FASCIA

IN SPORT AND MOVEMENT

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CHAPTER 17

Elastic walking

Adjo Zorn

Years ago I used to think of walking as a chore, much like doing the dishes. Until recently, walking was one of the main physical activities necessary for survival. So I thought that in this day and age we could count ourselves lucky that this was no longer the case. But then I happened upon a curious conjunction of apparently unrelated and disquieting facts that led me to examine the science of walking. Those facts were as follows:

- The cause of back pain is completely unclear in eight out of ten cases (Deyo & Weinstein et al., 2001) (Kendrick et al., 2001).
- There is a large and strong anatomic structure in the lower-back region, the elastic lumbodorsal fascia, which is consistently ignored by the multi-million dollar back-pain research industry (Tesarz et al., 2011). Until very recently, there was little indication as to whether or not this fascia could cause back pain (Taguchi et al., 2009) (Tesarz et al., 2011).
- Although this structure acts as the tendon of the latissimus-dorsi muscle, and thus directly connects the arms and legs, it too has generally been ignored by biomechanics researchers studying human movement.
- Gait analysis, the term for the science of walking, analyses different walking patterns only as pertains to certain clinical cases, such as in the use of prosthesis, certain forms of paralysis or Parkinson's disease. Gait analysis has paid little attention to the walking patterns of healthy people, which are as unique as their handwriting.
- It is almost a tenet of gait analysis that walking, as opposed to running, is an inelastic, muscle-driven pendulum movement (Alexander, 1991) (Sawicki et al., 2009).

I began to wonder whether some people walk 'incorrectly' and develop back pain, while others walk 'correctly' and don't experience any. In addition, I began to wonder whether those who walk 'incorrectly' actually fail to use their 'big' fascia, while those who walk 'correctly' use the fascia and thus maintain its elasticity (Jackson, 1998) (Burton et al., 2004).

With my background in mechanical engineering, I came to realise that the lumbodorsal fascia is excellently located. Given its elastic properties (Chapter 10) (Maganaris, 2002), it should actually function as an effective engine for walking. Being a Rolfer, I have the opportunity to observe many lower backs on the treadmill. Unfortunately, in most cases I can hardly detect any internal movement in the *lumbodorsal area*. This was very different in certain parts of Africa. In remote villages in Zambia and Ghana, people displayed quite a lot of movement in the area of the *lumbodorsal fascia*. There, the daily struggle for survival requires a great deal of walking for adults and children alike. In Europe, on the other hand, natural walking has become practically superfluous at work, and has fallen out of fashion as a leisure activity. We drive cars, ride the subway, go to the gym, cycle or jog. But hardly anyone simply goes for a walk.

This is where I would like to make a contribution towards a new understanding of walking. Not only is walking, besides running, probably our most natural way of moving, the one that most closely corresponds to our body structure, but it can also be a dynamic form of meditation, that is to say, walking can easily combine movement and contemplation. Now, while it is true that almost anyone can lumber around or shuffle their feet, I believe that walking 'correctly' is actually a great challenge.

My hypothesis is that to walk 'correctly', you need to walk 'elastically'. For this reason I have, in recent years, sought to understand natural walking from two different angles. On the one hand, I have used the exact mathematical principles of Newtonian mechanics to calculate a computer-based model of walking as an elastic operation (Zorn & Hodeck, 2011). On the other hand, I have gathered empirical experience from showing my Rolfing clients how to walk elastically. Both approaches have made it clear that elastic walking entails very precise coordination, that is to say, it requires the right amount of force to be applied at precisely the right time, much like the force that is needed to keep a child's swing in motion (Chapter 10).

