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Relationship Between Isometric Inter-Limb Asymmetry and Strength of the Lower Extremity in Military Personnel

Lily J Rosenblum, Evan D Feigel, Dakota Tiede, Kelly H Mroz, Todd J Stefl, Jennifer N Forse, Catherine R Gage, Kristen J Koltun, Mita Lovalekar, Brian J Martin, Bradley C Nindl, FACSM. University of Pittsburgh, Pittsburgh, PA

Isometric (IM) muscle force measures for single and multi-joint assessments have been previously measured using isokinetic machine and hand-held dynamometry in military personnel. Differences between the left and right limbs (inter-limb asymmetry, ILA) are expressed using equations with cutoffs indicative of performance decrement and increased injury risk. Recently, there has been an increase in the usage of portable fixed dynamometry to assess single-joint ILA (sILA) as well as multi-joint ILA (mILA) on force plates via the IM mid-thigh pull (IMTP). However, the relationship between sILA and mILA has yet to be investigated utilizing these techniques. **PURPOSE:** To assess the correlation of the peak force and magnitude of sILA IM methods using portable fixed dynamometry compared to the mILA using the IMTP in military personnel. **METHODS:** 22 men (age: 30.3±4.9 years, height:178.6±7.7 cm, weight: 86.0±9.9 kg, body fat percentage:16.9±5.4 %) volunteered. Single joint peak force and sILA were assessed with a portable fixed dynamometer where participants produced 3-5 second maximal IM contraction in the ankle plantar- and dorsi-flexor (ankle DF, PF), knee extensor and flexor (knee EXT, FLEX), and hip ab- and ad-ductor (hip AB, AD) muscle groups. An IMTP implemented with dual force plates captured multi-joint peak and mILA force data from 3-5 s maximal IM contraction for at least 2 reps. Peak force from both techniques was normalized to body mass (N/kg). ILA was expressed as ((right limb peak force – left limb peak force)/(greatest limb peak force)). A composite score of all sILAs was reported as the mean of all sILAs and reported as a single score, which was compared with the IMTP mILA. Spearman's correlation coefficients (ρ) were conducted to estimate the association between sILAs and mILAs (α= 0.05, 2-sided). **RESULTS:** All single-joint peak force values, except ankle DF, were significantly associated with IMTP values, (ankle PF; ρ=.499, p=0.018, knee FLEX; ρ=.688, p<0.001, knee EXT; ρ=.483, p=0.023, hip AB; ρ=.668, p<0.001, hip AD; ρ=.462, p=0.030). None of the individual sILA analyses were significantly correlated with IMTP mILA, but sILA composite was positively correlated with the IMTP (r=.469, p=0.028). **CONCLUSION:** A composite sILA score may have utility in associating all the joints compared to isolated percentiles, given that the IMTP is a multi-joint test. **SIGNIFICANCE/ NOVELTY:** These methods allowed for field-expedient and standardized sILA and mILA testing. These results demonstrate the relationship between peak single and multi-joint force tests that appear to be moderate to strongly correlated. However, ILA between the single and multi-jointed techniques do not appear to be related. Task specific techniques may be warranted for a more appropriate evaluation of performance and injury risk.

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