

Pelvic floor dysfunction and running biomechanics research project:

Running gait analysis report



Cardiff
Metropolitan
University

Prifysgol
Metropolitan
Caerdydd

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1 Introduction

Thank you for participating in our research study to examine the effect of pelvic floor dysfunction on running gait. This report provides information on your running gait, highlighting some key biomechanical features.

2 Running gait

2.1 Vertical force profile

Your vertical force profile is shown in Figure 1. The first 20% of stance is called the impact phase. Some runners show a sharp, transient peak in vertical force during this phase, whilst others do not. The presence of a sharp, transient peak is indicative of a rearfoot strike, a mild peak indicative of a midfoot strike and no peak indicative of a forefoot strike. Typically, the most force produced occurs at midstance (~50% of stance), this is when your centre of mass is lowest and the body must produce force to change the downward movement of the body to an upward, push-off movement.

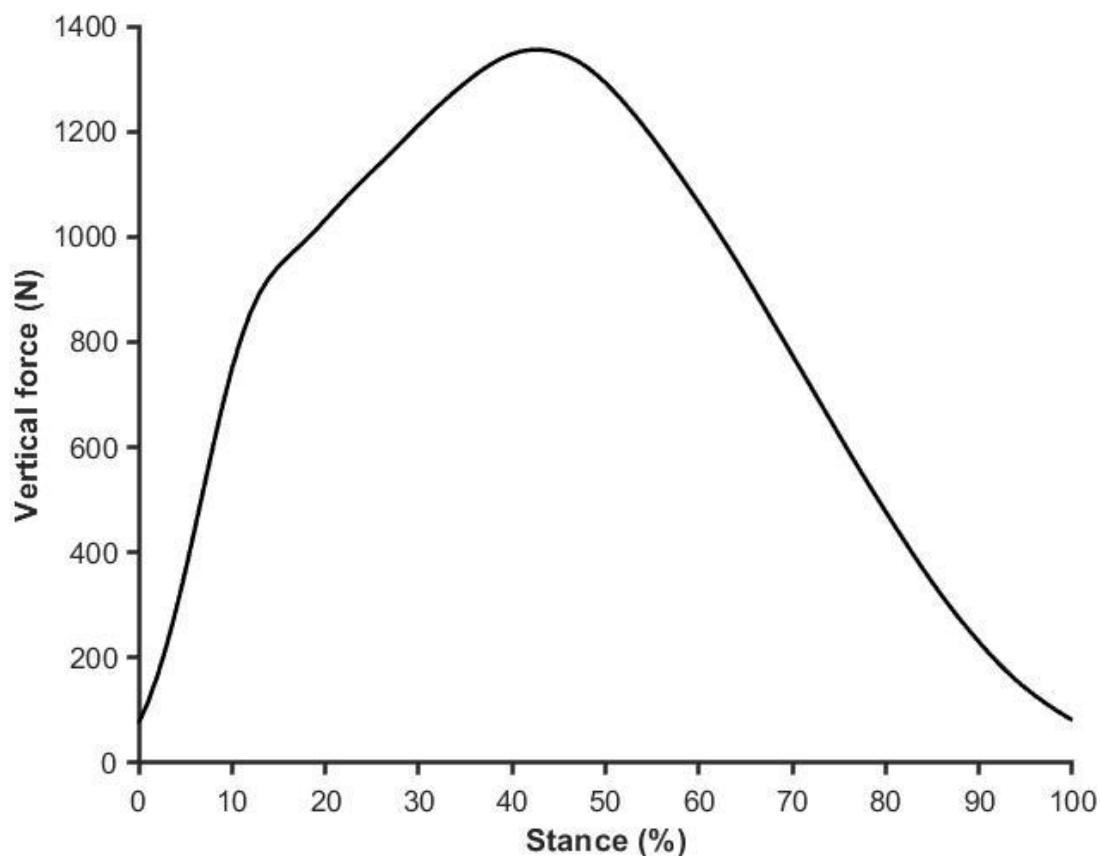


Figure 1. The vertical force (N) produced when your foot is in contact with the ground (stance; %).

2.2 Footstrike pattern

There are three different footstrike patterns common in endurance running: 1) rearfoot striking; 2) midfoot striking and; 3) forefoot striking.

Your footstrike pattern is: Midfoot strike

This means your heel and ball of foot hit the ground simultaneously.

2.3 Vertical displacement

This represents how much your body's centre of mass moves downwards whilst your foot is in contact with the ground. High levels of movement may be inefficient as it means the body has to work hard to produce energy to raise the centre of mass as you leave the ground (Moore, 2016). Most runners have a vertical displacement during ground contact of 3 to 5 cm across the range of running speeds used in this study.

Your vertical displacement was: 4.6 cm

2.4 Vertical stiffness

When your foot is in contact with the ground, the lower limb acts like a spring. The lower limb flexes (compresses) during the first half of ground contact and then extends (recoils) during the second half of ground contact. High stiffness is believed to be efficient as it suggests your body is using stored elastic energy to aid movement (Moore, 2016). Most runners have a vertical stiffness between 30 and 40 kN per m.

Your vertical stiffness was: 37 kN per m

2.5 Cadence

This represents how many steps per minute you take. There is no one-size fits all number you should be targeting when it comes to cadence. In fact, research shows that trained runners optimise their cadence to enhance their running efficiency, whilst untrained runners produce a cadence that is not optimised (de Ruiter, Verdijk, Werker, Zuidema, & de Haan, 2013).

Your cadence was: 169 steps per minute

2.6 Ground contact time

This represents how long your foot is in contact with the ground for. Similar to cadence, ground contact time has been shown to be optimised for an individual's running efficiency (Moore et al., 2019). Most runners have a ground contact time between 0.22 to 0.26 seconds across the range of running speeds used in our study.

Your ground contact time was: 0.24 seconds

3 References

- de Ruiter, C. J., Verdijk, P. W., Werker, W., Zuidema, M. J., & de Haan, A. (2013). Stride frequency in relation to oxygen consumption in experienced and novice runners. *European Journal of Sport Science*, 14(3), 251-258. doi:10.1080/17461391.2013.783627
- Moore, I. S. (2016). Is there an economical running technique? A review of modifiable biomechanical factors affecting running economy. *Sports Medicine*, 46(6), 793-807. doi:10.1007/s40279-016-0474-4
- Moore, I. S., Ashford, K. J., Cross, C., Hope, J., Jones, H. S. R., & McCarthy-Ryan, M. (2019). Humans Optimize Ground Contact Time and Leg Stiffness to Minimize the Metabolic Cost of Running. *Frontiers in Sports and Active Living*, 1(53). doi:10.3389/fspor.2019.00053