Clinician's Commentary on Keep et al.[1]

Quantification of hip extensor strength is often of interest to physiotherapists, as strength deficits are associated with conditions such as low back pain and hip osteoarthritis and may lead to impairments in physical functioning. Physiotherapists typically use manual muscle testing to assess muscle strength, but this grading scale is somewhat subjective and may fail to detect small changes in strength that are nevertheless clinically significant. There is an ongoing push in the physiotherapy community to adopt more objective, sensitive, and specific outcome measures, both to instil greater confidence in our assessment findings and to better evaluate treatment effectiveness. Handheld dynamometry (HHD) provides a more objective measure of strength that is portable, relatively inexpensive, and easy to use. Because the resulting value is on a continuous measurement scale (i.e., kilograms or newtons), HHD may allow us to better to detect strength changes over time in response to muscle training or disuse.

Before HHD is adopted into clinical practice to quantify muscle strength, we must first have evidence that its results are both valid and reliable. While investigations into the use of HHD to quantify hip extensor strength have typically positioned patients in prone, Lu and colleagues[2] have suggested that the "prone standing" position may be more appropriate. In this position, the patient stands with the upper body supported by a plinth and the standing leg, while the leg being tested is positioned in 45° of hip flexion and knee extension. Compared to prone lying, this position optimizes the length–tension curve of the hip extensor musculature and more closely mimics the functional tasks likely to be affected. Keep and colleagues' study, which investigated the validity of hip extensor strength measurements obtained in the prone standing position using HHD, found moderate correlations ($r = 0.51$) between values obtained with HHD and those obtained with an isokinetic dynamometer.[1]

Studies such as Keep and colleagues', although often overlooked by physiotherapists, are integral to the advancement of our field. So what can we take from the current study? When HHD is widely integrated into clinical practice in the near future, should we adopt the prone standing position over the prone position when testing hip extensor strength? Certainly, Keep and colleagues have generated sufficient evidence to demonstrate that HHD in the prone standing position produces a valid measure of hip extensor strength.[1] Furthermore, testing in this position seems to be more functionally relevant, as the patient is in a modified upright position with the hip being tested in flexion. Because most functional deficits will manifest in standing activities (e.g., stair climbing, walking) and will involve hip extensor activation at some degree of flexion, prone standing does seem to be a more logical choice than prone lying. However, other factors must also be considered.

People who are likely to have hip extensor strength deficits (e.g., those with low back pain) may not have sufficient range of motion to allow the degree of lumbar flexion required for prone standing, and for those who do have the necessary range, the prone standing position may provoke pain. Further, for people with balance deficits or dizziness, the prone standing position may compromise safety. In such cases, it may be preferable to test hip extensor strength in prone lying.

Other studies have reported higher peak values of hip extensor strength when testing was performed in hip flexion, as opposed to neutral position.[3] Because prone standing positions the hip in flexion, there may be occasions when or populations in which even weakened hip extensor strength in prone standing overpowers tester strength (e.g., when testing athletes). This is even more likely given the lunge position that the physiotherapist must adopt to apply resistance to a patient positioned in prone standing; when the patient is in the prone position, the physiotherapist can apply a more vertical force, and can easily adjust plinth height to incorporate more body weight into the resistance force if necessary.

We must also consider the minimal detectable change, that is, the amount of change required to be sure that a real change in strength has occurred outside of measurement error. Knowing this value is essential to the correct interpretation of our assessment findings. For example, it is well known that goniometry range of motion measurements may be associated with 10° of error;[4] we therefore know that changes in range of motion $<10°$ are likely not meaningful. Although Keep and colleagues established a minimal detectable change for strength values obtained using HHD in prone standing, the value established represents the minimal change required to be sure that a real change has occurred when strength is re-tested within the same session. Because changes in muscle strength resulting from adaptations in the number and size of muscle fibres are not expected to take place within a single session, clinicians are most interested in the ability to detect strength changes between sessions on different days. Keep and colleagues' methods do not account for error resulting from changes in patient position, dynamometer position, and/or patient performance between days. Before HHD using the prone standing position can be adopted into clinical practice, therefore, further research investigating the between-day error is required.

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