

# Elements of a 100m Sprint

There are many technical cues involved with sprinting, but as an athlete or coach, you should focus on mastering a few things rather than trying to work on everything at once. Information overload can become a real issue, especially for beginners. Many times I've seen athletes run in a robot like fashion, whilst over-thinking and trying to sprint 'perfectly', which is ultimately detrimental to performance.

Breaking a sprint into 'elements', then working on aspects within each can help athletes with their learning process. Some coaches do not like to separate phases of a race and prefer to focus on it as a whole, however I think most (myself included) like to break a sprint down into different components because it provides available cues that an athlete can easily understand.

## Element 1: The Acceleration Phase

This phase involves blasting out of the blocks by pushing off the rear and front leg hard. Here, you want to pull your rear leg through quickly whilst the body leans forward. Then extend the leg on the front block at the knee and hip upon completion of the drive.

I always tell my sprinters that they should be looking to clear around 3ft on their first stride out of the blocks with focus on pumping their arms as they drive out.

It's important that the front foot is driven back onto the ball of the foot for the first stride whilst maintaining a forward lean. I've seen athletes land on their heel after their initial stride due to over-striding with a high knee. This will only cause the athlete to decelerate faster and put unnecessary pressure on the hamstrings .

## Element 2: The Transition Phase

After exploding from the blocks you want to increase velocity and make an efficient transition to an upright sprinting action. After you leave the blocks, try and increase your stride length and frequency with each stride as you come into the upright position over the first 20-30m.

## Element 3: The Gliding Phase

This phase begins once the torso is upright. Here you will use your leg strength to maintain a wide but comfortable stride length. At this point you should be completely relaxed, low shoulders, jelly jaw and glide to the finish line.

## Acceleration and Maximum Velocity

An athlete begins a sprint by accelerating, then (depending on the distance they run for) will transition into maximum velocity sprinting. Track sprinters will accelerate from a dead start where they are not moving, whereas a games athlete, such as a rugby player, is likely to already be in motion. We'll continue to focus on these aspects from a 100m viewpoint and horizontal sprinting.

During the 100m an athlete will begin the race by accelerating until they reach their (or very close to) maximal sprinting velocity. At this stage it is no longer possible for

the athlete to continue accelerating. The focus switches to trying to maintain maximum velocity through sound technique, which will help limit the rate at which deceleration occurs during the remainder of the race.

Deceleration cannot be avoided, however the degree at which an athlete decelerates will ultimately have an impact on their overall sprinting performance. This is true too for games players in situations such as one on one duels to reach the ball or when an attacker is trying to outrun a defender. The most elite sprinters can hold their maximum velocity longer as they have a reduced amount of fatigue affecting their central nervous system and typically decelerate around the last 20m of the 100m.

### **Ground contact during accelerative sprinting**

For faster sprint times it is important to limit the amount of time that your foot spends in contact with the ground during each stride. This is why sprinters run on the balls of their feet and sprinting spikes all have the spikes positioned on the forefoot.

Force production is another important aspect to generate speed when making contact with the ground. The greater the force you apply into the ground, the greater return of impulse production, which creates greater speed. Longer foot-to-ground contact times will allow for greater force generation and impulse production.

So an athlete should limit ground contact times but also have long ground contact times to generate a greater force? This is obviously contradictory information. The goal, whether sprinting on a track or on a field, is to cover the required distance in the shortest time possible. Therefore, although a longer contact time allows for a greater force, it is not favorable to create it by this means. Yes, you will have more powerful strides, but ultimately it will slow you down. Therefore the key is to apply the optimal amount of force possible into the ground during the limited amount of time that contact is made.

Another thing to consider when accelerating is the point of foot-to-ground contact in relation to the athletes center of mass. You want the point of contact to be behind your center of mass so that there will be less ground contact time. This is why it's important to stay low and drive out the blocks, rather than immediately transfer into an upright position. Take care not to overextend your stride as you will not be able to produce as much force during ground contact and will be more susceptible to injury.

### **Maximum velocity sprinting**

During maximum velocity, as with the acceleration phase, shorter contact times are linked with better performance. Again, this can be achieved through applying optimal vertical forces during ground contact. This will lead to increased speed because you will be able to generate a great enough force impulse to overcome gravity and bound off the ground more rapidly.

One question that is always asked is whether an athlete should focus on increasing their stride frequency or stride length. Ultimately this will depend on the athlete and their running style. However, top sprinters can increase their stride frequencies during peak sprinting without decreasing stride length if they apply peak vertical forces. This is why it's so important for coaches and athletes to understand acting forces on the body during the phases of a 100m sprint. This understanding will allow for the improvement and development of each phase without negatively affecting the other.

## **The stride cycle**

Touchdown -> Toe off -> Flight -> Touchdown (one complete stride cycle)

The stride cycle begins at the touchdown phase. At the point of touchdown a sprinter loses momentum and slows down due to the braking effect. This is simply where the foot makes its initial contact with the ground.

This is where the ground contact time that we have been discussing begins and then ends after the toe off phase where force is produced when pushing off the surface. This then leads to the flight phase where neither foot is in contact with the ground, and ends with the second touchdown as the rear leg becomes the lead.

