ASSESSMENT OF GLUTEUS MEDIUS MUSCLE STRENGTH USING A HAND-HELD DYNAMOMETER AND TWO MEASURES OF PELVIC DISPLACEMENT DURING SINGLE-LIMB STANCE

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All subjects were voluntary participants and were made fully aware of the testing procedures before they began, and remained anonymous throughout all testing and analysis procedures. The study was approved by the Mayo Clinic IRB on 5/28/2014.

Disclosure of funding: No funding

BACKGROUND AND PURPOSE: Several methods exist for estimating strength of the hip abductors. The hip abductors are highly active during the stance phase of gait making lateral displacement deviations of the trunk and pelvis observable if abductor weakness is present. The purpose of this study was to determine if relationships exist between a lateral and angular displacement measurement of the pelvis during single limb stance (SLS) and a dynamometer reading of hip abductor muscle strength. Furthermore, we sought to identify changes in hip abductor muscle strength with age and gender.

METHODS AND MATERIALS: This study used two designs: cross-sectional, studying a stratified group and correlational, examining the relationship between hip abductor force using different methods. There are 105 subjects, 10 of each gender in each decade, ages 20-79. Two trials of the Trendelenburg test, manual muscle test with digital dynamometer, and lateral displacement measurements were taken for lower extremities, bilaterally.

ANALYSES: Descriptive statistics for isometric muscle strength of the hip abductors were calculated bilaterally and normalized to body mass. Test-retest reliability coefficients were estimated with two-way mixed effect model of the intra-class correlation coefficient for the three testing methods examined. Data was subsequently analyzed with two-way analyses of variance (ANOVA) comparing genders and ages, with post hoc Bonferroni corrections for multiple comparisons (a = .05). The data were analyzed with IBM SPSS 21.0 software.

RESULTS: There was a weak correlation between both linear ($r = 0.19$) and angular displacements ($r = 0.22$) of the pelvis during single limb stance and hip abductor muscle force. Intra-tester reliability of hip abductor muscle strength with hand-held dynamometer was very high (ICC 0.96). Intra-tester reliability of the linear and angular measurements was 0.86 and 0.88, respectively. Hip abduction strength was greater in younger than older participants ($p<0.001$) and, on average, was 10% greater in male than female participants ($p=0.045$).

CONCLUSIONS: Hand-held dynamometry is clinically applicable for estimating hip abductor muscle strength in healthy participants whose ages range between 20 and 79-years. Hip abduction strength is greater in younger populations, and also, on average, is greater in males.

IMPLICATIONS: Physical therapists should be aware that hip abductor muscle strength decreases with age in men and women. Manual muscle testing of hip abductors using a hand held dynamometer is preferable to functional tests and the utilization of a belt is recommended to eliminate tester error associated with examiner muscle strength.