In terms of the laws of physics, movement on an even surface does not require energy. If it were not for friction, a body that was set in motion at one point in time would continue rolling or sliding indefinitely. The same goes for a bouncing ball

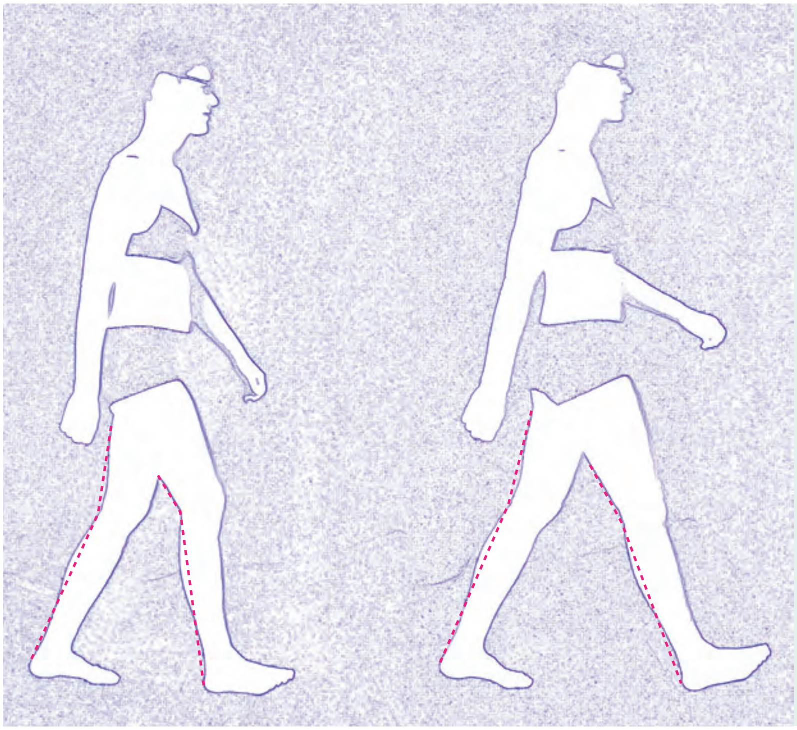

Figure 17.1
Two different ways of using the knee in the stance leg

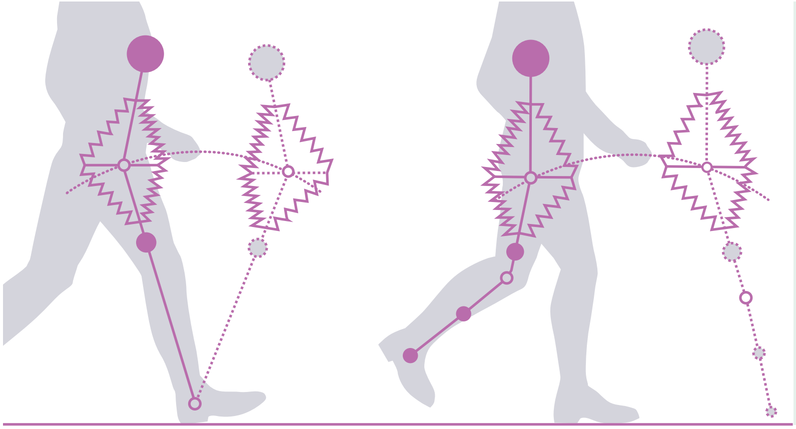

Figure 17. 2

The elastic springs of the hip pull the stance leg up, act as a brake as it drops down, maintain the balance of the upper body, accelerate the swing leg and brake its movement again. (The circles symbolise the body's centres of mass.)

or a jumping kangaroo, both using elastic springs in which, for a short moment, energy is stored and then re-used. My hypothesis is that this very principle may apply to a walking person. However, just as the air pressure in a bouncing ball has to be just right, the fascial springs of a jumping kangaroo and a walking person need to have the appropriate amount of tension (Chapters 1 and 10).

