexibility through that mid-tarsal, through the first ray. The first ray is often sitting quite plantar flexed. Shall we have a look at a foot? So often you've got a forefoot valgus position. So the forefoot is sort of everted onto the rear foot. So that's what's creating the high arch. There's usually a little bit of an equinus through the foot, and on the medial side we've got a plantar flexed first ray. That's what's causing the high arch. Now if that's fairly rigid, when we hit the floor, the foot's just gonna be tipped over. That's what's called the supination.

- Is that the only reason for supination?

- That type of foot, yeah basically, because we've got that plantar flexed first ray, forefoot valgus, we hit the floor where it can't give, there's not enough compensation

within the first ray to lift it, so the foot then is tipped over. Could be sort of stiffness through the rear foot as well, through the calcs, often we'll try to evert the calcaneum and it won't go. So the sub-talar joint, there could be some restrictions through here as well. But generally we've always got that plantar flexed first ray position. So apart from trying to mobilize through here, all we can do with the orthosis is support the outside of the foot. So we can balance the forefoot if that first ray is sitting plantar flexed by basically bringing the ground up to meet the metatarsals. So the foot doesn't have to twist by bringing the ground up towards it. And sometimes that'll be through the rear foot, the midfoot, into the forefoot as well. And we'll often extend that right through the toe. So we'll drop the orthosis, either angle it, or what's called a functional hallux is just cut out, hallux is cut out to allow a, so as we're moving forward over the foot, the orthosis is steering the foot into that position. And that works really really well. So very effective orthotic, had great success with that. As well as all the mobilization stuff that goes on.

- And clearly that's something we would have to send someone to a specialist to do if we're not already producing bespoke orthotics or something, there isn't an off-the-shelf insole that's going to compensate for that.

- There's two that I know of. One is the Vasily Dannenburg, which has a cutout underneath the first MTP joint. It's a fairly soft forefoot. The other one is a tailor-made Equiflex, which again has a first ray cutout, has a two-to-five platform and it actually has other additions you can add in. So you can sort of build up, and you can do lateral, rear foot and forefoot posting off that pre-made one, and it's a really good one actually to look at.

- Okay. So would you have to look for those particular types of modification on the Vasily and the tailor-made, or is that how they always come?

- They're built in.

- So every time you buy a Vasily, that one is gonna do.

- Have some water.

- Thank you. Yeah, the Dannenburg orthosis has that first cutout already.

- Right okay. And you talked about a two-to-five platform. Is that the same as the reverse Mortons extension? Is that what that's called?

- Yeah, pretty much through that.

- Because you're talking very quickly in podiatrist's terms which may be a little unfamiliar to some of our audience of chiropractors and osteopaths.

- So what you have is a little platform, it sits on the orthosis, and it will sit just behind the metatarsal head, and on the orthosis you can actually sort of feel it, and then we've got one built into any of these. No, it's not in there. So that's built in and then you can add in extra. So you can do what we call extrinsics post the orthosis.

- Right, so there is some useful things you can do for a supinator other than just sponge under their foot.

- Yeah, absolutely. If you sponge under his foot and it's off going that way it's actually just gonna go further. They are for their knees a little bit of cushioning, but it also needs a little bit of control. Whereas if we have a bit of movement and we can get it moving properly, that will create a softer impact anyway.

- Somebody has asked whether you look at the whole body when you're doing a running analysis, rather than just what the feet are doing.

- Definitely. We start at the head and work down. Head position, shoulder position, arm position, elbows, pelvis, the whole lot. And actually the feet are the last thing I look at. And when we're trying to get people to change what's going on as well I always start at the top. So we'll start at the head and work down. There's no point trying to change foot position of a body that's not in the right position.

- Okay, that to me is a chicken and egg thing, because to me I might say well maybe I'm running badly because my head's in the wrong place, if that makes sense, or my head's in the wrong place because my feet don't work properly. How do you work out --

- Well you've got to start somewhere. And I think it's easier for the person that's running, because there's so much going on, to start with something you can look at, and think right, just keep my head up and keep my eyes forward. I can relax through my shoulders, I can think about my arm swing, I can think about where my pelvis is. So it's easier I think to work down the body in those stages, and often then if we get the top bit right, the contact position will just come back anyway, and we're immediately seeing that little bit of pickup through the foot before we've actually asked them to do it. Whereas if you're trying to get the foot to change off of poor posture, it's really difficult to do.

- Have you got some video we can look at of good and bad running form?

- We have got a little bit in there.

- Yeah, do you wanna bring one up? Because it might be easier than trying to imagine.

- So here's my favorite little bit of video here that shows really good running technique. And it's my daughter a few years ago, but it's still one of the best ones underneath here. So it's all the basic principles. And we tend to find children will just do this really instinctively, and it's only as we're getting a little bit older, and we're starting to sit down, and be a bit more aware of our bodies, that we lose this ability just to run really fluid and really instinctively. So this'll just run through again.

- And we should tell people that this wasn't a video taken in the 1920s, this is because it's high-speed video under fluorescent light. Which is why it's flickering.

- Sorry about that, yeah. So just that little bit of forward lean, contact position right underneath the body, that lovely extension coming out behind, and just the automatic little heel flick up.

- Little smile at the camera I notice.

- Yeah, you gotta make sure, gotta make sure Dad's still recording. But you can see that forward lean, and as she gets moving, she straightens up nicely, and obviously into that--

- Arms seem to be a bit out to the side.

- Yeah, if we're gonna be really critical. And I did tell her about this at the time, but yeah. Arms are just a little bit flapping around. But she's getting it to just tighten up a little bit. But yeah, that's the criticism with her, she needs to tighten those arms up a little bit.

- Okay, so we've got our patient on the treadmill, and I'm looking at the head, what am I looking for? It's gotta be upright and --

- So the head, yeah ideally eyes looking forward. A lot of the time when we're running I think, we're gonna do it a little bit outside, because we've gotta look at the ground, but if we're really looking down on the floor, we just get dragged into that. Arms start coming across, we lean forward into it as well. So the first thing is head position. Even if your head's up a little bit, you can get the eyes down. But if you're really aware of head coming forward and head sinking down, just really try and make that adjustment.

- Arms and shoulders then, what are we looking for there?

- Yeah, relaxing through shoulders. We'll often see people, shoulders are up and they're really rotating through the body. So we need shoulders down. And ideally we want the arm swing to be coming out behind.

- Bet you're good on the dance floor, aren't you.

- Well not too sure about that. So yeah, arm swing has got to come out behind. So it's looking for arm movement off the shoulder. A lot of people get into that body rotation. You think the arm's moving, but it's not, because everything is moving together. And the other thing with arm swing is, the arm's coming forward, but you don't wan the hands coming across. So we'll see that a little bit as well. So the arm comes forward, and then it carries on rotating. And that rotation is the bit that then brings the leg forward. Because the feet will follow what's going on with the arms and the hands.

- I presume you're looking for symmetry in the arms, they're both going out the same distance behind the body and in front of the body.

