RAPID RESEARCH

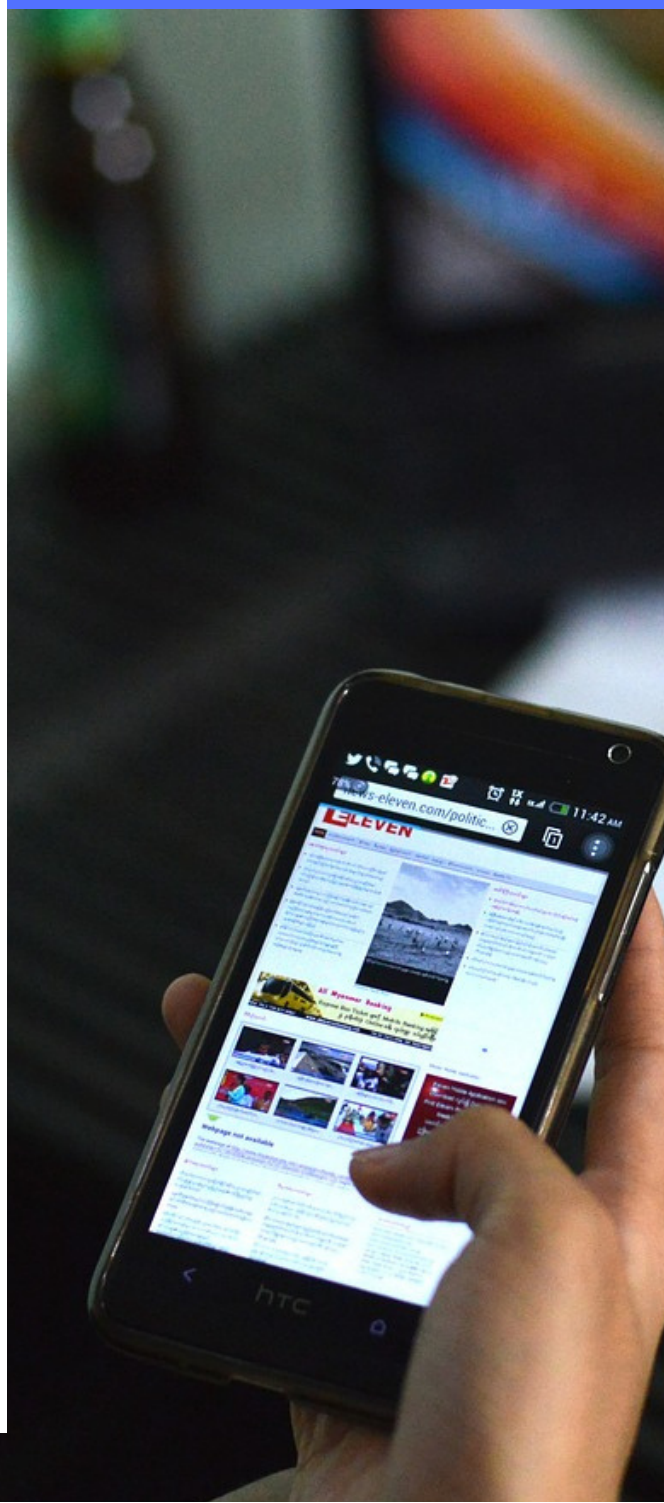
@physicaltherapyresearch

July 2022

Inside This Week:

Testing & Improving Foot Strength

- Reliability of Toe Flexion to Test Foot Strength
- Functional Assessments of Foot Strength
- How to Evaluate and Improve Foot Strength in Athletes



