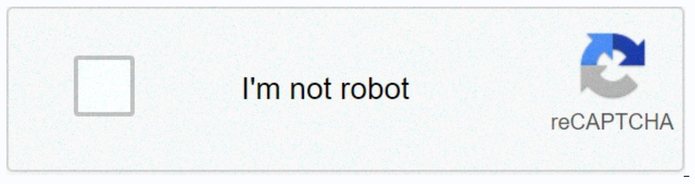

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Biomechanics of running pdf

bi•o•me•chan•ics /bīōm-kaniks/ Noun Study of mechanical laws relating to the movement or structure of living organisms. If the above stopped you slightly, I totally understand. It's hard to run these days without worrying about where our foot lands, what shoe we wear or the optimal step frequency. It certainly can't be that complicated to run! The good news is it doesn't have to be! The first thing you can do is discount everyone who tells you that their path is the only way. If that were the case, all the elite, world-class runners would have the same running style, and they just didn't. Running, like any sport, is a skill for which improvement will depend on proper conditioning and active development, but it's about building on your individual running style, as opposed to basing your training regime on what happens to work well for someone else. Having a basic understanding of biomechanics operation can help you appreciate your own form of operation and see where you might be able to make improvements. It can also help you make more sense of what you read and hear about your running styles, training programs, conditioning exercises, footwear, etc. Although running most definitely depends on the interaction of the whole body, dividing the operating step up into individual components or phases can help us understand slight changes can help improve performance and reduce susceptibility to injury. Getting started: Our introduction walking cycle to running biomechanics can start by looking at what we call the Walking Cycle. This cycle begins when a foot makes contact with the ground, and ends when the same foot makes contact with the ground again. It can be divided into two phases – the position phase (during which the foot is in contact with the ground) and the swing phase (during which the foot is not in contact with the ground). The position phase is traditionally paid more attention in the study of performance & injuries, so it is at this stage where the foot and foot carry body weight. The cradle phase is presented as a passive movement, i.e. the product of the position phase and is not consciously controlled. Trying to actively help the foot move through the swing phase is an example of where runners could potentially be wasting energy, for example, by consciously trying to lift the higher heel towards the back, or trying to lift the knee from the front. We'll look at this in more detail in the coming weeks. For now, let's look at the components that make up the position phase. Position phase It can be divided into four stages: initial contact, braking (absorption), middle and propulsion. 1. Initial contact Let's imagine that at that point in step when both feet are on the floor (sometimes referred to as the float phase). Your left foot is in front of you and it's about to hit the ground. This moment (whether you land on your heel, middle foot or foot) is called initial contact and marks the beginning of Phase. Your right foot behind you is on the floor and in the swing phase. 2. Braking (absorption) As soon as your left foot comes into contact with the ground in front of you, your body actually makes a controlled landing, managed by deceleration and braking. Left knee and ankle flex (opposite straighten) and left leg rollers in (pronates) to absorb the impact forces. During this absorption process, the tendons and connective tissue in the muscle store elastic energy for later use in the propulsion phase. 3. Midsance The braking phase above continues until the left foot is directly under the hips, taking the maximum load (maximum risk of injury) as body weight passes over it. The left ankle and knee are at maximum flexion angle. This moment is called midsance (you can also hear referred to as the single support phase). 4. Propulsion Now that your left leg has made a controlled landing and absorbed as much energy as it will get, it begins to propel you forward. This is done by the left ankle, knee and hip all extending (straightening) to push the body up and forward, using the elastic energy stored during the braking phase above. The more elastic the energy is available at this stage, the less the body needs to use the muscles. The propulsion phase ends when the left toe (now behind you) leaves the ground, commonly referred to as teg off (TO). At this point, both feet are off the ground, so be back in the float phase. Research shows that at least 50% of the elastic energy comes from the Achilles and tendons of the foot.