- Ideally, yes. I always say to people as well, because some people just have no idea what they're doing with their hands, as soon as we mention them, they're like what's going on with these hands, and they really start swinging around a little bit, but I always think, think of the elbow, and it's the elbow drive behind. And almost just try and keep the elbow at 90 degrees, keep the hands in a nice and relaxed position, we don't wanna be dropping the hand back. Going back to that big lever arm principle of trying to move big weight through a long range, if we've got an elbow going really tight through here, whereas if we've got a hand dropping it's gonna slow the whole cadence down as well. Gonna make a much longer contact position. So yet again, getting that quicker cadence, get shorter contact time, gotta move the arms quicker. And if the arms are moving quicker, the feet will follow along.

- Okay. So we've moved down from the arms, now I'm looking at the hips.

- Yup, ideally you want to try and keep that pelvis nice and level, we don't want any anterior rotation. And if we get anterior rotation we're not getting the eccentric loads through the hip flexors. But often people will drop the hip and will rotate through the hip and the body to generate that power through that swing phase.

- Is this something you can pick up without high-speed cameras? Because actually, somebody running on a treadmill, the pelvis is going to move, it's never going to stay level. What specifically, when you say anterior rotation, I'm expecting my person's pelvis to go up in a cyclical way like this. So am I gonna see that anterior rotation?

- Often what you'll see is a bigger lordosis. So just as they're going into that push phase, often what we'll see, and maybe we've got some video that may show this a little bit here, we're gonna have almost that big lordosis at that point, the pelvis is really gonna rotate forward.

- Right, so you'll see it on one side when they're running but not on the other.

- Yeah.

- So therefore when you're analyzing a person on a treadmill it's important that you can see their back.

- Ideally, you wanna see it on both sides.

- Okay. Because actually I've certainly fallen into the trap myself that if I'm usually analyzing people walking because I don't deal with runners to a great extent, I just keep them clothed. And I'm missing a lot of evidence then?

- To a certain extent, but I think you'll still see that movement a little bit. Again with running, because you'll see the drop, you'll see almost that big rotation, that big push forward of the pelvis at that point.

- Okay now we're moving down again, so we're looking at thighs and knees here. And we've seen in your daughter the extent to which her legs move forward, the bend in her knees, that was perfect.

- So ideally through that push phase, you want to see an extension. So the straighter the leg is when the toe leaves the floor, that's the important thing, so I do want maximum extension as the toe is leaving the floor. Often what we'll see is the knee will stay flexed, and the toe lifts off the floor, or the knee is actually flexing while the foot is still on the floor. And that's not a good sign, because that's putting all the emphasis back up through the hip flexors and through the quads. So we're picking the leg up and pulling it forward rather than extending that push and continuing the push out behind.

- And then you talked about the importance of the follow-through, the back kicking.

- The heel pick-up, yeah. So you want that heel to come up behind. And ideally we're looking at the tibia almost to be horizontal through that swing phase. And now what I would say for most people has got to be the minimum to work towards with that. If you can come up a little bit higher it's fine, but people are gonna be slightly different. But the higher that foot comes up, the quicker the swing phase speed, and also then the better the contact position is gonna be.

- And on contact, you want the foot very nearly under the body, or?

- As close to as possible. It's very difficult unless you're sprinting to get it right underneath. But the closer it is towards you, the less the braking force. And this is often what causes, people say they over-pronate, they over-pronate because they over-stride. If you hit the ground in front of you, you've gotta get past the foot. And the easiest way for the body to do it is actually just to pronate, almost to flick the foot and the knee medially, which allows you to move past it. But the problem is then how you recover from that position. So the less over-stride you have, the closer contact, also the less pronation we're gonna see.

- Right. Does that apply in walking as well? Because a lot of people, I'm prescribing orthotics for people who have problems walking rather than necessarily running. Is that going to be as much of a problem? Obviously the loading is less when you're walking.

- Yeah, because you've got two feet on the floor, generally. Even though we'll see from some of the videos some toe-off and heel contact are very very close. And the definition of running is not two feet on the ground at any one time. So some people, when they're fast walking, which we try and avoid, when they come in for running analysis, and you go actually you're walking, it's not great for them to see. But ideally we're still looking for that extension. So we want the leg extended before opposite side contact, to generate that power. So again if you're getting early knee flexion, early heel lift, which is the important thing, as soon as the heel starts to lift up off the floor, again the work goes through the calf muscle, and through the hip flexors. So the longer that heel can stay down on the ground, the more ankle joint dorsiflexion we get, the more we can use the glutes and the hamstring muscles to generate that power. So it almost should be glutes, hamstrings, then calf muscle, then the hip to almost control that swing phase. So the same things apply with walking.

- And turning this on its head slightly, when a patient comes to us with a problem, what sort of things should ring alarm bells with us that they are over-pronating for whatever reason? Typically, what does a pronator injure?

- It could be anything really in there. Because again those impact forces are gonna be a lot harder. We're not getting the release of tension through the body. So a lot of it's gonna be I suppose achiness through back, through hips, where they've been overusing small muscles, rather than using the big muscle groups. So if

they've been doing lots of glute exercises, but nothing seems to be changing, it probably means functionally they're not getting into a position where they're using them. So they're still staying in those flexed positions. And overuse again of little muscles, soleus, that gastroc-soleus junction, that's always tight. So it could be just those trigger points are fired up, it may not be causing a problem. Same with the hip flexors as well. Where if they're over-stabilizing through rotations.

- Do you see a lot of tibialis posterior problems?

- Yeah, that's one, or the medial-tibial stress is a classic one. So where we're getting that repeated loading. And it's often then the rotation through the tibia at that loading phase. So the foot is pronated, and often the knee is drifting slightly lateral, we've got a little bit of an over-stride, there's a lot of vertical force coming through the tibia, and it's got that slight curve on it, so it wants to give slightly anyway, the foot pronates on it, and actually we're getting a rotation. So that's a combination of the axial loading and the rotation through the bone. And it's that lower third that really cops most of that. And then the muscles pull against it. But I think it's more of a bony loading problem, rather than a muscle pull problem.

- Somebody's asked us what happens when the arms come across the body? And I know you touched on that a minute ago, but you did only fleetingly cover it. So when somebody's running, and the arms are coming across the body, what's it physically causing the body to do, what's happening?

- It tends to pull the body forward, so it leans forward, and also it creates over-stride. I've got a still on here. Shall we just have a little look on here. So we can see her hands have come right across her. So the hand's moving across, it's bringing that leg forward and she's leaning, you can see that little twist through her body, and she's rotating through there as well. So that we'll often see, those two will go together, so we've got the hand coming across the body, we'll often see the opposite leg will be over-striding as well. And again you start leaning into it.

- Would you, are we able to say whether she's over-striding? Her heel is only just in front of the body, and it looks as though she's just making contact.

- Just making contact underneath that, yeah. So it's close on there, but that hand is sort of pulling. The effect of that hand coming across will bring the foot forward a little bit as well. But yeah, so that is at the toe-off, so what we're saying about close to toe-off position and contact, but that's what's happening there. We've got full propulsion because the body is almost overworking. So the hands are coming across, rotating the body, yeah that's actually the propulsion, and that's why I wrote, is this actually propulsion or is it contact? It's not as easy, because one is so close to the other. Whereas contact position would be a little bit on from that, but it's few milliseconds on the camera, but it's late to do that.

