

## Intra-and inter-reliability of lower extremity muscle strength measurements using a hand-held dynamometer with and without a stabilization strap

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### ABSTRACT

Study's purposes: 1) determine the intra-and inter-tester reliability of the HHD with and without a stabilization strap for measuring quadriceps and hamstring strength, and 2) compare quadriceps and hamstring strength values obtained using a HHD with and without a stabilization strap. We hypothesized that intra- and inter-tester reliability would be improved with a strap, and muscle strength measured with a strap would be different than when measured without a strap. 24 men and women (Mean age:  $27.87 \pm 2.22$  years). 2 trained entry-level students of physical therapy measured participants' quadriceps and hamstring strength in the seated position using the same test procedures. Each of the testers performed the tests under 2 conditions: 1) securing the HHD to the lower leg just proximal to the medial and lateral malleoli on the anterior aspect for knee extensors, and posterior aspect for knee flexors, using a strap affixed to an immovable object, and 2) stabilizing the HHD manually in the same locations as for condition 1. Two trials were performed for each test condition and the order of testing under the 2 conditions randomized. One tester repeated the tests under both conditions after a 20 min rest to assess intra-tester reliability. Intra-tester reliability for measuring knee flexion and extension using a HHD with strap stabilization was excellent ( $ICC_{3,2} = .93$  and  $.94$ , respectively). Intra-tester reliability of measurements taken without strap stabilization for knee flexion and extension was also excellent ( $ICC_{3,2} = .90$  and  $.91$ , respectively). Inter-tester reliability for measuring knee flexion and extension using the HHD with a strap was good ( $ICC_{2,2} = .87$  and  $.88$ ) while inter-tester reliability without a stabilization strap was poor ( $ICC_{2,2} = .71$  and  $.54$ , respectively). A dependent t-test showed no significant difference between hamstring strength values when taken with and without a strap ( $t = -1.52$ ,  $p = 1.41$ ) but quadriceps strength values obtained with a stabilization strap were significantly greater ( $t = 5.93$ ,  $p < .001$ ) than measurements taken without a strap. A HHD can be used effectively by a single tester to measure quadriceps and hamstring strength with or without a stabilization strap. When different testers are used however, a strap is needed to get consistent measures.