A muscle is mainly comprised of one part, containing the contracting fascicle, and another, containing the tendon. The right tension can be achieved at very low energy cost if the muscle fascicles contract in a way that they maintain a *constant* length while the connected tendon (and further fasciae) can change their length, stretch and recoil (Fukunaga et al., 2001). In other words, the elastic tendon does all the work, at almost zero energy cost while the fascicles just maintain a kind of initial tension, at very low energy cost. Please note that this process should not to be confused with a muscle acting isometrically as a whole, where the fascicles and the tendon *together* maintain a constant length (Chapter 10).

In what follows I set out some advice to help readers to explore elastic walking. Of course, learning movement out of a book is a questionable endeavor. Therefore, I ask that you view this as an experimental proposition. (For a theoretical discussion hereof, see Zorn, 2011.)

1. Walking with straight legs

Humans are the only animals whose stance leg can be straight like a column while walking (Sockol et al., 2007). The rotation of this 'column' around the ankle is what produces the typical up-and-down motion of the torso in human walking, a motion that is also unique in the animal kingdom. Admittedly, nowadays many people tend to walk with slightly bent knees, thus preventing any elastic stretching, a problem that is only exacerbated by the current trend that favours standing with bent, supposedly 'relaxed' knees (Figs. 17.1 and 17.4).

If the back leg is properly extended in the final stance phase, then the psoas, rectus femoris and the triceps surae muscles, along with their fasciae are stretched and loaded. When the stance leg starts to become the swinging leg, these muscles recoil and unload, thus accelerating the lower leg forward like a slingshot (Ishikawa et al., 2005) (Schleip, 2013). In the final stage of the swing, the swinging leg, *if* it reaches complete extension, comes to a halt due to the stretching of the gluteus maximus muscle and its fasciae, especially the lumbodorsal fascia and the iliotibial tract (Fig. 17.2). Incidentally, this explains the oblique and almost horizontal direction of the gluteus maximus fibres, something that makes little sense for a hip extensor in the standing posture (Fig. 17.3).

After the heel strike, this same stretch pulls the weight of the torso upwards onto the new, rotating stance leg. After the mid-stance position has been reached, the downward fall of the torso stretches the psoas, the rectus femoris and the triceps surae regions once again (Fig. 17.2).

In terms of physics, the potential energy of the weight of the falling body is transformed into the energy of a stretched spring: the psoas and gastrocnemius gently catch the body weight. The elastic energy is then converted into the kinetic energy of an accelerating flywheel: the psoas and gastrocnemius propel the lower leg upwards and forwards. Subsequently, the kinetic energy is transferred into elastic energy again: the glutmax and the iliotibial tract cause the swinging lower leg to brake. Finally, the elastic energy is transformed back into potential energy: the gluteus maximus and the iliotibial tract lift the body weight upwards, via the hip.All of this only works if the knee of both the stance leg and the swing leg, in its final phase, is straight (Zorn & Hodeck 2011).

2. Take long steps

The stretches described above are only possible if you take long steps (Fig. 17.4). Make your stride as long as you can and observe how your pelvis then rotates in the horizontal plane, stretching the fasciae in your lower back (Figures 17.2 and 17.3). Don't forget to keep up a brisk pace!

3. The centre of the heel

Most often, people carry their weight on the outer edge of their feet. Unfortunately, some trainers and therapists even recommend this. In my opinion, to achieve dynamic-elastic walking, you really only need to use two points of the foot (see CH and BT, Figure 17.5) and, in between those points, the elastic anti-shock arch with the plantar fascia on the medial side of the foot (Ward et al., 2003)

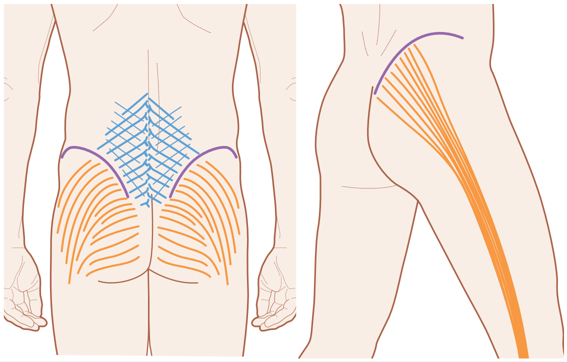

Figure 17.3

The smooth fibre extending from the lower leg to the lower back.