- A question here, what's midfoot running?

- Well midfoot strike is the same as forefoot strike, and ideally just where your contact position is more on the midfoot, rather than I suppose heel or forefoot. Which a lot of people think is a better way to go with it, because it's not quite as damaging on the body or the foot as hitting the forefoot, because you're not hitting those metatarsals the same way.

- There's only two things you can hit first on the ground, there's the heel or the metatarsals. I suppose you could land on your toes if you were a ballet dancer.

- Yeah. Often what we see is when people get on to that midfoot running, because their leg is coming out in front of you, it will start to draw back and then it will hit the floor. So you're not just going forward and then hitting the ground straight away, which you would do with a heel strike or sometimes with a forefoot contact. The foot comes forward through the air, and it starts to draw back before it hits the ground, and that's almost the ideal position. That means we're activating the glutes and the hamstrings through the swing phase as the foot's drawing back. So when we hit the floor, we're generating that power very quickly, rather than hitting the floor and having to pre-tension.

- So it's not as inefficient as it sounds then?

- No, no. No I think I might have a video showing it. Shall we have a quick look at that?

- Yeah, let's have a look at the video of some of the things we're talking about here.

- So here's a good sort of, left foot probably slightly onto the forefoot/midfoot, but that's the leg going forward. See how it goes forward through the air, but it draws back before it hits the treadmill? So it's drawing back, and that will often give you then more of a midfoot contact position. And we see then we've got that nice extension, and a nice sort of heel. So this is a good example of a nice relaxed, comfortable running style. We've got a nice upright posture, head's looking forward, relaxed through the shoulders, nice arms swing, arms coming out behind.

- Quite a lot of lordosis though.

- Yeah. There's still a little bit of that going on. This is someone who came in for an assessment and we're just sort of working with her. You gonna get a certain amount of that. She's a triathlete, and the triathletes tend to be a little bit tight through hamstrings and posterior chain, so you tend to get that little bit more lordosis. But again, just the contact position, it's that midfoot contact position, it's glancing through the heel and generating a lot of power through the extension, that nice behind-the-heel pickup.

- But in your first answer to the question, you said that this is pretty much the same as forefoot striking.

- Well yeah, but you're sort of glancing back through the heel. Sometimes when people have just changed onto the forefoot strike, with that poor posture you'll get the contact position will be on the forefoot, but it's still an over-stride. Because they're almost trying to reach the ground with the forefoot, rather than almost let the foot find its own position, I think is much preferred way. And also what we've done with this lady here, we've dropped the heel-to-forefoot differential down. So rather than, when she initially came in it was in a

support, she was in a big heel, and that will always tend to generate heel contact. So often taking the heel out of the shoe, and taking the support out of the shoe is what we did as well. It allows then the foot to almost find the ground on its natural position if you wanna call it, just because we haven't got a big blocky heel underneath it. So we'll often find if we want to reduce that heel contact, we take the heel out of the shoe, and naturally people will start, the contact position will come back in a little bit closer, and also we'll avoid the heel contact.

- Is that bringing us closer then to a barefoot shoe?

- Yeah.

- If that's not a stupid expression, but you know what I mean. The minimalist shoes.

- Yeah, and the theory behind it was to allow the foot to run a bit more naturally. Take everything out that's gonna impact on the foot, and we'll a lot of support shoes put a big heel on it, put a heavy block in the shoe, and the body's gonna react against that somehow as well. So take all that away, let the body find its own way. But get strong in your new movement patterns.

- So am I right in thinking then that you're suggesting that everybody should be comfortable running as a midfoot striker, provided they've been taught properly?

- They should run in a position where the foot will find its own way. Whether that's slightly heel, midfoot or forefoot is gonna be slightly different for everybody. But in theory, yeah they should be able to do that. But the things you've got on top of that is what people are doing all day. So they maybe sitting around 10 or 12 hours at work, sitting in a car. So all those things will have an impact on their overall posture as well. So if they've got good posture, nice and strong, and they do loads of yoga, and they do the pilates, and they do all the other bits and pieces, then in theory there's no reason why everybody can't run in fairly minimalist shoes and just allow the body to work as it should do. The problem is we're not built like that, and we have muscle imbalances, we're

tight through here, we're doing whatever, all those other environmental factors will play a role.

- Can we just bring up your video of the triathlete again, get her running again for us? This question has come in, people are really reluctant to give their names on these questions. But the comment is, it looks as though she's running with slightly bent knees, which we talked about right at the beginning of this. Now yes she is running with slightly bent knees, the question is, is that a good thing? And I think probably refine that into how bent is a good thing?

- It's probably the speed she's running at, because she's a very good marathon-distance runner, and she's probably running slower than she would do. So if we put the treadmill speed up, we expect that knee to become straighter, to an extent. So again, people's running speed will dictate what's happening as well.

- Okay. I thought earlier on that you said that you should strike with a bent knee, if not only to reduce the stress through the knee itself. You don't want the knee locked.

- The contact position? Yeah, sorry I thought he was talking about the extension.

- No contact is what I think the questioner means.

- Okay, yeah ideally we want that slightly bent knee at contact, which is gonna happen underneath the body there. Yeah we don't wanna be over-striding and hitting with that straight leg out front.

- Now we've got another anonymous questioner here, who says isn't a lot of running style just an in-built characteristic? Mine, for instance, he says or she says, hasn't changed over the last 20 years, which I put down to just getting older, I don't try to correct it. Is it all in-built?

- Well we've all got a certain way that we're moving, yeah. The shapes through the bones, the muscle bulk, what we've done throughout our lives, the way we've ran, the way we've moved, everything. That's gonna be pretty set. And it could be the case that the later people come in to having a gait analysis the harder it is gonna be to change, or the more factors you've got to address as well that's the thing.

- We had one of your podiatric colleagues on this show, several months ago. And we did cover briefly barefoot, and forefoot, and heel striking running. And he said that he thought a lot of the problems were occurring because people had decided that they ought to make the change, and it was the transition period that caused the problems. Not only in those people who shouldn't have changed in the first place.

- Yeah absolutely. You've got to look at a good reason why you're actually gonna change. So why are you doing it. So if you're doing it just because you want to see how it goes, then that's a reasonably good reason for that person. So people come in, I still have people come in and say I want to try and learn barefoot running. And my first question is why? Are you really sure about this? This is gonna hurt, it's gonna take potentially months, all the extra work you've gotta go through. Some will persist, some will give up. So that's the thing, it's like with any exercise, or any treatment without it, if someone's coming in and going I'm absolutely fine or whatever, just think okay, where are we gonna mess around with that? So we'll have a look at it and go maybe tweak this a little bit, maybe do that. So again, sometimes it's small changes that are gonna make the big difference. And it may be a little change of head position, a little bit of relax through the shoulders, a little bit of that arm swing, a little bit of pelvis. So we're not gonna necessarily change people in big huge steps, it's a very gradual transition with a particular reason why we're trying to do something as well.

