



Hand-Held Dynamometry for the Ankle Muscles – Basic Facts

HHD should be performed using a “make test” – hold the dynamometer stationary while the subject exerts a maximal force (Wang et. al, 2002)

Perform three consecutive contractions 3-5 seconds and use the average value

*Using the average value is shown to be more reliable (Van den Beld et. al, 2006)

Prerequisite: Tester must be strong enough to counter the force generated by the patient to properly stabilize

*Values recorded for plantarflexion are likely to be lower than the true strength (Spink et. al, 2009)



Hand-Held Dynamometry for the Ankle Muscles

Plantarflexion (Gastrocnemius*, **Soleus*, *Plantaris*, *Tibialis Posterior*, *Peroneals*) * indicates primary muscles**

- Patient Position: Supine with hip and knee extended, foot in neutral
- Clinician Position: At end of table; LE stabilized proximal to ankle joint
- HHD Position: Plantar surface proximal to 1st metatarsal head, , force transducer perpendicular to metatarsals



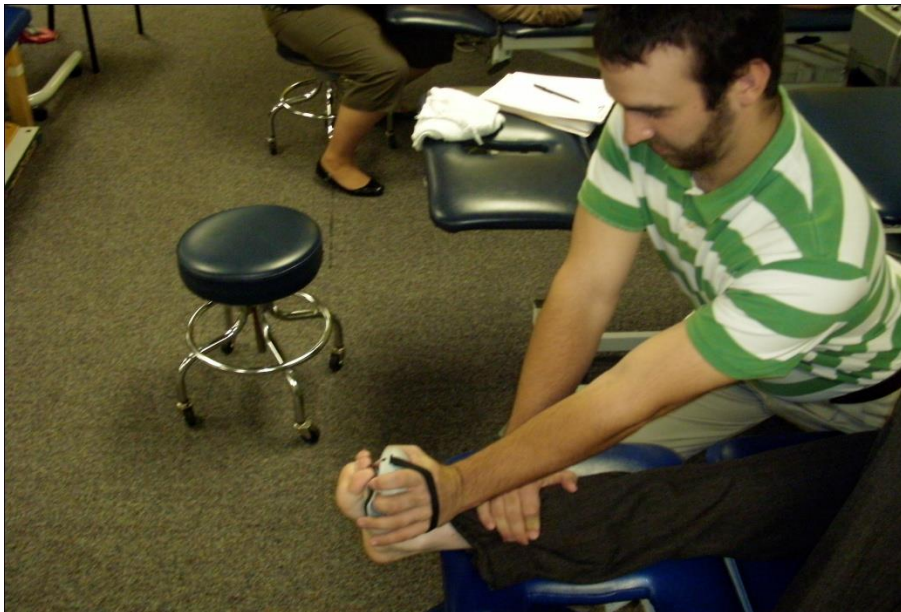
Interrater Reliability: ICC 0.89 (0.83 - 0.93)

Intrarater Reliability: ICC 0.80 (0.70 – 0.87)



Dorsiflexion (*Tibialis Anterior*)

- Patient Position: Supine with hip and knee extended, foot in neutral
- Clinician Position: On same side as leg tested; LE stabilized proximal to ankle joint
- HHD Position: Dorsal surface proximal to metatarsal heads, force transducer perpendicular to metatarsals



Interrater Reliability: ICC 0.91 (0.86 - 0.94)

Intrarater Reliability: ICC 0.81 (0.71 - 0.88)



Dorsiflexion Alternate Position

- Patient Position: Seated with hips and knees at 90° flexion; lower leg vertical to floor with only heel touching the ground
- Clinician Position: LE stabilized proximal to ankle joint
- HHD Position: Dorsal surface of foot proximal to MTP joints, force transducer perpendicular to metatarsals



Interrater Reliability: ICC 0.97



Eversion (*Peroneus Longus*, *Peroneus Brevis*)

- Patient Position: Supine with hip and knee extended, foot in neutral
- Clinician Position: On same side as leg tested, LE stabilized proximal to ankle joint
- HHD Position: Lateral border at midpoint of shaft of 5th metatarsal, force transducer perpendicular to metatarsals, force transducer horizontal



