TACSM Abstract

Reliability of Unilateral Isometric and Dynamic Leg Press Force and Power

JAMES P. PRESLEY, TOMAS J. CHAPMAN-LOPEZ, JULIANNA M. DEAN, KIRK L. ENGLISH, MARK A. SOMMER II, ZACHARY D. VON RUFF, and WILLIAM E. AMONETTE

Exercise and Nutritional Health Institute; Department of Clinical Health and Applied Sciences; University of Houston-Clear Lake; Houston, TX

Category: Undergraduate

Advisor / Mentor: Dean, M. Julianna (deanj@uhcl.edu)

ABSTRACT

Strength and power are critical components of athletic performance. Athletes commonly perform sport-specific movements off a single leg, but there are few reliable, easily administered unilateral leg force and power assessments. **PURPOSE:** To determine 1) the reliability of unilateral leg press maximal isometric force (MIF) and peak power tests and 2) the percentage of MIF that elicits unilateral peak power during a dynamic throw. We hypothesized that the tests would be reliable for the assessment of unilateral MIF and peak power and that unilateral peak power would be achieved at 50% of MIF. **METHODS**: Eighteen apparently healthy, recreationally active adults (17M: 1F; 27.4 ± 5.0 years; 1.78 ± 0.01 m; 93.5 ± 22.5 kg; 3159 ± 807 N bilateral MIF) completed three testing sessions. After a brief standardized warm-up, each subject performed three maximal unilateral isometric leg presses (MIF) with each leg at 90˚ of knee flexion on a modified leg press sled equipped with a force plate, linear encoder, and magnetic brake. Subsequently, the sled was unlocked and loaded in ascending fashion with 30%, 40%, 50%, 60%, and 70% of MIF; with an initial knee angle of 90°, subjects used maximal effort to throw each load twice, unilaterally, with each leg. Subjects rested and reset for 10-30 s between efforts. Data were sampled at 300 Hz, low pass filtered at 4 Hz, and peak instantaneous power (W) was calculated for each throw using the measured sled force and velocity. Intraclass correlation coefficients (ICC) were computed for the highest force and power repetition at each load across the three sessions. The ICC (95% CI) and peak power output were determined for both right and left legs. ICCs were considered excellent if ≥ 0.95, high if ≥ 0.90, good if ≥ 0.80, fair if ≥ 0.70, poor if ≤ 0.70, and very poor if ≤ 0.40. **RESULTS:** MIF showed good reliability between sessions [ICC: 0.85 (0.62, 0.94; left leg); 0.86 (0.58, 0.95; right leg)]. Unilateral peak power also showed good to high reliability between sessions across all loads: ICC (left leg) 30%: 0.91 (0.81, 0.96); 40%: 0.91 (0.81, 0.96); 50%: 0.95 (0.88, 0.98); 60%: 0.93 (0.86, 0.97); 70%: 0.81 (0.64, 0.92); (right leg) 30%: 0.95 (0.89, 0.98); 40%: 0.94 (0.87, 0.97); 50%: 0.92 (0.84, 0.97); 60%: 0.92 (0.84, 0.97); 70%: 0.90 (0.80, 0.96). Across all three sessions, peak power by the left leg was achieved at: 30% (11 of 18 participants); 40% (6 of 18); 50% (1 of 18). Peak power by the right leg was achieved at: 30% (13 of 18 participants); 40% (4 of 18); 50% (1 of 18). **CONCLUSION:** Unilateral leg press MIF and peak power can be reliably assessed with a modified leg press equipped with a force plate, linear encoder, and magnetic brake in a recreationally active population. Sport teams and coaches can use single leg isometric presses and throws as reliable methods to test their athletes' unilateral force and peak power, respectively, with loads of 30-50% MIF appropriate for peak power measurement.