Figure 17.4

Walking in Ghana: long steps, straight knees, upper bodies forward.

(Roux et al., 2009) (Inman et al., 1981, p16). The foot then rolls up exactly at those two points CH (leg forward) and BT (leg back). In order for the heel to touch down precisely *in the middle* (at point CH), a 'centre-of-heel' awareness is needed (Figs. 17.5 and 17.6). You need to feel this point while walking (see also Chapter 15).

It may be the case that the outer edge of the foot is only important for balancing on one leg, like the training wheels a child uses when learning to ride a bike.

4. Pressure with the ball of the foot

At point BT, and only at that point, there is a sesamoid bone that can function like a ball of a ball bearing. When your stance leg gets close to its furthest back position, try pushing down and towards the back, with your *knee straight*, on to the main joint of the big toe, as if you wanted to make the earth roll away. What you would actually do is give yourself a push forward but the first description works better in terms of imagining what you have to do. This way, you roll off exactly on the sesamoid bone and stretch the triceps surae region. Interestingly, the stretch of the gastrocnemius muscle, with its sling shape around the condyles, then helps to prevent over-stretching of the knee.

5. Carry your pelvis

As a general principle of human posture, bones are not usually balanced on top of each other around a central axis. Rather, they form hook-shaped units that are suspended in tension through muscles and fasciae (Chapter 1). If you fell asleep standing up, for instance, your head would drop forward and then your knees would buckle because the neck and calf muscles would lose tension. An alert human poise requires steady tautness in the body. In terms

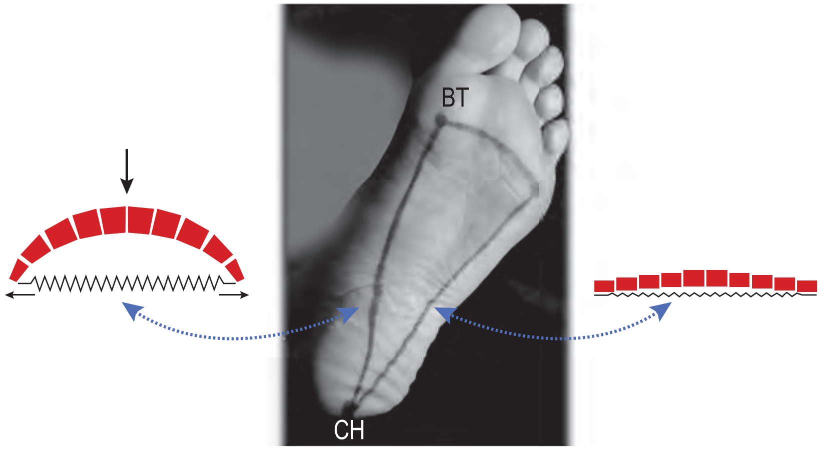

Figure 17.5

The elastic anti-shock structure is located on the medial side of the foot.

