The Human Foot Was Built for Walking — Here's the Proof Transcript

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Introduction to the Human Foot

I am so excited to explore how perfectly, anatomically engineered the human foot is. We have low back pain, a side joint pain. Our rib cage is stiff, our neck hurts, we have plantar fasciitis, We sprained our ankle, whatever it might be.

You start to shift into this inefficient walking pattern. Hello and welcome to another episode of Root to Rise. My name is Dr. Amelie Spickel, your host.

And today we are talking about walking, but we're going to talk about the foot and how it's so perfect for walking. In fact, as I was getting ready to do this podcast, I kept thinking about this song, how these boots were made for a walking?

Well, guess what? our foot was made for walking. I know, totally cheesy, but I am so excited to explore how perfectly anatomically engineered the human foot is for bipedalism.

Now I did this in a webinar several years ago, I've actually done two iterations of it. The first one I was 10 years and I love going back and hearing some of these older topics that I explore, bringing them back out of the vault, re-exploring that, and that is what we are doing today.

And by understanding the power of human foot for walking helps you really understand kind of function, how to train it, where does pathology start to happen?

Where's that breakdown? And how do we navigate that or prevent it? So when you think about the human foot, the shape of the Human Foot, very, different from any other animal.

If we want to think of like a primate, a Primate's foot and a Human foot. And then we're to Think about The way that they move. Humans move in a very fascinatingly unique way.

It is called bipedalism. That is our upright posture and gravity standing on two feet with this fascinating structure in our feet and a fascinating in structure and our pelvis that we will explore on another episode.

But we have the skeletal system that is so perfectly engineered to stand upright, to balance on one leg and to take these nice, long, beautiful steps into bipetal.

Now the human foot, the shape of it is called plantar grade, a planta grade foot. You have your foot tripod with these long, straight, flat toes. you are on that tripod underneath your first met head, fifth met, head heel, lifted arches, and you're stacked on the structure.

It is perfect for walking.

Bipedalism and Foot Anatomy

Now, when we think about bipedalism, there are certain requirements that we need to be able to achieve to walk the right way and to support movement longevity.

That is going to the ability to stand on one leg. And if you think of the human foot, it is perfectly engineered for single leg stability from that tripod and that beautiful weight distribution to toes that are long, straight and active into the ground, for standing and balancing.

Second is we have to take an optimal step. Each step that we take is evolutionarily designed to be long enough to

essentially access sufficient walking strength.

Now, in order to do that, this beautiful plantar grade foot has to able to rock forward into a high heel position. It actually happens to called a rigid lever, ankle planar flexed, toes extended, and that position of the foot, again, rigid leaver, high-heel position behind our hips, allows us to take long steps.

Another requirement in human bipedalism is that our foot has to be engineered to absorb impact. And when we walk, we are taking up one to 1.5 times our body weight in energy at foot contact.

When we run, were experiencing three to four times your bodyweight in impact. And one we jump into different dynamic movements that is more ballistic, eight to 10 times, actually some gymnasts will experience 18 times their body weights and that foot is perfectly designed to handle it.

And then finally, of course, in addition to that long step, we have to be able to go forward. So not just a step but a propulsion, so forward propulsion.

Okay, now when you think about the way that we walk, our mechanical goals of modern bipedalism. are designed with long steps, with optimal transfer of energy or impact forces, and minimal stress to your soft tissue system.

That is ideally how we want to walk. To unlock your movement longevity, you need to be able to do that long step, absorption of the energy, transfer energy and minimum stress the system As we start to break down, we have low back pain, SI joint pain.

Our rib cage is stiff. our neck hurts, we have plantar fasciitis, or we sprained our ankle, whatever it might be, We start to shift into this inefficient walking pattern.

And it actually becomes quite primal. So any of a breakdown, any form of breakdown in our bipedalism, this perfect bipelism gate pattern, as it starts to unravel, you of course are going to get joint stress, which leads to wear and tear of the joint services, premature formation of osteoarthritis.

You get a limitation in joint mobility which just feeds into this further reduction in optimal gait. But this is what starts to happen. We start to get a narrowing of our step length.

And of course there's research that shows increased morbidity and mortality as your walking speed goes down. We start to bend at our hips, we kind of break at the hip and we bend our knees.

Think of a very stereotypical older individual walking, they're kind-of crouched down they're walking. That's what we start to notice and then there's a forward lean of the chest because you are trying to essentially make yourself walk faster by falling into your center of gravity.

These are strategies that people will take subconsciously without even realizing that they are doing it. And then what's interesting If you compare a primate to a human, primates walk in the way that a humans starts to lose that optimal.

