

The Missing Dimension: Why Bidirectional Evaluation could be a Predictor of Hand Health

Sagar Deshpande¹, Sachin Kale², Mugdha Oberoi³, Ashok Shayam^{4,5}

Learning Point of the Article:

Comprehensive assessment of hand function requires objective evaluation of both grip (flexor) and release (extensor) strength. Bidirectional grip strength assessment represents a promising advancement that may improve diagnosis, rehabilitation monitoring, and functional outcome measurement in orthopaedic and neurological practice.

Hand strength has served as a cornerstone of clinical assessment over decades. Recognized as a reliable indicator of overall muscle function, physical performance, and nutritional status, the handgrip test is a staple in orthopedic, rehabilitation, and geriatric practice [1,2]. It is frequently utilized as an objective outcome measure due to its simplicity and significant prognostic value for functional independence and the diagnosis of sarcopenia [3,4,5]. Yet, despite its ubiquity, our current approach remains surprisingly one-sided. By focusing almost exclusively on the force generated during hand closure, clinical practice has largely overlooked the critical role of the extensor muscles responsible for hand opening [2,3].

Beyond the Squeeze: Limitations of Traditional Assessment

Although the conventional hydraulic and digital hand dynamometers are very reliable and valid, only flexor muscle strength can be quantified during a grip [2,3,4,5,6]. This focus does not give an objective assessment of the function of the extensor muscles, which is necessary for controlled opening of the hand, release of the object and dexterity [3].

This gap may consequently lead clinicians relying on standard

unidirectional instruments to ignore objective extensor weakness assessment or major muscle imbalances despite a patient achieving a seemingly “normal” grip strength score [3,6]. This constraint is particularly relevant for specific populations, including individuals recuperating from:

Orthopedic injuries: Tendon repairs, fractures, and reconstructive hand surgeries where balanced muscle function is critical [2,3].

- Orthopedic injuries: Tendon repairs, fractures, and reconstructive hand surgeries where balanced muscle function is critical [2,3].

- Neurological conditions: Patients with stroke or peripheral nerve disorders who require nuanced neuromuscular recovery data.

- Sports medicine: Athletes needing coordinated grip-and-release patterns for high-level performance [4,7].

The Bidirectional Advantage

Normal hand function requires coordinated flexor and extensor muscle activity, and functional performance cannot be fully understood by looking at one without the other [4].

Author's Photo Gallery



Dr. Sagar Deshpande



Dr. Sachin Kale



Dr. Mugdha Oberoi



Dr. Ashok Shayam

¹Department of Neurophysiotherapy, School of Physiotherapy, Dr DY Patil (Deemed to be University), Navi Mumbai, Maharashtra, India,

²Department of Orthopedics, Dr DY Patil School of Medicine, Apollo Hospital, Fortis Hiranandani Hospital, Navi Mumbai, Maharashtra, India,

³Department of Electrotherapy and Electrodiagnosis K J Somaiya College of Physiotherapy, Mumbai, Maharashtra, India,

⁴Indian Orthopaedic Research Group, Thane, Maharashtra, India,

⁵Department of Orthopaedics, Sancheti Institute for Orthopaedics and Rehabilitation, Pune, Maharashtra, India.

Address of Correspondence:

Dr. Sachin Kale, Department of Orthopaedics, Dr DY Patil School of Medicine, Mumbai, Maharashtra, India.

E-mail: sachinkale@gmail.com

Access this article online

Website:
www.jocr.co.in

DOI:
<https://doi.org/10.13107/jocr.2026.v16.i10.8170>

Submitted: 02/07/2026; Review: 14/08/2026; Accepted: September 2026; Published: October 2026

DOI: <https://doi.org/10.13107/jocr.2026.v16.i10.8170>

© The Author(s). 2026 Open Access. This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (<https://creativecommons.org/licenses/by-nc/4.0/>), which permits unrestricted use, distribution, and non-commercial reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The Creative Commons Public Domain Dedication waiver (<http://creativecommons.org/publicdomain/zero/1.0/>) applies to the data made available in this article, unless otherwise stated.