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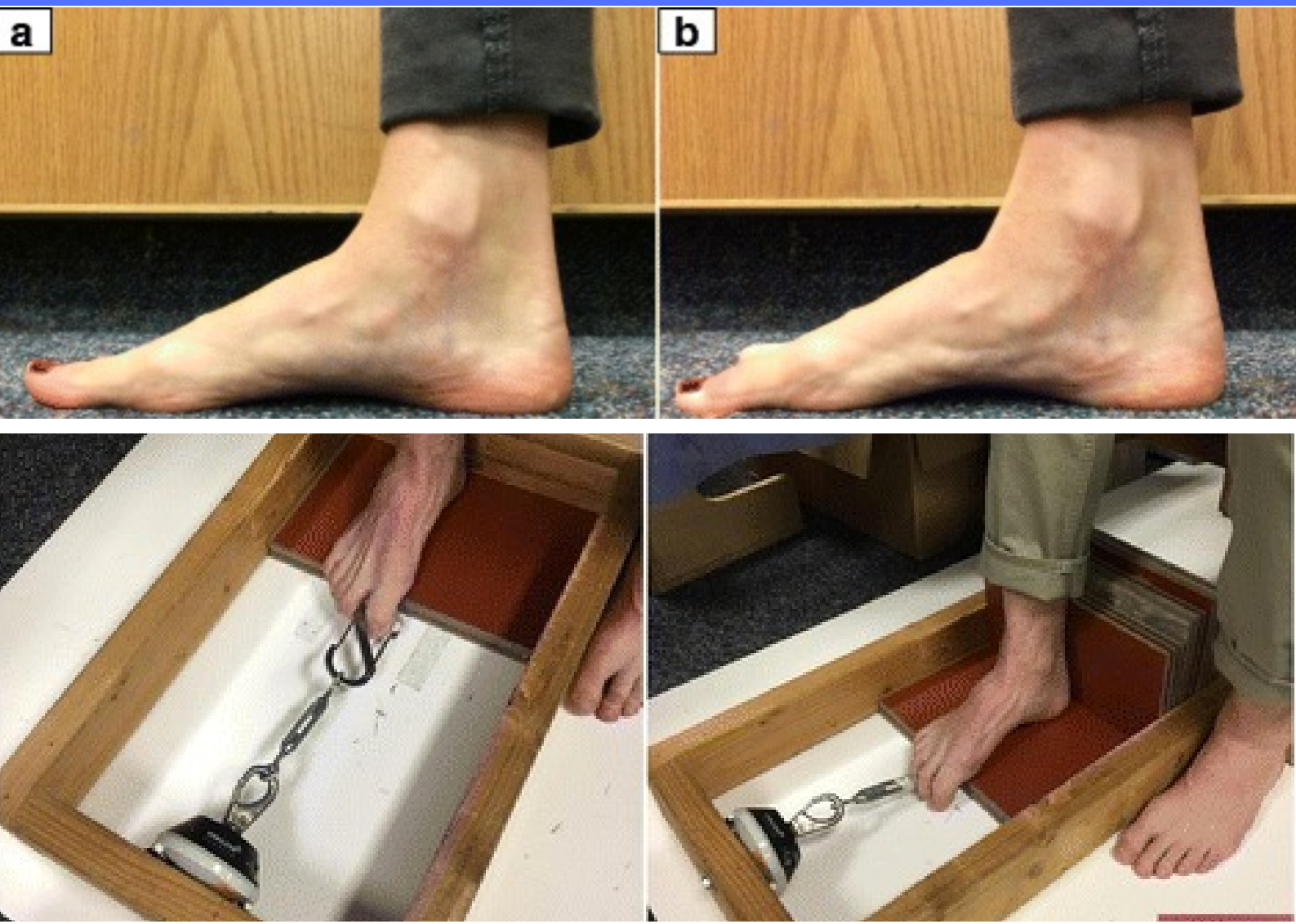
RELIABILITY OF TOE FLEXION TO TEST FOOT STRENGTH

Click for Full Text (Ridge et al. 2017)

This research assessed the reliability of strength testing during functional movements (doming, hallux flexion, and lesser toe flexion), to quantify strength during the doming motion.



KEY FINDINGS

21 performed strength tests
Intra-class correlation coefficients were calculated to test for reliability.

ICCs showed good to excellent reliability for all tests between:
Days
Raters
Sessions

Same Day: 71-93% inter-rater reliability; 94-99% inter-session reliability.
Different Days: 90-95% for the same rater; 80-82% for different raters.

Average doming strength was 99.96 ± 47.04 N.
Average hallux flexion strength was 65.66 ± 24.5 N.
Average lateral toe flexion was 50.96 ± 22.54 N.

MAIN TAKEAWAYS

The 3 novel tests showed good reliability between testers and on repeated days of measurement.

These are simple tests using relatively low cost equipment which could be used in a variety of situations to compare feet within a subject and/or monitor foot muscle strength changes in a population of interest.

FUNCTIONAL ASSESSMENTS OF FOOT STRENGTH

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Click for Full Text (Bruening et al. 2019)

This study assessed the repeatability and comparability of several functional foot strength assessment techniques.

