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 5\(^{th}\) 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