of evolution, this can be traced back to the fact that it was probably more beneficial for early humans to react quickly in case of an attack by a predator than it was for them to be able to stand around in a cool, energy-saving pose. Nowadays, people can afford to be lazy and outsmart this dynamic tensional principle by lounging in their ligaments. For instance, some people sink into locked knees instead of standing in a posture of active balance. Less obviously, the pelvis too needs to be actively balanced with certain tautness (Rolf, 1989) and 'the passive part of the lumbodorsal fascia requires the reduction of lordosis in order to become tightened.' (Gracovetsky et al., 1987) (Adams et al., 2007) (Chapters 13 and 14). Instead, many people let the front of the pelvis drop down, lock the lumbar vertebrae, buckle the vertebral column, and disable the lumbar fascia (Adams, 2001) (Smith et al., 2008). Unfortunately, there are many alternative movement or posture teachers who continue to promote this posture by telling their students: 'relax your belly!' Similarly, some physiotherapists regard the rectus abdominis muscle as being 'superficial' and therefore automatically assume that it is generally over-activated. In my opinion, the rectus abdominis muscle is often too inactive (Porterfield & Derosa, 1998), sometimes along the oblique abdominal muscles, not only among those with a 'relaxed' belly but also among bodybuilders with impressive but rigid six-packs. In fact, this large muscle should *pull up* the pubic bone with agility and, thereby, adjust the balance of the pelvis and fine-tune its position with respect to the quickly changing forces during movement (Fig. 17.7, Arrow A).

Furthermore, this muscle should form an elastically tensioned abdominal wall (McGill, 2001) that functions as a partner to the diaphragm for breathing. This should not to be confused with sucking in the belly. 'The importance [of the rectus abdominis] in erect posture is universally recognised… True strength is not hardening; it is resilience, adaptability, stability. It is characterised by elasticity' (Rolf, 1989). Currently, some readers probably feel that the role of the rectus abdominis muscle is overvalued and that I miss proper mention of the transversus abdominis muscle. Please keep in mind that the main focus here is not on stability but on elasticity.

Figure 17.6

Effective use of the elastic structure of the sole requires the correct placement of the heel.

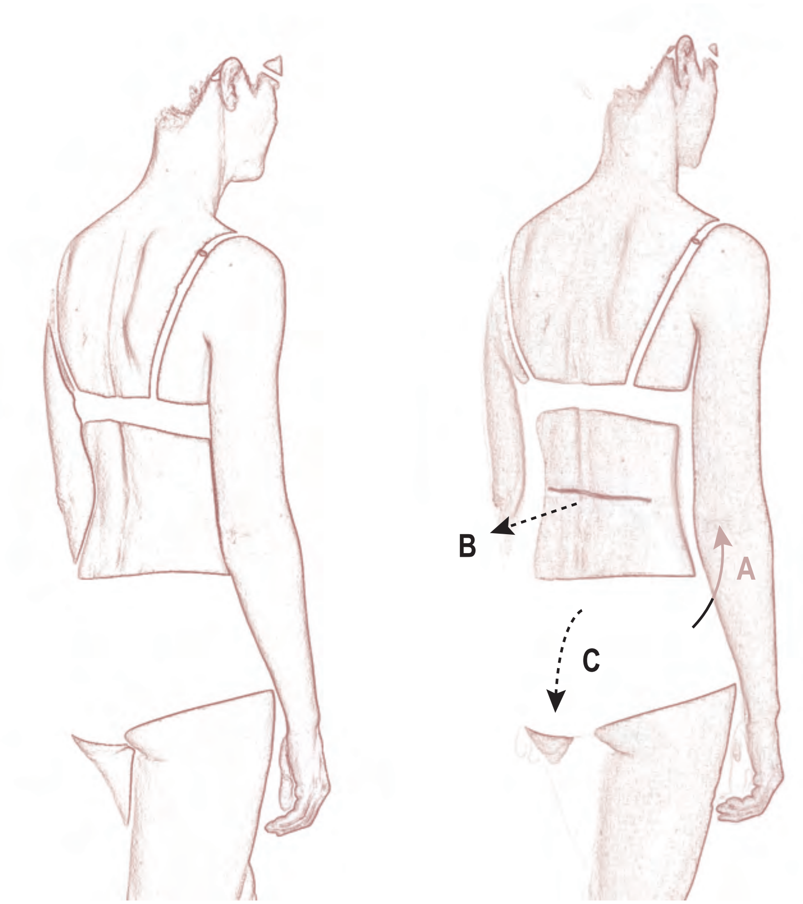

Figure 17.7

Balancing the pelvis and stabilising the lower spine for people who otherwise let the pelvis drop in front.

