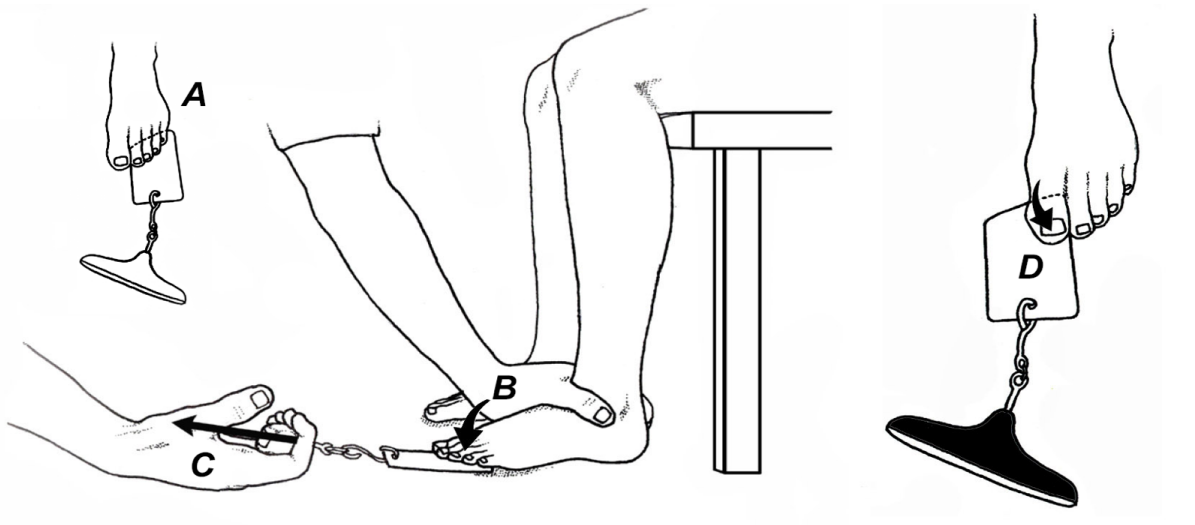


Instructions for Using the Human Locomotion Dynamometer

Before beginning the measurements, press the **Power Z/T** button to turn the device on, and repeatedly hit the **UNIT** button to select pounds or kilograms, making sure that “**PEAK**” appears on the upper left side of the display. **Peak** records the highest strength measurement achieved during the test, and this number can be reset to 0 by again hitting the **Power Z/T** button. Holding the **Power** button for 3 seconds will shut the device off. When turned back on, it will default to your prior settings.

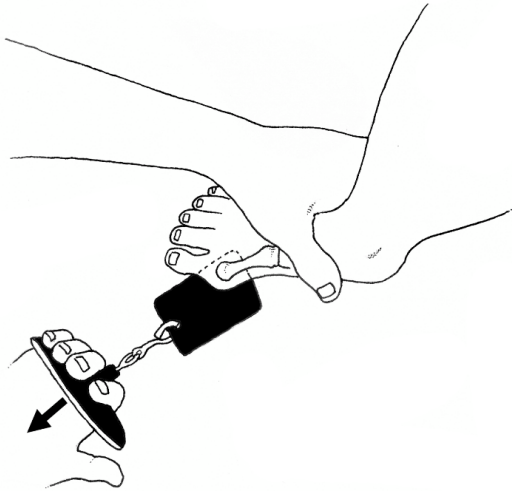
Measuring Toe Strength

To measure strength beneath the lesser toes, place the dynamometer card so the angled portion parallels the angle present beneath the second through fifth toes (**Fig. 1, A**). It is important that the card does not extend beneath the forefoot, as it should be placed *beneath the toes only*. The practitioner then places their hand on top of the patient's foot to keep it stable and to detect if the patient attempts to lift his or her heel from the ground. To perform the test, state, “Keep your heel on the ground, keep your forefoot on the ground, and try to stop me from pulling this card out.” The patient is then instructed to grip the card as firmly as possible (**B**) while the practitioner slowly pulls the card out from beneath their toes (**C**). If the patient lifts his or her heel, the test must be repeated. *Repeat the test until a consistent measurement is achieved, usually 2 to 3 times.*



To measure force output beneath the great toe, place the long end of the card beneath the great toe as illustrated in **D**. Repeat this measurement until a consistent number is achieved, then repeat the measurement on the patient's other foot. As a general rule, adults generate 10% of their body weight in force beneath the great toe, and 7% of their body weight in force beneath the lesser toes. Athletes should be able to achieve 15 to 20% of their body weight beneath the great toe and 10 to 15% of their body weight beneath the lesser toes. The repeat measurement

should be performed on the same surface as the original test. The ability to quantify toe strength is important as people with strong toes tend to be more athletic (1) and are less likely to fall as they get older (2).