So aging gates starts look almost primal. is that they're going to stand, crouched over, hips and knees flexed, short little steps, almost shuffling. They have a very slowed walking speed and they are leaning their chest forward.

So it becomes very, very similar in that movement pattern. And I'm very fascinated in some of the similarities between primates and humans. Again, just for a fascinating exploration.

And, I want to share some these interesting facts with you now. Think of it as an anthropological exploration into some similarities that exist between a primate and a human.

Arches, Foot Posture, and Energy Transfer

first one is that we have all of the same bones. So all the bones found in the human foot, you can find every single one of those in a primate's foot including the sesamoid which are two little bones that sit underneath your first metatarsal head around that big toe joint.

The flexion lines of a primate's foot, so the flexion lines are the creases in the palm of the foot. And those on the primates match that of an newborn baby, which is pretty cool.

Foot arches in a human were developed during and for ambulation or walking. So our arces unlock Bipedalism. The only muscle that is found in the primate foot and is not in all human feet is called plantaris.

This is like foot to trivial pursuit for you, okay? So your plantaris muscle, this is a deep muscle in your posterior compartment, it sits with your gastroc and your soleus, which are your calf muscles, goes down and it's a very thin, thin thin muscle actually in a lot of people.

It is just a tendon sheath. You actually don't see any muscle or tendon anymore. You just find the sheath of the tendon that exists and goes down. But that is the only muscle and that's in a primate that not in all humans, which I find interesting.

Now the muscle that found in the human foot and not any primates foot is called peroneus tertius. Peroneous tertias is a muscle found on the front of your foot, front your ankle.

and it runs down and inserts on the outside top of your foot. And the purpose of the Peroneus Tertius is that it lifts your feet up when you swing your leg through so that your foots does not sickle.

It's an important muscle. It keeps your foot flat as you're swinging that leg through when you are walking. So to me, that demonstrates that the human foot is perfectly designed for bipedalism, where a primate's foot isn't.

Primates are quadrupedal. Now the interossei, which are these small muscles in the bottom of the foot, they actually shifted to be a little bit more parallel to the metatarsals that furthers MPJ function.

MPj function ties into the rigid lever, that's how you push off. And then the flexor hallucinus brevis which sits underneath the big toe, has two bellies in an adult, or in a human, and one belly in primate.

So again, it's just showing and reinforcing that our foot is perfect for bipedalism. Now, I had already mentioned that the human arches are evolutionarily designed for bipedalsm, for upright stance and for BIPEDALISM, and this ties to what I call foot posture.

All of us have a certain type of foot posture, that is your foot alignment when you are standing on two feet in gravity. And your feet posture dictates the rest of your skeletal alignment.

So foot postural will influence total body posture. This is where all of my programming begins. When I work with a patient or an athlete, an individual, I teach them first, what is their static foot-poster currently?

How do you rotate your foot into a strong stable foot posture? And then how do we strengthen it to maintain that? Now this foot posture, one of the key characteristics of it is that it has arches and we have three arces in the human foot.

You have a medial longitudinal arch, you have lateral longitudinal and then you have a transverse arch. Those three arches very very unique again to a plantar grade foot, the human foot.

Primates do not have arces like this, they do NOT have the longitudinal arch and they DO NOT HAVE THE TRANSVERSE ARCH. There are very important muscles that insert and pass under those arches to keep them lifted.

Of course, we want to have a lifted arch and those arch is actually connect to your pelvic floor. So an important part

of upright posture and bipedalism is a stacking of your skeletal and your fascial domes.

That first arch in your foot is lifted by a muscle that's called your posterior tibialis. And we activate the posterior to be Alice through short foot exercise.

Short foot, is an anchoring of you toes into the floor. and a contraction of those intrinsic muscles, activate the posterior tibialis, lift, arch of foot.

Posterior tibilis runs through your lower leg, inner thigh, into your pelvic floor, and you are going to lift the pelvic at the same time as activating your posterior.

So that stacking of the arches is critical to how we stand and how walk in gravity. Very, very important to our evolution. Now, the second one has to do with the transverse arch.

And the Transverse Arch allows us to roll forward into that rigid lever position. It is created by what's called a metatarsal declination. The met- metatasals are angled at a very specific degree.

it's a 15 degree declina- tion. So you have a fifteen degree declin- ation of your metata- sals and you calcaneal inclination creating that beautiful shape of the human foot.

That declination of metatarsals allows a lifting off of your metatal heads. Now this is important Because when you understand that the human foot was designed to hold your body weight statically and dynamically, but it was design to holds your weight fashionly, unlocks how we look at the story of human movement.