- I've saved this question because I knew we were gonna come back to barefoot running, but somebody has asked whether you could go through the problems of barefoot running, which we touched on earlier on. But again, as opposed to forefoot striking.

- Yeah, the two will often go together. I think people, if you're gonna go down the barefoot running route, it's often a lighter contact on the forefoot. The main thing is

are you gonna reduce your contact time? This is a problem with a lot of heel strike and over-stride. Over-stride and heel strike you're on the ground for a long period of time, and if you don't have that protection from your shoe it's gonna hurt. So if you go immediately into a barefoot run, you imagine if you take your shoes off and you run yourself, you're gonna be on your tip-toes and spending as little time as possible on the floor. So they're the changes you've got to put into place.

- So people switching to barefoot running are gonna have what, shorter stride, higher cadence?

- Shorter stride, higher cadence. That's the two factors on that. And looking at your posterior position as well. So often people, well the magic number that people talk about is 180 steps a minute off both feet. Now that's just a number that's sort of come up there, there's no hard scientific fact that you should be running 180 steps a minute. But that's the sort of position you've got to aim to, if not a little bit quicker. It's contact time is the problem. The more time you're on the ground, the more chance you've got of injury. Flying through the air isn't an issue. If you're falling out of an airplane or running, it's the impact that's the problem.

- Yes, but, if you're going to run for a mile, at the end of that mile you've probably had as much contact time no matter how short your stride is. Whether you're barefoot or running whatever, because you're just doing more of it. So you'll have a shorter contact time but lots more of those shorter times. So you're still going to get that repetitive strain, and built up over a mile or whatever it might be. Sorry, a kilometer.

- Yeah, it's sort of down to the impulse on that as well. So you can be on and off it a lot quicker, it's a lot less amateur than being on it for a longer period of time. And again, you're not probably gonna half your stride, it's gonna be a sort of equation down there when it happens. We'll see from, we've got an interview gait analysis system, where if someone had come in with a heavy heel striker, they'd be on the ground for a quarter of a second, whereas someone who's a very quick-on-the-toe forefoot striker they go down to 0.9. So you know it is a big difference in actual time on the ground. So you've got a lot of margin to play for in there. And again it's down to impulse. You can have a quick hard contact that is not as damaging as really pushing that foot through for a longer period of time.

- I really hope you know the answer to this question, because I haven't the faintest idea what this person is talking about. They ask do you have any experience of using D30 foot beds to reduce shock transfer and is it useful? What the hell is a D30 footbed?

- D three oh. Yeah, it's a new material that's come out that a company called Rights Rider are introducing to some of the running shoes as well. It's one of those non-Newtonian mechanical materials. So if you hit it softly, or if you hold it in your hand it'll run through your fingers. But you can bounce it, so it's one of those, the harder you hit it, the more bounce-back you get.

- Custard does that, doesn't it?

- Yeah, it's basically custard powder in your shoes.

-Don't try that if you're going for a long-distance run.

- Yeah, fill your shoe with custard and away you go.

- People are probably wondering about that. For those of you that don't know, there is a theory that if you fill a swimming pool with custard, you can actually run across it because the impact is hard. Again, don't try this at home unless you've got an awful lot of time on your hands and a lot of custard powder.

- Well same on the beach on the sand. So if you're walking in the surf and you stand there, you sink into it. If you run along it, you bounce off it.

- So the D30 foot beds work on this principle?

- It's the same material, basically, yeah. Brooks used it, the DNA, which was their layer they put through the shoes, and it's the same sort of principles. So it is good cushioning underneath here. Yeah, it's a good shock-absorbing material. You can put the layer on, and you hit your hand with a hammer and it's not gonna hurt. So it definitely is a good shock-absorbing material. It's quite heavy, that's the only thing with it. So again, running shoes are always trying to keep the weight down, going back that big weight on the end of a long lever, it does make a big difference, and grams make quite a big difference, again for that repetitive strain. So that's the only problem with the material, it is a heavy material on the footwear.

- I do remember learning some years ago that actually a lot of injuries, particularly in sports such as football, rugby, particularly hamstring injuries, happen towards the end of the match when the boots are getting heavier and the athlete's getting tired. So that extra weight on the end of your long lever becomes a danger presumably at the end of a long run, when you're not able to cope with injuries quite so well.

- Yeah absolutely. Everyone fatigues during a run, and the stride shortens, the body gets a little bit tight. We're gonna find that whenever you run, really. And the longer you can stave that off the better. So again, going back to those principles of trying to get the muscles to stretch out a little more, use that connective tissue. All the elasticity we've got naturally in our bodies, let's use that as much as possible for as long as possible during the run just means you're gonna be less strained, and you're not using those muscles through that concentric action for a long period of time.

- Sally says, thank you Sally, she says that she finds that you need, I don't think she means you personally, she finds you need a strong pelvic floor to maintain a decent barefoot running posture.

- Yup, everything's gotta be working. You need a strong core, again because of that faster cadence, that quick turnover, and posture's really important as well. So I'll often use your posture, your forward lean, if you go somewhere like chi running or pose running, very much into chi running or pose running, different ways of more mindful running where you're actually trying to create

that very quick turnover, minimal contact time, but you're actually using the forward lean to control your speed a little bit. So again you don't wanna be bucking in at the lips, at the pelvis and just leaning forward into that. You've gotta stay really tall and strong. So yeah, strong core is essential.

- Pose running as in P-O-S-E?

- Yeah, a lot triathletes went through that. So again it's almost mimicking that pedaling action, where you've almost got a very vertical cadence, a very very fast cadence, almost like spinning the pedals on a bike, you do exactly the same thing with your feet.

- There is a theory though, isn't there, a well-researched theory, that there's no point trying to train, let's say the pelvic floor to run, because by running, if you're trying to do it correctly, you will be training the pelvic floor to do exactly what you want it to do. Whereas if you try artificially to do that actually that's not functional.

- Well it comes into those things of people doing lots of plank work. And it's like is plank useful for running? Because it's a very static movement.

- And you're lying down.

- Absolutely, you're lying down, which you don't wanna be when you're running too much. But I see a lot of people who come in there doing a lot of pilates, a lot of core work, but then as soon as you see them run they're all over the place. So they're very good at standing still or doing those poses, very very stable, but as soon as we put any movement in that, because there's impact forces, there's foot movement, there's knee movement, there's body rotation, often then the body's being twisted so much that it either fatigues very quickly or it doesn't even bother, it just gives up.

- Yeah. As I predicted, lots of questions coming in because we're getting on in the broadcast here. So I'll run through them, because I actually want to get on to some of that functional training, because I know you've got some videos on functional training.

- We can take a quick look at some of that, yeah.

- Do you prefer to assess people on a treadmill or outside?

- Ideally, for me personally, on a treadmill. Because they're not going anywhere. I like to stand next to them, and video, and I can talk to them, and it's not raining, and the lighting's good, and all the rest of it. But if people are not very good at running on a treadmill, they really hate it, we've gotta go outside. But we do out in the Peak District, and we do treat a lot of hill runners, so often we'll go on the hills as well. So we'll actually go out onto the hills.

- You're on the bicycle?