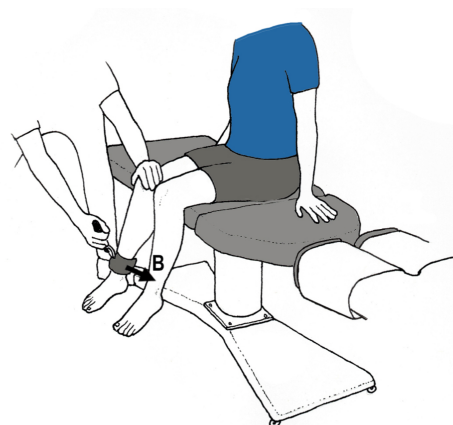
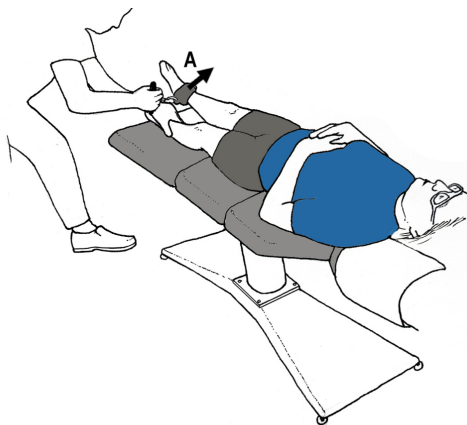


Measuring Peroneus Longus Strength

The long end of the card is placed beneath the first metatarsal head as the examiner pulls outwardly (**arrow**). Ideally, the person being tested will generate at least 10% of their body weight during this test. Because no muscles attach directly to the first metatarsal head, this measurement allows you to reliably quantify the strength of the peroneus longus muscle in isolation. The person is seated while performing this test, and the leg should be near vertical. A strong peroneus longus maintains integrity of the entire medial forefoot, which is essential not just for injury prevention, but also for improving athletic performance.

Measuring Hip Strength

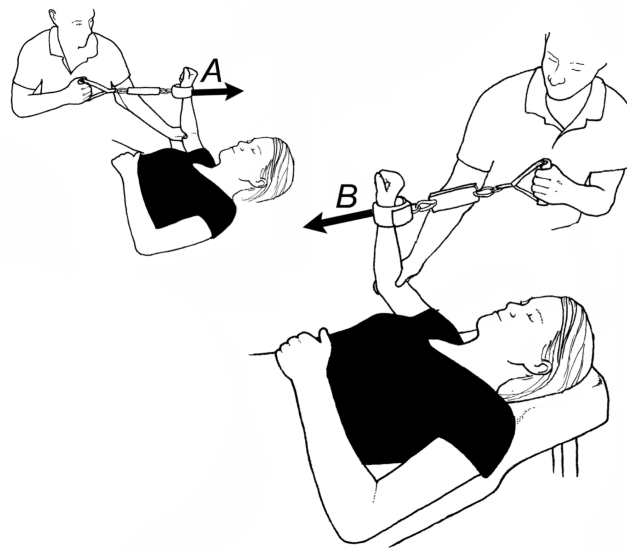
Hip abductor strength is measured by attaching the dynamometer's accessory strap just above the ankle. Ideally, the patient should be able to generate 22% of their body weight while pushing their ankle sideward (**A**). Hip rotator strength is measured while seated, and people with strong hips should be able to generate at least 20% of their body weight while pulling their ankle inward (**B**). A study of 501 competitive athletes (138 females and 363 males) competing in different sports shows that individuals who did not hit these target numbers were 7 times more likely to tear their anterior cruciate ligament (3). You can monitor response to specific rehabilitative exercises by repeating these measurements every few weeks.



Measuring Rotator Cuff Strength

This is a simple in-office screen to identify supraspinatus tears. Using the dynamometer with the attached strap, shoulder abduction strength is measured at 90° scaption with the palm down (**A**). (Scaption refers to abduction with the shoulder horizontally flexed 30° to the frontal plane.) Shoulder external rotation strength is measured with the humerus abducted 0° and internally rotated 45° (**B**). A strength ratio is created by dividing abduction strength by external rotation strength. If the resultant ratio is above 0.86, the supraspinatus tendon is most likely healthy. Conversely, a ratio below 0.48 indicates a large, full-thickness supraspinatus tear.

Shoulder external (**A**) and internal rotation strength (**B**) are measured in the supine patient with the shoulder abducted 90° and the elbow flexed 90°. A ratio is created by dividing external rotation strength by internal rotation strength. The resultant ratio should be between 0.75 and 1.0. In a five-year study of professional baseball pitchers, athletes who scored below 0.75 were significantly more likely to be sidelined with a shoulder injury (4). A detailed exercise program targeting the rotator cuff musculature is available at the following link: <https://tinyurl.com/5efaprzy>.



1. Yuasa Y, et al. Relationship between toe muscular strength and the ability to change direction in athletes. *Journal of Human Kinetics*. 2018 October 15;64:47.
2. Valeriani S, et al. Foot and Ankle Risk Factors for Future Falls in Older Adults: A Systematic Review with Meta-Analysis of Prospective Cohort Studies. *Health Science Reports*. 2026 August: 9(8).
3. Khayambashi K, Ghoddosi N, Straub R, et al. Hip Muscle Strength Predicts Noncontact Anterior Cruciate Ligament Injury in Male and Female Athletes: A Prospective Study. *Am J Sports Med* . 2015;(44):355-361.
4. Møller M, Nielsen R, Attermann J, et al. Handball load and shoulder injury rate: a 31-week cohort study of 679 elite youth handball players. *Br J Sports Med* . 2017;51:231-237.