We are not designed be standing like a brick of bones and very passive. So we're not sitting on our feet, just like we are not hanging on a skeleton in gravity.

We are continuously lifted. and the lifting of your longitudinal arches and your transverse arch and entire foot posture. Again, we've already said that this is a fascial response that connects your pelvic floor.

So you are evenly distributed across that tripod, across those toes. And then that allows you to actually unlock the next element of bipedalism, which is energy transfer.

So we have to be able to absorb the energy from the ground and release the Energy from The ground. And the way that that is unlocked is that, that beautiful arch that I just spoke about has to compress.

If you don't have an arch, you have nothing to compress. So the ideal foot for optimal walking has to start with an Arch. Compress the Arch, load your fascial system, release and lift the arch energy and the catapult effect.

You load and you release, and that is the dynamic nature of your facial tissue and what is often referred to as an Archespring. that ArchSpring allows you again to catapult the energy forward.

And it is that absorption of the Energy that unlocks the optimization of forward progression. Because guess what? When you walk, the whole purpose of walking is to get somewhere.

So we want to make sure that we are able to achieve that beautiful lever position and you have enough energy absorbed to release it and catapult it so it's a little bit biomechanical and a bit myofascial.

And then that helps us unlock that optimization for human movement and movement longevity. So again, I want to go back, make sure we're all here touching the same base as far as the fascinating perfection in the human foot for walking.

Our ability to stand on one leg, tripod, toes long, straight and flat, lifted arches, stacked foot postures, skeletally goes into the rest of the body.

You access then a myofascial sling between the foot muscles and the pelvic floor, so you are lifting and saying hello to gravity. Second requirement for optimal walking is going to be that absorption of energy or impact forces.

Training Balance and Arch Support

That is your foot as a dynamic structure that is contracting and relaxing, and that contracting, relaxing is through the 26 muscles in the bottom of the foot.

As it contracts you absorb the energy through that arch compression. which is potentiating your fascial system and then you roll forward into that rigid lever which allows you to access forward progression and the catapult effect or the energy is released.

That is ideal. Ideal. Thats how we were designed and unfortunately thats not how a lot of people move. Because what starts to happen is we start to lose this powerful evolutionary position of the foot and the function of foot, and we started to loose our arches.

We become sensorily disconnected. Your intrinsics are atrophying. Soon you have hammer toes and bunions and flat feet. And now we are just shuffling our feet through every step and not moving the way that we were actually designed.

And that is where we need to understand how to start to get back to that optimal foot posture and foot position to therefore unlock the ideal walking speed and movement longevity.

So on this, we need to understand how to go back and set our base, how do strengthen the intrinsics, How to lift those arches, coordinate your feet and your core, and how support that rigid lever position.

So in this, what we want to make sure that we are doing is understanding as a first step, how do you set your base? Setting your bass, as I mentioned, is always your first set.

You are lifting your toes, you are feeling your foot tripod, first met head, fifth met heel, spread those toes as wide as you can and place them back down onto the ground.

From there you're going to slightly rotate into your hips, which is going lift those longitudinal arches. And then to activate your transverse arch, you are going connect the tips of your toes into the ground.

The way that you connect those toes to the floor is through an exercise called Forward Lean. That forward lean I've taught or mentioned on other episodes.

with you standing nice and tall and then just going to ever so slightly sway forward and back. That is you activating your toe flexor reflex. You are now in an optimized planta grade position.

Now, if you cannot hold your arch up, because you have some sort of ligament laxity, maybe there's a tear in the tendons, extreme muscle weakness, then you want to use some kind of arch support to hold you foot posture in an ideal position.

And that foot position held, I would recommend using something like the Noboso Form, which has the texture on it, so you're not using a passive structure.

A passive structure is going to cause further atrophy and denervation. So we want to make sure that we are focusing on that. Once you have that ideal position, now we're going into your first of the three requirements, building better balance.

This is through focusing that toe position and that toes strength. Toe position, using toe spacers if you need. If you have bunions or hammer toes, you want to make sure that you are using two spacars when you were training the foot.

And you're training a foot with those toe-spacers on. Forward lean we already discussed. Other great exercises for improving balance is, of course, your going to transition into a single leg.

But as we balance on that single-leg, we want make that your foot is coordinated with your diaphragm. So every time you push those toes down, you're going to exhale and you are going lift the pelvic floor muscle.

We are stacking the domes in our system, making us primed for gravity. You are then going to incorporate different exercises on something like the kinesis board, but the entire time you are remembering, maintain foot posture, keep those arches lifted, and keep your toes engaged to the floor.

