

Plantar Pressure: Load Sole vs Force Plate – Thomas Young

New technology has emerged over the past few years to take portable devices to athletes instead of bringing athletes to the lab. The purpose of this project was to examine the differences between the Loadsol (plantar pressure insole system) and GRF measured by the AMTI force platform for the following conditions: walking, jogging, jumping, and cutting.

The equipment used for this project was the following: one force platform (1200 Hz, BP600600, OR6-7, AMTI), one pair of plantar pressure insole system (Loadsol, 200 Hz), 3D motions analysis system (240 Hz, VICON), and Nike Pegasus lab shoes. Condition 1 was called walking and 3 trials were collected. Data collection occurred only with one participant from the graduate school. The participant was instructed to walk at normal walking pace and asked to land her right foot on force platform 1 and left foot on force platform 2. Condition 2 was called running and 4 trials were collected. The participant was instructed to run at a comfortable speed without hitting any objects in the lab. Condition 3 was called counter movement jump and 3 trials were collected. The participant was instructed to jump by going into a squat and use their upper extremities to help achieve a significant jump height. Condition 4 was called VCUT, and 3 trials were collected. The participant was asked to jog toward the force plate and cut at a 45-degree angle while keeping a jog pace until out of the motion capture area. Data processing was completed with Visual3D (C-Motion, Inc.) and excel in the biomechanics computer lab.

There was a slight difference in body weight with the loadsol reporting a higher weight (993.45 N) in newtons compared to the force plate (991.895 N). This is probably due to having to add the right and left loadsol data together to get a combined weight where the force plate data comes out with a single value. The gold standard here is motion capture, but the loadsol plantar pressure devices were very close.

All data collected were the ground reaction forces in the z direction. For walking (C1), all the first peaks were higher for the loadsol except for trial 2. For running (C2), all the loadsol first peaks were higher than the force plate data. For the jumping trials (C3), the second trial had higher first peak values (propulsion) for loadsol, but the second peak (deceleration) was higher for the force plate. For the second trial, higher ground reaction forces were exerted for the force plates in the both propulsion and deceleration compared to the loadsol. This could be due to the loadsol data being processed with two different points versus the force plates being a single value (one output). When comparing these numbers, the left and right ground reaction forces had to be added together to determine peak propulsion and peak deceleration. For VCUT (C4), trial 2 had higher force recorded with the force plate while trial 3 had a higher force recorded with the loadsol. This could be due to the angle the subject cut at. The participant could have pushed off more anteriorly or more laterally which could have influenced the ground reaction force captured. This is due to the magnitude taken as we only looked in the z direction. Medial / lateral reactions could have also played a role in this.