Bidirectional evaluation quantifies the grip and the opening force and provides a more comprehensive understanding of muscle balance and rehabilitation progress. The approach is in line with the current evidence-based treatment guidelines regarding functional goals rather than isolated strength measurements [8,9].

Innovation in Measurement

The Bidirectional Grip Strength Measuring Medical Device [10] was created to address this clinical requirement. The innovation is unique in that it measures two separate grip strengths (flexor and extensor strength) without the need to have two devices. With configurable bidirectional resistance and real-time force feedback, the device provides a useful and

portable instrument for performing thorough hand examinations in a variety of clinical scenarios.

The Path Forward

Evaluations of functional outcomes and return to work may be enhanced by combining assessments in both directions of flexion and extension [2,6]. Extensive work in establishing normative hand opening and closing reference values could serve as target points to be achieved across demographics [2,7,8]. It would help clinicians to select treatment approaches in line with our understanding of “recovery” as the restoration of a balanced and coordinated functioning that would allow them to have a good quality of life.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflict of interest: Nil **Source of support:** None

References

1. Li EY, Robinson LS, Stockdale C. Establishing the reliability and validity for GripAble: A handheld sensor-based dynamometry device. *Hand Ther* 2025;30:90-9.
2. Lee BJ, Hong HT, Yu GH, Kim KT. Validity and reliability of the InGrip® load-cell handgrip dynamometer compared with the Takei handgrip dynamometer in healthy adults and patients with stroke. *J Korean Med Sci* 2026;41:e147.
3. Desai R, Malavde R, Sawant SS, Palekar T. Validity and reliability of Bluetooth-enabled smart hand dynamometer to measure hand grip strength and pinch strength in healthy young individuals. *Physiother Q* 2026;34:37-42.
4. Karademir F, Uysal Ö, Tüzen Tek Ş, Çakıryılmaz EM, Fırat T. Hand size reduces the reliability of K-Force® grip dynamometer. *Hand Ther* 2025;31:22-8.
5. Kanauchi Y, Murase T, Nishiwaki M, Odagiri M, Wanezaki Y, Ishikawa H. Study of reliability and validity of the load cell-type hand dynamometer compared to the Jamar dynamometer and the number of reliable grip strength measurements. *J Hand Surg Asian Pac Vol* 2023;28:562-72.
6. Myers EJ, Dominguez DS, Guigliano ME, Mallory MG. Comparison of the BTE Tech EVJ handgrip to the Jamar hand dynamometer for measuring grip strength. *Technol Disabil* 2021;33:1-7.
7. Sartorio F, Lippi L, Vercelli S, Gallo F, Zanin D, Bergesio S, et al. Reliability and validity of the hand-held dynamometer “NOD”: A new instrument for assessment of isometric grip strength. *BMC Musculoskelet Disord* 2025;26:5.
8. Cruz-Jentoft AJ, Bahat G, Bauer J, Boirie Y, Bruyère O, Cederholm T, et al. Sarcopenia: Revised European consensus on definition and diagnosis. *Age Ageing* 2019;48:16-31.
9. American Society of Hand Therapists. Clinical Assessment Recommendations. 4th ed. Mount Laurel, NJ: American Society of Hand Therapists; 2021.
10. Deshpande S, Kale S, Patnaik J, Hiwrale N. Bidirectional Grip Strength Measuring Medical Device. Indian Industrial Design Application No. 441495-001. Kolkata: Indian Patent Office; 2024.

Conflict of Interest: Nil
Source of Support: Nil

Consent: The authors confirm that informed consent was obtained from the patient for publication of this article

How to Cite this Article

Deshpande S, Kale S, Oberoi M, Shayam A. The Missing Dimension: Why Bidirectional Evaluation could be a Predictor of Hand Health. *Journal of Orthopaedic Case Reports* 2026 October;16(10): 14-15.