- Well, there's one guy I do work with quite a bit and I do need a bicycle to keep up with him, yeah. But my camera work is not very good. So yeah, basically just panning as they come through. But yeah, we'll take people out in the environment where they're actually training.

- And are you always using high-speed cameras for this?

- Yeah, generally.

- Is that essential?

- It is if they're running quickly, just to see the detail. We're usually recording at either 120 or 240 frames a second, just to get that level of detail.

- I'm going through it in sequence, so they're a bit unrelated, these questions. Anonymous questioner again, do you recommend any stretches to help poor, abnormal or problematic foot mechanics, and do you recommend anything to help with plantar fascitis? Presumably in the way of stretches.

- I mean stretches are one of those things, the muscles are tight because they're holding, they're protecting the body. So sometimes just stretching low down, we're taking the support out of the body. It can be used as part of other treatment as well. So if we are trying to get the ankle joint moving properly, and the calves are tight, we've got to do a little bit of stretching through there. But we've got to look at the reason why they're tight anyway. And if it is that the mid-tarsal is pronating and it's collapsing that late mid-stance and propulsive phase of gait, do we need an insole or an orthotic in there to try and help control it at that point? We've got to mobilize through the ankle. So it can be useful, but not by itself.

- You talk about the calf there, it's a common muscle to try to stretch, isn't it? How do you recommend people stretch their calves effectively, soleus or gastrocs?

- The most effective way is standing on a step, both feet on, dropping heels down. Keep a straight leg, and then coming up as well. So you tend to put the concentric action on as well. So bit of both on there.

- One at a time, or both together?

- Both together, depending on what we're trying to do. You get more pressure through one, but often the foot is gonna drop out underneath you, so again you're putting a stretch through the foot, which means the calf muscle often will tighten because of that. So often I prefer both feet on together, so one foot supporting the other one. And then either you can just drop one heel down and come back up, so you can do a little bit of a walking action, both feet down, or both feet up.

- You've got your disco moves going again.

- Absolutely, you've got my secret out here.

- Okay, a bit more technical then. How long for, how often, how frequently, per day, would you get somebody doing this, if you really want to get the calf muscles stretched?

- I think more importantly I would work on how they're walking as well. Because if they've got those problems, they've often got early heel lift, they're not creating extension when they're pushing. The body's often very stiff, and they're not actually using any rotation through the body. So I think the easiest way to try and stretch out calf muscles and feet is actually to just start walking a little more effectively. So actually getting a little more rotation through the body. And just trying to think of that extension. Because there's no point doing loads of stretching, and then the heel lifting early as soon as you walk, and you're not changing the way that you're moving. So the heel lifts up early, and it rotates, what we call an abductory twist, where the heel whips in as soon as it lifts up off the floor. If that's still going on, the calf muscle is just gonna tighten again. So you could do 20 minutes of really good stretching or have a massage, and often by the time you've walked out the clinic, or you've walked off and made a cup of tea or something, everything's just tightening up again.

- Okay, so we're gonna tell them to walk correctly. You're gonna tell them to make sure that they've got lots of extension in their stride when they're walking.

- But often it's the upper body. We'll work on it through the upper body. And often they're really stiff. The body's either not moving at all, so we just try and get the arms swinging, get the shoulders and pelvis opposite rotation.

- And do you find you're gonna need to give them a specific length of time to do this for? Because of course what they get to work, or doing what they're doing throughout the day, they forget about what you've told them. So how long are you gonna tell them to do this walking for?

- Just to be aware of it. I think a lot of it is just the awareness. Every time they stand up, start moving, just have that in your head, just start trying to introduce it. But as we start to get the movement going on through that, it almost starts improving itself. So as soon as we get that movement happening, the body starts rotating. And often people that are in pain, they often tense, and they don't want to move. So often the problem is they're just staying in that really tight position. So what they've got to do is just relax into that and actually just try and start moving a little bit again. So that's the main thing with that. So I think you can do your normal stretches, on the step and doing that sort of thing in the morning. Short periods of time, I think. Once that muscle has stretched as far as it's going to, which happens very quickly, there's no point hanging off the step for another 20 minutes, because it's not gonna shift any more. And potentially, if anything it's gonna tighten a little bit, because it doesn't like what you're doing to it. So it's about teasing those muscles out, getting a little bit of length back through them, rather than actually forcing to try and do something. But it's movement, it's movement that's the important thing.

- Talking about getting people moving, here's a question from yet another anonymous questioner, I'm gonna stop reading out questions from anonymous questioners soon, because it would be nice to know who you are. Couch to 5k, do you have any suggestion to help getting patients started with running? With heavier patients, is running or jogging sensible, or should they focus on other exercise to lose weight and improve their stability and fitness before the start to run?

- I think Couch to 5k is brilliant, it's really really good. And building up to a local park run has just been so good for so many people, and I think for just getting more movement--

- For the benefit of people who don't know about Couch to 5k, would you like to just tell us what it does?

- There's various programs, I mean to the NHS do one, I think it's a 12-week program, and it basically takes you through every week, for a certain number of days per week, it gives you a set program for three months on basically getting back up to run a 5k sort of position. So to start with you'll be walking most of it, and you'll be running 30 seconds every four minutes, or something like that. And it's a very very slow build up of just increasing your running time. But it's walk-run for the first half, which then you're building up the running to that point of running say 30, 35, 40 minutes.

- And you can download a program for this?

- Yeah, there's loads out there on the internet. So it isn't just one, there's loads out there to do, so find something good. The only issue potentially I would say with that a little bit, we see a lot of people roundabout week four, five, six, where they're starting to get the injuries. And if they haven't done anything, oftentimes it's quite a quick load up to that point. So often what I'll tell people to do is actually just listen to your body a little bit, because it may be running for a minute is actually quite hard for people that haven't done it for a long period of time. And they're looking at the watch, and they'll just run for a minute. And actually your body could be screaming at you after 20 seconds to start with. So back off, do a little bit more walking, give your body the time to adapt as it needs it. And if you have that slower build up, often you'll progress much quicker at the top end of the program. So sometimes you've got to go really really slowly, and then you can build a bit quicker, rather than trying to go too quickly too soon.

- So this is the key for those overweight patients that our questioner was talking about, use common bloody sense. If it hurts, you might be doing a little too much.

- Absolutely. But you've gotta push yourself, you've gotta put that little bit of effort in, but the body's gotta recover as well. And also sticking to the program, they're geared to building the rest periods. That's often the problem with runners is, they just wanna go out and run. And you've got to give your body that recovery time. That's the important thing. It's the recovery time when all the hard work is done, basically the muscle building.

- Bob has asked us a question. I'm not sure which Bob it is, but Bob thanks for identifying yourself. He's wondering if you would have changed anything in Paula Radcliffe's running style. She had a very unorthodox style, but of course was very successful. If she'd changed her gait or style, would she have been a better runner, or would she perhaps have less injuries?

- I know, there's a lot of talk about Paula, and I think lots of people did have a bit of a go and see what they could do with her. It's a difficult one, isn't it? Again, you've got to look at the whole, it comes back down to looking at the whole of the body, what you're trying to do, what you're trying to gain from it. It's not just a case if someone's got a funny arm swing, you just need to straighten that arm out, because that funny arm swing, or the head bob or whatever is going on, is going on for a particular reason. And if you can't identify why it's happening--

- What was her unorthodoxy?

