

Why do Lunges cause so much DOMS?

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I am a fan of the traditional lunge movement, but I am sure I am not alone in saying that lunging causes me more DOMS in my adductors than any other exercise that I undertake.

I fondly remember running a session 20-years ago whereby I had all my athletes building up their walking lunge distance from 20m to 100m. I had a very keen student join me on this particular session and ignoring my warning, he joined in with my group and completed a couple of repetitions of 100m lunges. He was keen to come to several of my sessions but after this session I didn't see him again until a week later.

It was only after he told me that he was in so much pain the next day that he couldn't get out of bed for several days that I truly appreciated the danger lunging can be to the unprepared!!!

So what is it that causes so much pain with the lunge exercise?

If we look at recent kinematic and kinetic analyses of the standard forward lunge, we see the following attributes:

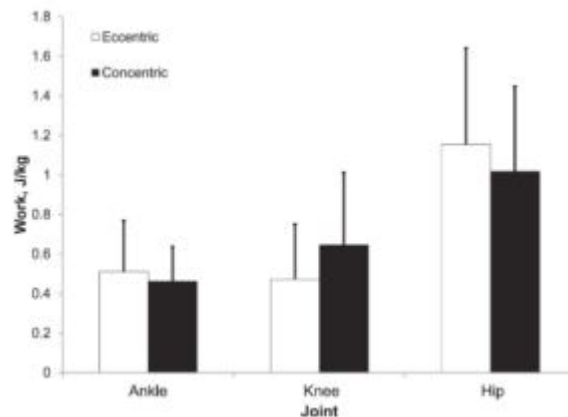
1. Range of Motion (ROM)



Your body position during lunging (leaning back (80°), body upright (87°) or leaning forward (108°), can affect the hip joint angle when in the full lunge position.

The greater the ROM, the greater the stretch that is placed upon the muscle and thereby the greater eccentric ROM which all contributes to the onset of DOMS when your joints (muscles) are not used to this ROM.

2. The amount of Work completed by each joint.



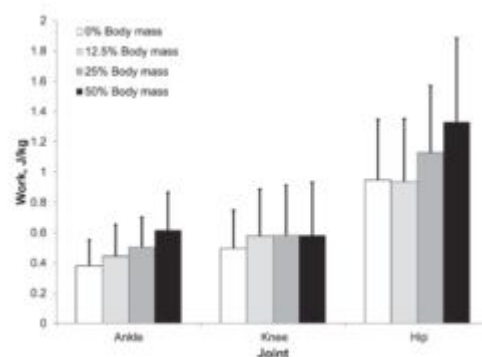
The hip joint is the main joint undertaking load during the lunge activity.

Specifically, the hip provided 53% of the total support impulse, compared with 26% and 21% provided by the knee and ankle joints, respectively.

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From a kinematic perspective, the anterior lunge involves significantly greater motion at the knee, but from a kinetic perspective, the exercise is hip-extensor dominant.

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External loading (up to 50% of body weight) prompted increases in hip and ankle contributions but had minimal effect at the knee .

So unlike the squat, where there is a concomitant increase in quadriceps (knee) contribution to an increase in squat load, the hip joint takes the brunt of the lunge and increasingly so with added weight.

.3. Gluteal/Adductor EMG – Much higher in lunging than in squatting.



A larger EMG amplitude equates to a greater % of total muscle fibre activation meaning that the exercise in question has a more prominent effect upon the key lunging muscle groups (major hip extensors, Gluteals & Adductors).

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4. Single Leg vs double leg training.



The fact that you are now exercising with a single leg, immediately doubles the load on that leg (compared to the shared load of a two leg squat).

Whilst I can't find any research on my next statement, I do believe that there is an additional strain placed upon the adductors in particular when lunging/split squatting or even Single Leg Pressing as these muscles are required to not only engage the hip in a powerful extension movement, they are also involved in the stabilisation of the pelvis now that you are exercising unilaterally and there is the desire of the body to rotate under load.

As you lunge forward (with your right leg for example), the left hip will rotate to the left due to your rear left leg and may excessively anteriorly tilt your pelvis.

It is the responsibility of both gluteus medius and adductors to ensure that the pelvis doesn't rotate to the left (if you are trying to keep a neutral pelvic position) and the adductors are also involved in trying to minimise this anterior tilt.

This added load on these muscles seems to enhance the amount of DOMS you feel over the next couple of days.

Summary

It seems that a combination of single leg, large ROM, high EMG and dual muscle roles (prime joint mover and stabiliser) are all factors that result in high levels of DOMS when performing exercises like the lunge.

Bibilography

Trunk Position Influences the Kinematics, Kinetics, and Muscle Activity of the Lead Lower Extremity During the Forward Lunge Exercise.

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Biomechanical Analysis of the Anterior Lunge During 4 External-Load Conditions.

[Bryan L. Riemann](#), Shelley Lapinski, Lyndsay Smith, George Davies, . *J Athl Train* (2012) 47 (4): 372–378. <https://doi.org/10.4085/1062-6050-47.4.16>

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