That is going support the balance. For the energy transfer, And this is again through the intrinsics, but the way that I recommend this, is by introducing more dynamics.

So this where you can do more dynamic movements, such as small hops. And every time you hop, you want to make sure that you are actively engaging your foot.

One of my favorite exercises, if you had a small step, so a aerobic step type setup, and you're stepping off of the aerobics step and your stepping down onto the floor, you are going to go ball, heel, as soon as your heel touches the ground you want to activate your toes.

And that activation of your toe is kicking on the isometric contraction. So ball heel and toes contract, but this is all happening simultaneously. The contraction of your toes activates the isometrics in your foot, which is going to damp or absorb the impact forces.

And then those impact courses get stored in you fascia as energy. So the step downs, again, one of my favorite ways to do it. Step down, engage, step down engage.

Push-Off Mechanics and Achilles Tendon

Again, mention that you could do a small hop, you can do something like jumping rope, but I like to really emphasize the jump and then the engage so if you did a jump rope you would want to swing the rope jump, and land on both feet and contract them.

and then do another single rep and contract your feet and hold it. So you are really making conscious the foot contraction through the toe activation.

And then this can become a little bit more dynamic, such as bounding. When you're doing bound, you hop, land, engage the feet, hop land engage, the foots you doing these small micro movements.

The final one that is focused around forward progression, again, you have to be able to maintain those arches and that foot posture. You wanna make sure you of optimal range of motion through that big toe joint and plantar flexion of the ankle, so that's important.

But one thing that I see in my patients when it comes to forward progressions is that they lose the ability to fully stabilize the rear foot as they lift the heels.

Now to do this, one great test that everybody can do, not now if you're driving, but if your at home or you are in a place that you can stand, is if stand next to a desk or a wall, lift one leg so you were balancing on one foot, and then you going to try to doing a single heel raise.

And then lower back down. And then do that a couple times and lift all the way up. How high can you lift on a single leg, on his single heel raise, and then lower back down.

And, then, of course, to the other side. So do your left side balance. Make sure you're not leaning on the table or the wall, but very lightly, just for balance, And lift that heel as high as you can and go back.

Now, a Single Heel Raise is by far one of the most functional foot movements that you could do. It is how you take a step. We aren't doing both legs at the same time.

It's still inherently built around that ability to stand on one leg. You're standing on a leg and you are lifting your heel to become a rigid lever on your one.

If you cannot do a single heel raise, you will not be able to walk the way that we evolutionarily designed to. You will also not be able to walk fast enough.

So that is really important and what I want you to work towards. A great exercise for training the push-off position or the rigid lever is if you take a ball like a narrow ball, lacrosse ball or tennis ball.

and you're standing on the floor next to a wall again, because it's not a balance exercise, take the ball and put it between your heels. And now the balls on floor between you heels and your going to spread those toes as wide as you can.

Slightly lift your heel, squeeze your heals together into the bowl and just hold that and squeeze. Just doing that you are activating your posterior tibialis.

And by holding, holding holding 10 seconds and then come back down, you're waking up that muscle. Remember, it is your posterior tibialis that lifts your medial arch.

It's your posture tibi Alice that actually allows you to do a single heel raise. Your posture, your, uh, posture to be Alice is also connected to your postural pelvic floor, which is how we stabilize the pelvis and the glutes for bipedalism.

So, we've done that a few repetitions, stay exactly as you are, keep those toes spreaded. This time, when you lift the heels, squeeze the heel into the ball.

I want you to lift, lift all the way up, and at the top of the exercise, I wanna you tuck your heels under the balls. And then you're going to make your ankle straight and you are going lower back down.

So as you do this, as your lifting and tucking your heels under the ball at the top, you should feel this powerful spiral that happens in your legs. And as as lower down you get the opposite spiral as we lower it back.

If this is not clear to you, I have videos on YouTube about it. This is called, on Youtube, ball between heel exercise. So if you put ball-between-heel and then put my name, you will see this exercise and it is one of the most powerful exercises for training the rigid lever position, that's that push-off position.

but it's also one of the most powerful exercises for training that muscle, posterior tibialis, that allows us to do a single heel raise. So your ability to access that power of a single heel raise can be optimized through that exercise.

That's one of my favorite, favorite exercises. Of course, you eventually start to coordinate your pelvic floor and your breath in it. Very powerful. Now, if you happen to have hammer toes and bunions, You are doing that exercises with your toe spacers on.

We always want to make sure that we are optimizing those toes, the toe alignment, and those MPJs for optimal push off position. Now, if you do not have the ability to roll through that big toe joint, If you have a bunion, you may start to turn your feet out.