- It was a real head movement, it was really bobbing and throwing her head around quite a bit. Which in theory I suppose is putting a little bit more sort of imbalance, she's gotta stabilize that. But it's how she run, it's how she kept moving. And perhaps she's using that little bit of rotation actually just to create that little bit of forward momentum as well. So stabilize the head, stop that momentum, you've gotta put something else back in. And that's the same whether you're doing running technique, stretching, or using orthosis, if we're taking a movement out, you've got to put something back in there to replace it. And that's the bit that often gets missed with people that try and change running technique, they try and change something. They're very good at removing bits, but actually what doesn't happen is you don't put something else back in. So the body just compensates in a different way. And at some point they're gonna break down at that point.

- A question about software. Do you use any particular type of software for gait analysis?

- I do, there's a company called Kinevia which I use, I don't use any of the other big ones, but it's great for patients, basically.

- And we'll put a link up for that on our website.

- So it's a really straightforward one to use, it uses your video files off your computer where you store them in, or off our memory card I tend to use straight out of the camera, or plug the camera in. And it gives you one screen you click and then you go frame by frame, you can draw little angles on it, you can get a grid onto it, you can do two, playback, you can use two cameras if you want to get technical with it.

- Used to be a thing called Dartfish. Are they still going?

- Yeah, there's quite a few around. There's quite a few commercial ones you can buy, with lots of different programs on.

- What do you need then? I mean this person is obviously thinking about what's effective, what do you recommend? I mean if you're not into multiple high-speed cameras and that sort of level of analysis, what does a bog-standard jobbing osteopath chiropractor need to do gait analysis?

- So if it's a camera, you just need something where can you look at things frame by frame. But there's so many things out there on iPads, and I don't know Coach's Eye I think is one on that, where you can download the program and just use the camera off the tablets. And that's how a lot of people do it, it's the easiest way to do it.

- And you can analyze frame by frame with those?

- Yeah.

- What sort of speed are they running at?

- I think they're only 30 or 50 frames per second.

- Well 30 or 50 is not bad. It's not 240 as you said.

- You're gonna miss a little bit of detail, but if you've got enough running time, you're gonna see everything at some point, just by a period of actually seeing enough steps. So yeah, there's plenty out there, it's really available off the iPads and apps these days.

- Now I've got a question here about your triathlete, in fact if you'd like to get her running again on our screen there, since the question is about her running style. This person says, it looks as though she strikes on the anterior lateral aspect of her midfoot and forefoot. How would you advise her to remedy that? Would you encourage a heel strike? She's presuming here that you would encourage her to remedy that.

- Not necessarily, no.

- Can you show us, what was she like before you worked with her? Because you've got another video of her here, haven't you? So this is the same lady.

- Yeah, this is earlier on in the assessment. This is where she came into me. So it's on a slightly slower recording because we're in the clinic room rather than in the shop, because we were trying different shoes, so this is at the 240 frames per second. But we can see we've got a lot more body rotation, so the big impact here is hands are coming across a lot more and there's a lot more rotation through the body. And there's this right leg contact, we see it's a little bit further out, it's onto a heel strike, underneath here. So a little bit more of a heel strike contact, and we can see almost that rotation through the pelvis, a little bit more lordosis.

- You have got a little bit of that backward swing before it makes contact on the left side. Less so perhaps on the right.

- Yeah. So there is, yeah I mean she's not a bad runner to start with, so she didn't come in as a really basic, so she's a good runner to start with. So with this type of person we're doing a little bit of tweaking, but the main thing here is the hands coming across, a lot of that body rotation, just a little bit of over-stride. But the big thing here as well, she was running in support shoes. One thing she came in to see me about was to look at what sort of shoe she needed, and whether these support shoes, she'd been advised by the running shop she needed support shoes.

- When you say support shoes, do you mean--

- Motion control.

- Motion control, so that's the more severe form of correction as opposed to stability.

- Yeah, so we're actually getting on here, so we can see that yellow piece on the shoe. So we're actually getting the higher-density midsole down that inside of the foot, basically.

- Now the reason that I got you to show this is because I wanted to illustrate the fact you'd already changed her gait by the time she was in the second video, the one with the white top on, in the shoe shop. And our questioner wanted to know what you would do to improve her striking pattern.

- Yeah, so this is the improved version basically from where she was underneath that. And we've also changed the shoe. So we've taken a lot of the support out the shoe, and we've got this lower drop, this is a four mil drop, as opposed to a 10 or a 12 which would have been the other support shoe. Which will sometimes make you feel just a little bit more lateral, they're just trying to find the floor a little more, different part of the foot is gonna hit the floor,

than whatever you're happy with. So this could also be because she's a little bit tight through the hips and pelvis as well. So there's gonna be a little bit of work in here, but this is actually just putting someone straight on the treadmill, saying this is what we need to address, and seeing how they get on with it with some shoes. So sometimes we'll see this, this isn't gonna be the finished product, but the patient has almost got a feel that they are I suppose in a better position. It sometimes feels quite strange for people to be in this new position, so we use the video to reinforce that. So they're sort of running, think it feels a bit weird, they look at it and go okay, I can see that actually makes sense. So it's understanding how that position feels when they're running, and then mind's eye, actually how does it look. And that's the connection they've got to make. Because the body is going to put you back into your comfort zone very very quickly.

- Are you happy for me to put these videos up on our site for people to look at?

- Yeah, some of these ones we have.

- If you say we can't show any for whatever reason, patient confidentiality of course it's fine.

- No, this lady won't mind, she'll be fine with that.

- You've talked about different types of shoes, and I know you've got different types of shoes on your presentation here. Would you like to just talk us through some of these more weird and wonderful designs? Then we'll get back to those exercises, because I'd quite like some of those.

- So this is just the classic sort of support shoe. So New Balance, we've got that high medial build up, we've got a little bit of profiling through the midsole.

- That's the bit they're showing as white underneath --

- Yeah, this is the white bit through here. So that's a really hard layer. We've got a slightly firmer layer through behind it as well then a soft bit on the outside. So the idea of this is, the outside of the shoe is gonna give much easier than the inside of the shoe.

- So you won't pronate so much.

- So you won't pronate. And you can't quite see because we've got this writing over the side here, but there's this part here where the forefoot will sort of flare out a little bit as well. So the whole of that side of the foot, it's making it harder for the foot to fall down the inside. So for those of you that do rapidly fall in, that are in that flat position, or that pronating position, the shoe can just slow down that rate of loading and encourage you over onto the toe. The issue with support shoes is, if there's too much support in there, it will then hold you on the outside, and we'll end up with a very lateral weight-bearing position, basically. So we're still not getting over to the toe. Even though, from the rear foot analysis, a lot of the running shops we'll look at, say that heel's not rolling in, but there's no particular reason why that heel shouldn't roll in anyway. And it's a really good case that actually we need the foot to pronate so we can then get the power through into that push phase. Whereas actually if you're just holding it, running in that supinated position, again it's very rigid, we're making a supinated foot, which has poor shock absorption, has poor propulsion, we can't get off the floor very quickly. So we've got to allow a bit of both.