Arrow A: Carrying the pelvis at the pubic bone.

Arrow B: 'Waistline back!' (Ida Rolf). Making sure the vertebral column does not buckle.

Arrow C: Dropping the sacrum. Stretching the lumbodorsal fascia.

If your usual walking style includes short steps, a dropped pelvis, and a hollow back, then your hip flexors have most likely not developed the range of motion necessary to carry your pelvis as described above. Reconditioning the hip flexors through stretching by undertaking elastic walking will probably take effort, determination, and patience but will eventually pay off.

6. A sideline: Elastic breathing

This is not actually a part of walking but it is essential in terms of having an elastically tensioned abdominal wall. Diaphragmatic breathing has a great impact on the autonomic nervous system and on stress-related conditions. Elastic breathing is not possible when the belly protrudes forward flaccidly, due to a lack of rectus abdominis tone as described above, or when the belly is sucked in, through a shortening of the upper transversus abdominis muscle. Equally unhelpful for elastic breathing is a six-pack, if all that it does is look good but is actually rigid. In elastic breathing, you feel the stretching of the tensioned abdominal wall every time you breathe in. In the give-and-take of breathing, the rectus abdominis muscle and the diaphragm behave like strong, rhythmic dance partners cradling the internal organs in their movement (Chapter 12).

7. The pinnacle: Letting the sacrum drop

This is possibly the most difficult part of my whole proposition. If the long muscles and fasciae in front fail to do their job of stabilising the spinal column, some short muscles in the back then get involved as a kind of emergency back up

(Bergmark, 1989) (Reeves et al., 2007). This creates a paradoxical situation. These muscles become overactive and, sooner or later, overloaded in a region which is already too short: the over-lordotic lower back.

People in this situation may easily be able to relax the lumbar muscles if they bend forward to tie their shoelaces but they may not be able to relax these muscles at all when doing a physical activity. This situation is not uncommon among

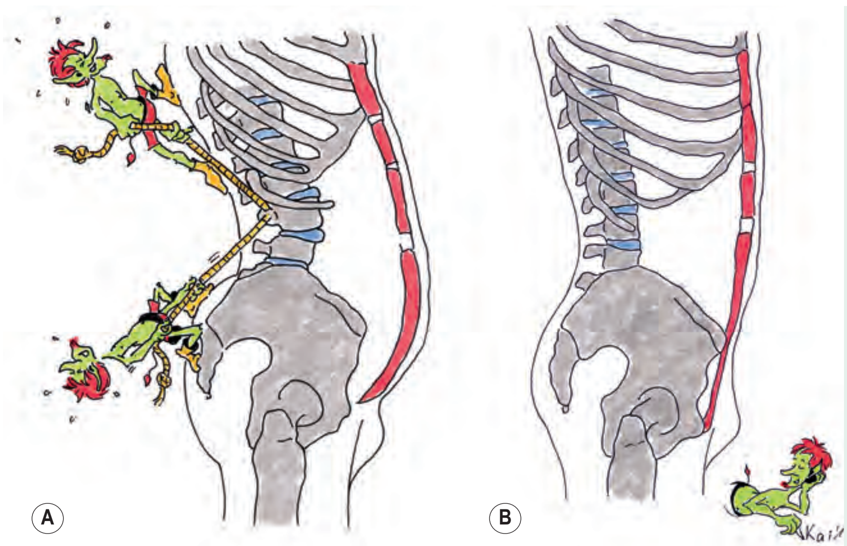

Figure 17.8

If the front muscles allow the spine column to buckle, some of the muscles in the back have to work very hard.