## **Factors Affecting Technique:**

### *Relaxation*

A lot of the time you will see athletes tense their whole body whilst sprinting. This is a red flag in relation to technique. It could be down to nerves but is also likely due to trying too hard to generate force and exert power. This causes unwanted tension in the body and will lead to poor form. By over-tensing, the body wastes energy, becomes stiff and is unable to move fluently.

### *Posture*

Good posture is essential for sprintings. Many athletes have a tendency to lean forward by over flexing at the hips. A slight tilt is recommended but leaning too far forward will slow you down and ultimately affect your running mechanics.

A good way to ensure you have good sprinting posture is to make sure that all drills are completed with perfect form (A skip, B skip etc.). Poor form during your drills will transfer into your sprinting technique so its highly important that they are performed correctly. Focus on keeping your back straight, head neutral with your spine (this will keep your head above your shoulders) and look straight ahead.

### *Simple way to improve your posture and strength:*

A great exercise that I get my athletes to perform are back extensions. Performing this exercise regularly increases trunk strength and improves physical fitness. Back extensions target your erector spinae which contains parallel sets of muscles that run down the spine from the base of the neck to the sacrum. These muscles control extension and flexion of the vertebral column and can increase optimal posture of the spine when performing sprints.

Back extensions also engage the hamstrings and strengthen other muscles which will allow you to become stronger and keep the torso erect when sprinting.

### *Arm movement*

Its vital to recognise that your arms play a vital role when sprinting. Your arms help to propel your legs which will lead to you sprinting faster. I heard sprinting legend Carl Lewis once say he uses the cue "elbow to the sky, thumb to the eye" to ensure his athletes are moving their arms correctly. I like this a lot. It's catchy and easy for my athletes to remember.

As mentioned, for fluidity its important to stay relaxed. Relaxation in the arms comes from dropped shoulders and no tension in the hand or fist. This will help you achieve a synchronized rhythm with your legs.

### *Stride length*

Be careful when trying to open up your stride when trying to increase the length of ground covered. As mentioned, overstriding means you will generate less power during ground contact which will increase the rate at which you decelerate. It also puts a lot of strain on the hamstring muscles, increasing your risk of injury.

Try to complete every sprint cycle in a circular motion where you are aiming to keep your knees parallel with the ground and your feet flexed upwards towards your shins.

### **Starts**

Perfecting your sprint starts (especially when using blocks) is arguably the most important aspect of the acceleration phase as it will affect your overall efficiency throughout the race. It's important to practice your starts separately so that you are comfortable using the blocks, moving efficiently and reacting to the gun.

### **Exercises to Improve Your Sprinting Technique**

When it comes to sprint technique there are many drills you can practice which will help you with your form. Here I will tell you a couple of exercises you can use that will be beneficial to all athletes who want to improve their speed and technique and are applied throughout many sports.

#### **Sled striding**

When pushing or pulling a sled you will see that the position you obtain is very similar to when driving out of the blocks. Using a sled is a great way to reinforce this positioning which can help improve your start off the blocks.

Don't make the mistake of loading the sled with lots of weight. The purpose here is to practice your running stride, not to see how much weight you can shift! Focus on stride length, leaning forward and pushing powerfully off the balls of the feet during each stride.

Example: Don't push the sled too far. As in the drive phase of a sprint, you should drive the sled forward for about 30-50m. Repeat this for around 10-20 reps depending on your fitness levels. You can increase the amount of reps as necessary.

#### **Hill running**

Hill running is perfect for improving your acceleration. The incline causes the body to automatically lean forward when sprinting up the hill. To make it up, you will really have to drive the knees up high and you'll be forced to run on the balls of your feet. Don't worry too much about how steep the hill is but aim for a 15% incline.

Example: Sprint up the hill, then slowly walk back down and repeat. Do this for a total of 5-10 reps for 2-5 sets. Again this depends on your fitness levels. Try not to complete these at a high intensity (above 75%) otherwise you will struggle to complete the workout. Aim for 5-8 minutes rest between sets depending on how many reps you perform.

# Sprint Form Checklist and Reminders

## Upper body:

### *Head*

Keep your head in line with your spine  
Focus your sight directly down the track  
Relax your neck and jaw muscles  
Don't clench your teeth  
Shoulders

Don't shrug your shoulders. They should be kept low, not up by your ears.  
Hands and arms

Run with open palm (if you naturally run with a closed fist, stay relaxed and don't clench)  
Remember "Elbow to the sky, thumb to the eye"  
Sync arms with legs  
Remain upright during maximum velocity. Flexing or extending at the hip will limit your range of motion

## Lower body:

Run on the balls of your feet and push off with your toes  
Keep stride long but comfortable. Overstriding means less power and unnecessary stress on the hamstrings  
Focus on rapid turnover of sprint cycles with knees parallel to the ground

*by Liam Coultman, creator of The Speed Project, is a sprint and conditioning coach, strength coach and certified P1CP Athlete Performance Specialist. He's currently located at the National Performance Centre for Athletes in Leon, Spain.*