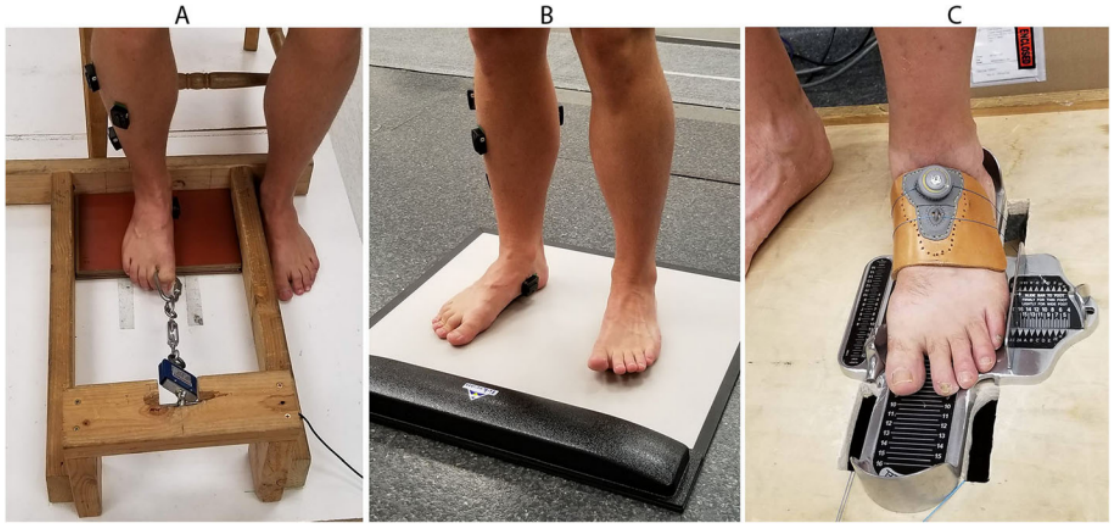

Fig. 1 Three strength testing apparatus were used to create seven strength assessments. **a**) Toe flexion device (GTF and LTF), **b**) Pressure mat (GTP_I, LTP_I, GTP_R, and LTP_R), **c**) Doming (DOM) – the force transducer is in tension underneath the wooden platform

KEY FINDINGS

40 participants evaluated; Electromyography tested isolation
Different measurements:
Toe flexion dynamometer (seated)
Doming dynamometer (standing)
Pressure mat (standing).

Doming: excellent within-session reliability (>94%) but a clear learning effect was present

All toe flexion tests had excellent reliability (> 94.5%).

Seated toe flexion tests using the dynamometer were **moderately correlated to standing toe flexion tests** on a pressure mat.

On the pressure mat, **reciprocal motion appeared to display slightly greater forces and reliability vs. isolated toe flexion.**

MAIN TAKEAWAYS

The toe flexion device is likely better for isolation and assessing changes over time.

The pressure test is more functional and easier for some populations to perform.

Foot strength analysis requires some custom post-processing.

For doming, our novel test could be duplicated in the clinic, but would also require a separate apparatus and software.

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HOW TO EVALUATE AND IMPROVE FOOT STRENGTH IN ATHLETES

Click for Full Text (Tourillon et al. 2019)

This article reviewed current modalities available for foot strength assessment and training and recommends certain foot exercises for performance and injury prevention in track and field.

KEY FINDINGS

Testing should include:

Foot Strength
Medial Arch Height
Navicular Drop
Arch Rigidity Index
Mobility

Exercises/Training (Based on Assessment) should include:

Isometric Strengthening:

Short Foot Exercise, Toe-Posture Exercises, and Tower Curl

Dynamic and Plyometric Foot Strengthening:

Heel Raises & Short Foot with Propulsion

Minimalist or Barefoot Running:

Slowly built up over 10-12 weeks

Neuromuscular Electrical Stimulation (NMES)

Biphasic symmetric regular-wave pulsed currents (85 Hz), 4 sec delivery, 8sec rest; 9 to 12 NMES sessions through 3–5 weeks.

MAIN TAKEAWAYS

The foot core system must act as a strong and rigid lever in order to best transfer lower limbs forces during propulsion.

Variation and progression is necessary and ranges from isometric, concentric to eccentric contraction modes.

Overuse injuries are related to deficits in active foot stabilization during running.

Medial tibial stress syndrome or Achilles tendinopathy are often linked to a lack of stiffness in the medial arch of the foot.

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MEMBERS

We are on a mission to make research more accessible, easier to interpret, and quicker to implement.

Help us by giving 1 minute of your time to leave feedback for us.

We would greatly appreciate any feedback you have, as it helps us continually improve!

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