Marathon Training – biomechanics report

**Subject ID:** MT0##

This report outlines the development of five biomechanical variables measured by the Lumo Run you wore during your marathon training program. A breakdown of the average score for each of your runs is provided in the bar graphs below. For each variable recommendations, provided by Lumo Run, are included. Running parameters are highly individualised and runs outside of these targets do not necessarily indicate issues with performance. Our team are currently investigating the impact of these variables at the individual level, how they can be used to describe a runner’s typical pattern, and how we can identify deviations from what may be considered normal for an individual.

The following are some summary statistics about the runs included in this report.

|  |  |
| --- | --- |
| Number of Runs | Typical number of runs per weeK |
| 0001 | 0002 |
|  |  |
| Typical duration (H:MM:SS) | Typical distance (kM) |
| 0003 | 0004 |
|  |  |
| Typical speed (km/h) | Typical Elevation gain (M) |
| 0005 | 0006 |

# cADENCE

The number of strides (footstrike to footstrike) you take with each foot every minute. This number depends on how fast you are running and is dependent on your leg length as well as running speed. There is no ideal stride rate, but significant side-to-side differences are a good indicator of an antalgic (limping) gait pattern. Elite runners, independent of run distance (800m vs. a marathon), have been observed to have a stride rate in the 180-200 steps per minute range; recreational athletes tend to run between 150-170 steps per minute.

If your cadence is too low, it’s often an indication that you are either over-striding or wasting energy due to excessive motion (e.g., bounce). If your cadence is too high, it’s often an indication that your flight time and stride length are too short, which creates an inefficient shuffling pattern when you run.

|  |  |
| --- | --- |
| Lumo recOMmended cadence | your typical cadence |
| 180+ steps per min | 0009 |

[Add Cadence Image Here]

**Drills & Tips to Improve Your Cadence**

It is recommended that runners should work on increasing their cadence gradually (5-10% from session-to-session). Increasing cadence too quickly increases risk injury.

**The Puddle:** Imagine you are running through a puddle and make as little splash as possible to promote quick steps.

**The Metronome**: Set a metronome to your target cadence, and match each step to the metronome while running.

**Foot Landing:** Land your feet closer to your pelvis to decrease your stride length in order to increase your cadence.

breaking

Braking is the measure of how much your speed slows down with every step. Each time your foot hits the ground, your speed drops temporarily until you push off of your foot to propel forward and pick up speed again. A good way to think about this is to imagine yourself switching back and forth between the brakes and accelerator of a car. The initial contact your foot makes with the ground is similar to stepping on the brakes, and pushing off of your foot is like stepping on the accelerator to speed back up.

Reducing your braking is important when running because the greater the change in your speed before and after each step, the more energy you waste slowing down and having to speed back up. Often times, a high braking value is an indicator of over-striding. If you land your foot far in front of your pelvis, you hit the ground with more backward force, causing you to slow down. The bigger the deceleration, the more energy it takes for you to speed back up. Ideally, your braking value will be as low as possible for a smooth run at a constant speed.

|  |  |
| --- | --- |
| Lumo recOMmended breaking rate | your typical breaking rate |
| 0.4m/s or lower | 0010 |

[Add Breaking Image Here]

**Drills & Tips to Improve Your Breaking Rate**

**Controlled Falling:** Try to lean forward from the ankles. Wait until you feel like you are about to fall before you swing your leg forward in a running motion.

**Your Feet:** Work on landing each step closer to your body. This will reduce your braking.

**Ears Over Shoulders:** Keep your ears over your shoulders. This will force you to lift your knees higher, which will increase your cadence and reduce braking.

bounce

Bounce is the vertical movement of your body while you run. This is also known as vertical oscillation of your pelvis. This is important to running efficiency because as you run, you want to exert as little energy as possible moving up and down, and as much energy as possible propelling yourself forward.

While the ideal bounce is no bounce (i.e., 0 in.), having no bounce is nearly impossible for even the most elite runners. Bounce values under 5% of the runners height are considered good for most runners.

|  |  |
| --- | --- |
| Lumo recOMmended bOUNCE | your typical BOUNCE |
| Less than 8.2cm | 0011 |

[Add Bounce Image Here]

**Drills & Tips to Improve Your Bounce**

**The Egg:** Imagine you have an egg sitting on your head and you are trying to keep it from falling. This will engage your core and minimize your up and down movements.

**One Inch Ceiling:** Try to reduce your upwards motion. Imagine you’re running under a low ceiling and try to avoid hitting your head.

**The Gum Scrape**: Imagine you are trying to scrape gum off of your shoe. This will drive your foot into the ground and help you propel forward.

rotation

Rotation measures the side-to-side movement of your pelvis, which is most easily observed from a bird’s eye view of the body.

Asymmetric movements from left to right can signify a strength or flexibility issue for the runner. This is often due to a gluteus weakness and hip flexor tightness. Imagine trying to stretch your leg back with thigh hip flexors, your pelvis will rotate with the leg. This can also be caused by you driving forward more with one leg than the other leg. An arm swing that crosses the body can also contribute to increased pelvic rotation as the arms mimic the leg movement and vice versa.

While a lower rotation is ideal some rotation is necessary to move a runner’s swing leg forward. A Rotation value under 15 degrees is considered good for most runners.

|  |  |
| --- | --- |
| Lumo recOMmended rotation | your typical rotation |
| Less than 15.0° | 0012 |

[Add Rotation Image Here]

**Drills & Tips to Improve Your Rotation**

**Tunnel:** Try to keep your pelvis from twisting. Imagine running through a tunnel the width of your body.

**Skateboarding:** Try to keep your pelvis square as you run. Imagine you’re skateboarding and push through your foot to extend your leg behind you.

drop

With each step during gait, you spend time standing on one leg, which is called “single support”. During single support, the pelvis, opposite to the stance limb, drops slightly. Excessive pelvic drop is associated with excessive hip and knee inward collapse to the opposite side of the body and can create increased shearing forces within the pelvis, hip, and low back.

Increased drop of the pelvis is often due to weak hip and core muscles, specifically your abductor muscles such as your gluteus medius. This can lead to undesired twisting of soft tissues such as the IT band and pulling on the patellar tendon. A stable, steady pelvis gives you a strong platform from which to launch your steps from, whereas an unstable pelvis can waste energy making you inefficient.

Ideally, your drop value will be as low as possible to reduce loss of energy and decrease the risk of injury. A realistic value drop value is considered to be any number below 12 degrees.

|  |  |
| --- | --- |
| Lumo recOMmended drop | your typical drop |
| Less than 12.0° | 0013 |

[Add Drop Image Here]

**Drills & Tips to Improve Your Rotation**

**Horizon:** Try to avoid up and down movement. Keep the horizon steady in front of you.

**Low ceiling**: Try to reduce your upwards motion. Imagine you’re running under a low ceiling and try to avoid hitting your head.