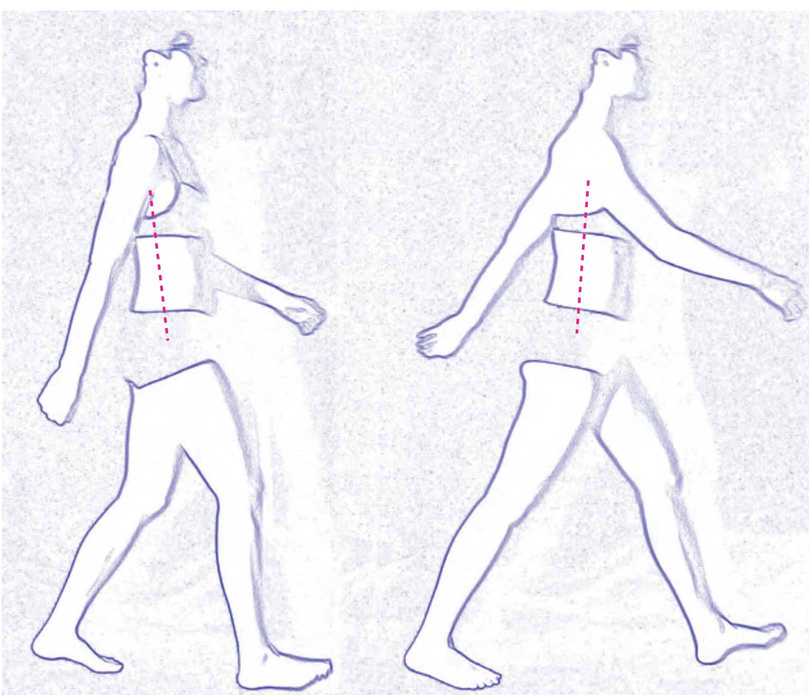

Figure 17.9

To walk energetically, the upper body needs to bend forward slightly.

professional athletes and dancers with lower back pain. What people in that situation need is the ability to relax their back muscles, i.e., to let the sacrum bone drop down while performing a forceful physical move (Figure 17.7, arrow C). The ability to carry out such subtle, fine movement is also absolutely necessary in terms of being able to balance the pelvis and to walk using the elastic fasciae in the back. It is, of course, impossible to teach this 'intellectually' but, according to my knowledge, the techniques of Tai Ji Quan come closest to such training (see also Chapter 15).

If the elastic fasciae in the lower back are able to stretch and recoil in walking, a wave-like motion swings through the spine and the lumbar vertebrae. Thus, all fascial structures in the lower spine stretch appropriately and have little reason to develop pain.

8. Move your upper body

Although traditional gait analysis regards the upper body as a mere 'passive passenger' (Perry, 1992), I think that the elastic fasciae of the lower back are there to be used in walking. For this to happen, the fasciae need to have a healthy level of tension, instead of being crumpled. For dynamic elastic walking, the lower back needs to be elongated in a certain way. This means the upper body should have a slight forward tilt. This forward tilt will likely feel quite odd at first, as if you might fall forward, and often causes people to look downwards. Look towards the horizon instead (Fig. 17.9).

Figure 17.10

Walking in Ghana: using the arms.

9. The arms are important too

While you are walking, let your arms swing backwards much further and more vigorously than usual. If the arms swing far enough and the legs make the long strides, described above, then the pelvis and the upper body will show torsion movements and merrily stretch their fasciae. Furthermore, the heel of the forward foot is then able to touch the ground as softly as a cat's paw (Chapter 16) (Fig. 17.10).

11. Walk more often

Leave your car or bike where it's parked and walk more often. Walk to a station further down the street. Take a longer walking route when you leave work. Park your car on the other side of the park and walk home. Get yourself good wet and cold weather gear. Walk briskly so that your circulation rate increases slightly and treat yourself to a little more oxygen. Get your children used to walking too! If people complain to you about back pain, then ask them: How often do you walk? *How* do you walk? Don't be surprised if you catch yourself smiling for no reason while walking elastically. After all, you might come to discover the joy of walking, as I eventually did.

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