Swing phase When to foot off, the left leg has traveled as far as its back as it goes to and the heel starts to rise towards the back. The height of the heel reaches and the return unit of the knee depends on the extension power of the hip reached, and therefore will be higher at higher speeds. Steve Magness, Head Cross Country Coach of the University of Houston, compares this reflex stretch mechanism to stretching back a sling shot and then letting go. Extending the hip (as the back foot moves behind you before pulling you out of your feet) is equivalent to pulling back on the sling. Letting go goes to the burning foot before quickly leading with the knee. Steve argues that any conscious attempt to move the foot through the swing phase (which he makes as the recovery phase) leads to a waste of energy and a less strong burning of the slingshot. Once the knee has passed under the hips, the lower leg is carried out in preparation once again for initial contact, marking the end of the swing phase. Upper mechanics of the body and arm The interaction between the upper and lower body plays a vital role in running, upper body and the action arm providing balance and promoting effective movement. This balance is achieved by the arms and upper body that work effectively in direct opposition to the legs. Bringing the left arm forward opposes the forward unit of the right leg, and vice During the braking (absorption) phase described above (initial contact with the middle), the arms and upper body produce a propulsion force. During the propulsion stage (mid to to the feet off), the arms and upper body produce a braking force. Working as opposites, the forward impulse is maintained. The arms and upper body also counterbalances the rotation in the middle section. For example, as the right knee is pulled through in front of the body (right swing phase) a clockwise boost is created. To counterbalance this, the left arm and shoulder move forward to create a clockwise boost to reduce rotational forces. To help the appearance of the above as effectively as possible, arm swing should be initiated to and through the shoulders. Leading the elbows down as well as back can help avoid the elevation of the shoulders, which in itself causes the sensation of constriction and limits the range of motion. Equally bringing the knee into the cradle phase must be a passive movement, as well as the forward movement of the arm. Leading the arms up and forward wastes energy and reduces the efficiency of the shoulder-stretching reflex mechanism. Your hands crossing the midline of the body is a sign that it is possible to lead your arms forward instead of backward, or that you feel tightness in your chest. It is worth noting that as the arms counterbalance the legs, if they are crossing over it can counterbalance a narrow walk cross step. This is a good example of how important it is to look at the whole body when addressing the rolling form, not just correct bits in isolation. Consciously bringing your arms too far back (or forward) can also lead to over striding which, as discussed in future articles, can cause excessive braking and lead to injury. Improving Mechanics Next Week, we will look at how changes to the form of operation can help increase biomechanical efficiency and current thinking on how we can achieve these changes. There are many suggested methods out there - isolated exercise, functional exercise, exercises, clues, etc., so we will take the time to consider them in detail. I'll leave you with this thought though: So it's the case for changing any habit, changing the form of operation is a gradual process that takes time. The process can be broken down into the following process into four stages: 1. Unconscious incompetence At this early stage, you are not aware of the need to improve and thus cover your running distance without suspecting that something needs to change. 2. Conscious incompetence Armed with new knowledge of biomechanics, you are now aware of where you might be improving your efficiency. Combining properly conditioned, start making changes. 3. Conscious Competence Now run with awareness of what you do best. There are times when you still have to think about the form of operation, so it is not yet comes completely natural. 4. Unconscious Competence Congratulations! You were able to change the form and make you have to think about it while running. If you are interested in learning more about improving your own form of operation and developing the most effective step for your biomechanics, sign up for our 6-week online form course. The online course will help you run with the appropriate form of teaching your science to run biomechanics and will give you a simple to follow, progressive set of exercises, exercises and mental cues to help you make lasting changes to your form. Are you a runner who has managed to change the running shape and seen an improvement in running efficiency? Have you also seen a reduction in injury? Or maybe you tried and ran into new trouble! Whatever your experience, we are as always eager to hear from you. Happy running! Matt Phillips is a specialist in running accidents & video gait at StrideUK & Studio57clinic. Follow Matt on Twitter: @sportinjurymatt references