- How much does the sole pattern actually relate to or affect running style?

- Well I can show just a couple here. This is the Brooks version of that. Again this is--

- Now Brooks have a pretty good reputation.

- Yup, Brooks is good. So this is their support one. A lot of people we see come in with this type of shoe. So again we've got a lot of support, we've got extra reinforcement, plastic through here as well. So this shoe is really gonna go

nowhere once someone's loading it. The other thing that companies will do, this is a Defiance, which again is a Brooks shoe, but it's got less support through, as in the medial support, but it has stiffness. So they're creating a plastic cradle underneath the foot as well. So this will stop the foot from twisting and rotating quite as much, but we don't have the medial support. So we're trying to slow down that rate of loading and try and encourage more onto the forefoot. Sometimes what we've gotta do is stiffen the shoe up. So we need to take out the medial support, but still keep the shoe stiff and allow the foot to roll through a little bit easier. So we'll tend to find with most people, there's the combination of the heel height, and the shoe stiffness will make it work for them, basically their running style. And if we're trying to change something, the shoe has got to allow them to make those changes. So that again may be a gradual transition. So we may go from someone from a support shoe into a stability shoe then into a neutral shoe, so you get a stiff neutral shoe, and then if they want to go down that more flexible, more minimalist shoe, but it's gotta be that little bit of transition. If you take someone out of a support shoe, put them in a minimalist shoe, the body is just gonna break down. There's just so much going on. Those muscles are gonna have to do so much work that they haven't been used to that it's gonna take a little bit of time for that. And just say one more thing about this whole pack, this is the important thing through here. So this is a couple of Nike shoes. This one here, again we've got that little bit of plastic, but if we can look at this line that runs across the bottom of the sole here, you see on this shoe here it's very medial, but on this shoe here which has no stiffness it's very lateral. And these tend to create a little bit of longitudinal torsion, a little bit of twist through the shoe. So even something along this line here will actually make the shoe work very differently. This one is obviously very stable on the lateral side, this one here is a lot more stable on the medial side but very unstable on the lateral side with no midfoot control. But also the arch, the midfoot of the shoe here, the base of the shoe, is actually very narrow. So where some people's foot move you think of that sort of medium arch foot that has a lot of mid-tarsal pronation, if they're running in that type of shoe, there's actually nothing in the shoe there that's gonna control them at all. Whereas actually just stiffening it up slightly, putting that line down the medial side, all of a sudden makes the shoe just feel so much different. And that's nothing to do with the upper, that's basically the sole pattern, the mid-sole and what they've put in. So those type of feature well worth it in the bottom shoe, these shoes here really really unstable, that one here, little bit more stability in there.

- Okay, I'm gonna give you two minutes to run through the three different types of shoes that you've got on slides there, because we're running out of time and I want to get on to some other things as well. Because you've got a Newton and a Scott and an Om.

- Okay. A lot of the countries are trying to encourage more of a forefoot, Newton were the first people to come up with it. They've got these lugs underneath, so again encouraging almost that pivot point over the metatarsal heads.

- So good for someone who wants to run on their forefoot.

- Yup, to encourage that more forefoot. Scott do a similar sort of thing with the midfoot rocker.

- It's like Maasai barefoot runners, is it?

- Not quite, because it's not really squishy in the heel. It's a nice solid heel through here. But again, it's a nice wide, stable shoe.

- A toe spring?

- A toe spring, some people call it, through here, because the toes really curl up. And some people say this isn't great because you're rolling through the shoe, and whether it does push off. But again, if you've got someone that's got, sort of trying to get through the forefoot, trying to get some power onto the forefoot quickly, this shoe will help.

- This is a weirdy, I know it's slightly distorted.

- Om, yeah, just from the picture on there. Yeah this is Cloud shoes they call it. So these lugs here, they compress when you hit the floor, they grip, so it's a lot more cushioned when you hit the floor but it's really really stable into push off, because those lugs, they've got little teeth you can see underneath here.

They grip together. So as you hit the floor they compress, so you get that initial cushioning.

- Who would you suggest wears those then?

- All these type of shoes, if you're really trying to get off that contact, getting out of those big support shoes, big heavy shoes, making it really flat through here, to really try and help get onto that forefoot, the heel, midfoot, forefoot transition is basically where we've gotta be with running shoes.

- Okay, some quick questions before we hopefully have a little bit of a chance to look at those exercises.

- Do you normally film from the side, or behind, or both?

- Both.

- Okay, if you had to make a choice, because you can only get your treadmill in one part of you treatment room--

- Side. Definitely side view gives you so much more information.

- You only get lateral side on one foot and medial side on the other. Does that bother you?

- Mirrors?

-Mirrors, okay. Yeah all right.

- If you haven't got the room to get round. But ideally, but yeah if you've only got room on one side, then yeah. But a sagittal view, that side view, because we can look at contact position, you can look at knee position, you can look at body posture, you can't see any of that from the back. Side view.

- If you think we're going fast or speeding up towards the end here, someone's just sent in a comment that their brain is exploding with all this information, thank you for squeezing so much in to 90 minutes. We'll we've got more to go yet, I'm not giving up until I've got those exercise videos shown. What's the best way to stretch the hamstrings so you get the belly of the muscle and not the distal end or posterior knee? I've found offering a little knee flexion with the patient supine with their ankle on my shoulder seemed to help, but is there a better way, and for how long, and what's the best way for the patient to do this themselves as an exercise? Philip has asked that. Well done, Philip, that's a really complicated question.

- It is a real problem with trying to stretch hamstrings.

- But does it matter? Doesn't the muscle find its own--

- Yeah, I would say again if you're changing the function, getting the movement properly. Why is it tight in the first place? It's probably because it's not being used properly. If we can get some extension, get the knee extended slightly into that push phase, it will start stretching itself.

- So there you go, that's the answer, get them moving properly and that muscle will do the work for you. Because there is an argument that MET muscle stretching in the clinic doesn't last very long unless you support it with functional changes.

- Yeah, you've gotta do the functional change.

- From Jill, hello Jill. Jill is Claire's cousin in fact. Can you tell me please what you feel are the most important factors when putting together a rehab program for lower extremity injuries like chronic ankle stability or achilles tendonitis, for example? I told Jill she could attend this broadcast only if she could ask a question, so thank you for that Jill.

- It's about graduated loading, that's the thing. So you've got to take the patient and push it as hard as they're able to without causing more damage. And a variety of exercises as well. We haven't got time to go through all of those, but you've got to be stressing the tissues itself, the neuromuscular system, the proprioceptive system, the whole lot. So it's variety of exercises and activities.

- Presumably as functionally relevant as possible.

- Absolutely, it's gotta be functional.

- I hope that's enough, Jill, we've not got much time left.

- Hopping, skipping, jumping.

- Right? Well come on, show us some of your rehab exercise videos. Because there's a variety of different techniques that you're using in those which I thought were quite interesting.