And then that changes the way that we were designed to walk. You start shift into what's called a low gear push off. A low-gear push-off is a turned out foot position where you are walking and you're pushing off of the insides of your feets.

that is not an optimized gait pattern. That is one that I often describe as having a energy leak. It is going to be

someone who's going present by working harder than they actually need to working.

We do not need be working that hard. Ideally, it's called a high gear push off. A high-gear push-off is when you are in that straight alignment and you're pushing through those MPJs and shifting forward.

Now the one last structure that I want to talk about which is really unique to the human and allows us to walk the way that we do and actually run the we that do is our Achilles tendon.

Why Foot Function Matters for Longevity

The Achille's tendon which the largest strongest tendon in the body is formed by the calf muscle, gastroc and soleus, and some people plantares will come in there, but your calf muscles gastroxolus are coming down into the Achilles tendon inserting onto the heel wrapping around the heal and becoming your plantar fascia and then your planter fascial goes all the way forward splitting into five tips and inserts onto It's a very long tendinous structure that is important to energy transfer.

And remember, that was the second requirement for human bipedalism is our ability to absorb and release energy. Transfer. Now Achilles tendon, largest strongest tendon in the human body, this is where most of our elastic return comes from.

The second structure where you get the rest of the elastic returned is your plantar fascia. So it is the arch compression, plantarfascia, with the loading of Achille tendon and the way that your Achile tendon is loaded is through ankle dorsiflexion.

So when we walk, you imagine someone walking, the points during the gait cycle that someone is loading their Achilles is when their leg is behind them, heel is all the way on the ground, and they are in a maximally dorifluxed position.

That is called late mid stands when the leg is behind heel down maximally dorsiflex. I consider this the point of peak potential energy because you are priming your Achilles tendon.

Now that stretch of that Achilles tendon is putting all of the energy, you're like pulling that bow and arrow back and you are about to release it and then when you pick up your foot into a lever position, your starting to released that energy.

So you roll through that foot very quickly. It is actually referred to as the catapult effect. And this catpult affect interestingly was studied in kangaroos.

Kangaroas have a fascinating ability to jump very very far on an itty bitty foot and therefore there's a lot of comparison of the kangaroo tendon and the human Achilles tendon.

And just isn't that fascinating that for our biomechanical structure and some of our height that we are able to run, jump, do all the fascinating dynamic movement the way that And a lot of that has to do with the Achilles tendon.

So again, that energy transfer really, really important. So if we bring this back together and we think about the fascinating ability for a human to walk the way that we do, how come primates can't walk that way we that do?

What's going on with their foot structure? what's unique about human footstructure? And how do we start to see certain pathologies that cause a breakdown of that ability of an optimized gait pattern?

To walk fast enough and to support movement longevity, you have to be able to protect the human foot posture and the Human Foot Function, which is tied again to being a tripod with three arches and long straight flat toes.

That structure allows you to balance on one leg, absorb energy, and become a rigid lever for forward propulsion. if you start to lose the tripod, if your arches start fall, If you get a flat foot, you if get bunions and hammer toes, and

you lose your ankle joint mobility, your intrinsic atrophy, now we start break that perfect foot structure and our ability to walk the way that we were designed is not possible.

Therefore, what do we do? We turn to artificial devices to help us walk the right way. We turned to shoes. And in many cases, those shoes contributed to the breakdown of that optimized foot posture in the first place.

So it's a fascinating catch-22 that we find ourselves in. My goal as a functional podiatrist is to educate you to understand First, what is the ideal human foot posture and function as a baseline to unlock walking speed and movement longevity?

Once we understand that, how do we maintain it? What are the exercises that we do? What is the recovery that? We do what are different devices such as toe spacers and foot wedges and things that.

We could use to help maintain and keep us at that ideal foot function. And then if as a last resort, we need to turn to any of these shoes, then maybe we.

To turn that, but we are always trying to stay as close to that optimal foot. Function as possible. Now, many of these different exercises on YouTube, I know that I was saying and talking out a lot of this, so sometimes it's difficult to visualize what we might be doing.

So, definitely head to YouTube and search my name. Under my practice, Dr. Emily Spickle, lots of videos, programming, workouts, any of the Noboso products, all of them have videos that are supportive and show you how to use the foot wedges, how do you use a kinesis board, the toe spacers, and how can we continue to focus on and push towards this ideal foot posture and foot function to again maintain that ideal walking pattern that we were evolutionarily designed to maintain.

I hope that you enjoyed. I heard that. You learned a lot. Continue to explore and remember that this journey in healthy feet for movement longevity is a lifestyle.

Consistency in all of these exercises is key and it will truly help you unlock that longevity.