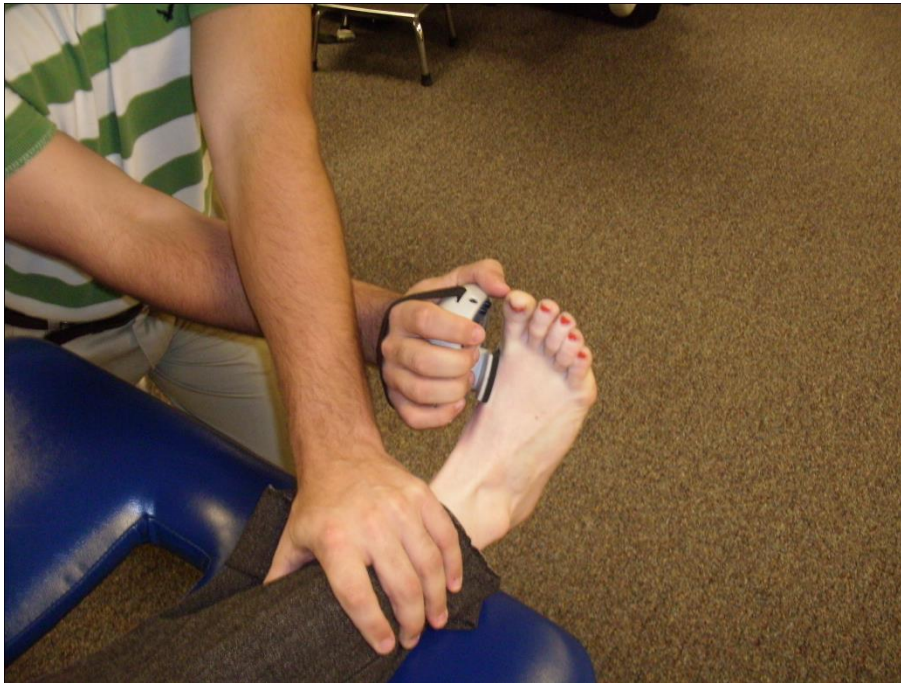
Interrater Reliability: ICC 0.88 (0.82 - 0.92)

Intrarater Reliability: ICC 0.80 (0.69 – 0.87)



Inversion (*Tibialis Anterior, Tibialis Posterior*)

- Patient Position: Supine with hip and knee extended, foot in neutral
- Clinician Position: On opposite side as leg tested, LE stabilized proximal to ankle joint
- HHD Position: Medial border at midpoint of shaft of 1st metatarsal, force transducer horizontal



Interrater Reliability: ICC 0.88 (0.82 - 0.92)

Intrarater Reliability: ICC 0.77 (0.66 - 0.85)



Hallux MTP Plantarflexion (*Lumbricals, Flexor Hallucis brevis*)

- Patient Position: Supine with hip and knee extended with hallux and TCJ max dorsiflexed
- Clinician Position: At end of table, LE stabilized proximal to hallux PIP
- HHD Position: Plantar surface of IP joint of hallux using smallest force transducer



Interrater Reliability: ICC 0.94 (0.90 - 0.96)

Intrarater Reliability: ICC 0.88 (0.81 – 0.92)



Hallux MTP Dorsiflexion (Extensor Hallucis Longus, Extensor Digitorum Brevis)

- Patient Position: Supine with hip and knee extended with hallux and TCJ maximally plantarflexed
- Clinician Position: On same side as leg tested, LE stabilized proximal to hallux PIP
- HHD Position: Dorsal surface of IP joint of hallux using smallest force transducer



No current research validating



References

- Van den Beld WA, van der Sanden GAC, Sengers RCA, Verbeek ALM, Gabreels FJM: Validity and reproducibility of hand-held dynamometry in children aged 4-11 years. J Rehab Med 2006; 38: 57-64.
- Wang C-Y, Olson SL, Protas EJ: Test-retest strength reliability: hand-held dynamometry in community-dwelling elderly fallers. Arch Phys Med Rehabil 2002; 83:811 815.
- Spink MJ, Fotoohabadi MR, Menz HB: Foot and ankle strength assessment using hand-held dynamometry: reliability and age-related differences. Gerontology 2009.