- So functional again, hamstring activation. So a lot of problem with the hamstrings is they're just not getting into position where they're being used properly. So what we're looking to do with this exercise here is to generate a very big sort of posterior chain movement. So we want the knee extending, we want the bodyweight going through the foot. So standing from sitting off one leg. So you sit in this position, he's probably slightly low on this position here.

- On his right side.

- Left leg's off the floor, he's sitting a little bit low, and ideally, let's have a look here. We're just gonna stand up off one leg with a good extension at the end. Sit back down again. So this is actually just trying to isolate the hamstring particularly. So we want no leaning forward. So as soon as we lean forward everything goes through the hips and through the quads. And we're aiming to almost feel the knee being pulled back behind by the hamstring extension.

- It's quite hard to do that without leaning forward. You'll fall over.

- Potentially if the seat's too low. So if the seat's higher, so what you need to do is get the seat or the bumper up high enough so you can do the movement without leaning forward.

- Nice thing about those blocks is that most of them have got three different heights. If you stand them on different sides, they get higher or lower. I don't know if that one can go any higher than that.

- No, it can't actually. And the other one we tend to do to move that one a little bit more functional is then do exactly the same thing as the step up. So with that sort of walking and running action. So step down, step onto there, flat foot, whole of the heel has got to go onto the bench. Again, and extend. So there's no point doing it off the toes, it's got to be the heel down. Because we want the weight to go through the heel. If the weight's going through the heel, the hamstrings are doing the work.

- And the arms are working there as well, so that's presumably quite important.

- Yeah.

- And that seems like it's relevant to anybody, not just a runner.

- Yeah, definitely. So those two exercises are generally what I would say to be they're sitting down all day, doing their drive, they get to home, and before you go out, get these hamstrings woken up a little bit.

- Yeah, I'm sorry I'm laughing because I've just seen somebody's sent in a comment saying they've just tried that one leg standing exercise at home and they've spilled their gin. He's obviously getting the hand movement right anyway.

- Definitely, yeah. And the other one that takes that a little bit further is then to, this is a very specific hamstring isolation. So the knee slightly bent to start with, and actually you're just trying to use the hamstring to straighten the knee. So stability, we don't wanna see any rotation through the back, and we don't wanna see the toes pointing, the foot shouldn't point. If there's any movement through the foot, we'll know calf muscles active, so people that are very active through calf muscles and hip flexors tend to find this really difficult. And we need the opposite knee in flexed position. All those exercises there, we need that opposite leg to come up. Because if we're flexing through the opposite hip, we'll immediately activate the opposite side hamstring. Which is why we see a lot of sprinters do that high knee work. Because even just stand yourself. If you stand with just one leg with the knee down on the other side, hamstring's not tight. Lift it up, immediately the hamstring is activated.

- Please tell me it's not important to have a ridiculous beard to do all these exercises.

- No, Mick's one of our favorite runners there, he's great, well-known for his beard.

- And you've got some exercises outdoors as well, which probably we've just got a little bit of time to look at.

- Yeah. So often what we'll do is the high knees. This is just everything being put together. But we'll do high knees to start with, as an activation, we'll do bum kicks, and then into a run. So just let that run through again. So this is high knees to start with, feet activated, bum kicks, and then into the run. And this is almost just pushing the body through, higher than you would normally run. So we're doing higher knee lift than usual, we're doing a higher bum kick than usual, so when you go into a run your body's used to doing those movements, and it almost just feels a little bit more natural. It's just a little bit more springy. And we have good fun doing these drills. These are some of our runners we work with. But yeah, so high knees we want the toes up, we want to be activated, so we're activating through the foot during that swing phase. And the bum kicks as well, arms nice and straight, we're really generating a lot of power, arms driving up behind, and then into that run phase. And the other one that's quite popular, again trying to get hamstrings activated before they hit the floor, and then into the high knees, and then into the run. And this is to effect neuromuscular control, we're getting the body moving, we're really putting it out of its comfort zone for a lot of people. We're asking it work in one position, then in another position, but we're borrowing a little bit of that. But these are all quite good runners, but we get people doing this for the first time, they're all over the place with it a little bit. But they're really stressing their muscular system because they've got so stuck in running the same way, the same cadence, the same movement, we've got to break things up a little bit. And we use those hills behind as well in there, which is quite good fun.

- And the very last one, if you go down two slides from that one. Yeah that one there. Tell us what's going on in this one, because I love this because the bloke at the end gets it wrong every time. Admittedly it's only on the loop.

- So yes, one jump up onto a bench. But again, it's putting all those elements together. We use a lot of jumping, a lot of hopping, a lot os skipping type exercises. So again, it's just using stuff that's out there in the park. You can use benches to do those step ups, a series of steps, we'll do hops up, two feet.

- What's this functionally retraining?

- Again, that neuromuscular control, just getting that dynamic position. We're trying to generate the power through the hamstrings. But often jumping is good. You've gotta stop start. But it's easy sometimes to keep the movement going.

But actually to control that movement and generate the power again is really good plyometrics. So it's basically all plyometric type work. We use it as a combination.

- Okay, that's all we've got time for. Apart from, just very quickly to talk about what you can do for other people. Because you run workshops for practitioners and workshops for runners, don't you. So if there are people out there who want to get into this in more depth, we're going to give them your contact details whether you like it or not. So how does that work?

- Well the one for patients, we do that as either a four-hour workshop generally, and we either run them from the clinics, in Chesterfield we'll offer a couple of people, either podiatrist and an osteopath, we've actually gone into their clinic where they have some of their clients come in so we go down for the day and just run, everyone gets an individual gait analysis. They're all out together and we go through that. We look at what's the good technique, do a lot of the theory, we look at some of the videos, what's good running, what's poor running. And then basically we do a lot of those individual exercises.

- Can you cover the whole country?

- Well potentially, if there's enough people in and it's worth coming down.

- Well we won't go into how much you charge for that service here, but it sounds like a useful one for people.

- Yeah, we don't mind traveling round. And for the practitioner's one it's something we were looking at to do. Now there are a couple of people running courses to train people to more in-depth gait analysis, and specifically from a running point of view. So we haven't got anything together, but if there's enough interest, I'm quite happy to put those on. That could be either one day or potentially two day where you're actually analyzing other people on the course. Not necessarily, you don't have to run to come on but we would need some runners on there for people to have a look at.

- Final question, is there a register of biomechanical podiatrists that someone can refer to if they don't want to do in-depth analysis themselves?

- No, it's a little bit tricky. I suppose you've just got to look on the Society of Podiatrists, it's under Feet For Life, is the website for that. And have a look, and everyone should be registered on there, and then you just have to contact them and see, basically. Our training doesn't take us to that point, it gives you a basic gait analysis type of thing.

- So this is advanced stuff.

- Yeah, if people have gone on and either done masters in this, or they're actually just in an environment where they're seeing a lot of runners. But if you've got people who are running, you really need to look at it then.

- Fantastic, we're well over time, but thank you so much for coming in.

- Okay, thank you.

- I'm hoping that you'll get lots of interest from our viewers and do a lot of good for their patients, but it's been really informative and we got a lot of good feedback already from our many viewers this evening, thank you again.