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Effect of Pelvic Inclination on Dynamic Equilibrium

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PURPOSE: Determine the effect of pelvic inclination (measured in the sagittal view) on the displacement of the center of force (COF). **METHODS:** Two groups of 10 healthy college age females were evaluated, selected based on sagittal view pelvic inclination of either pelvic neutral of 0-5º or pelvic inclination of >10º as measured by digital photography. Subjects had to squat to 60º of knee flexion in two seconds (1 sec. flexion, 1 sec. extension) with visual (knee displacement on oscilloscope) and auditory (metronome) feedback to insure precision. Three trials of force data were collected (40 Hz) using TekScan pressure mat (MatScan) and software (F-Scan version 5). Foot position was traced to ensure the same position for the pelvic inclination measurement and the squat. COF displacement was quantified for the whole body (WB) and for the two feet separately (R vs. L). In both quantifications, three variables were measured: area, distance, and variability. Area (A) estimated how much "ground" was covered by the COF during the squat using the X and Y excursions and the formula for an ellipse. Distance (D) reflects the total distance traveled by the COF, while variability (V) gives the amount of variation in distance from one point to the next. For the WB quantification, groups were compared using a t-test, while the R vs. L quantification allowed comparisons using a groupXside factorial ANOVA with repeated measures on the last factor. **RESULTS:** WB quantification revealed significant differences ($p<0.05$) for A and V. The following differences were found for the R vs. L quantification: no differences for A, D showed significant side ($F_{1,18}=6.82$, $p=0.02$) and groupXside interaction ($F_{1,18}=6.01$, $p=0.02$) differences, and V showed all main effects (group $F_{1,18}=10.93$, $p=0.004$, side $F_{1,18}=12.68$, $p=0.002$) and groupXside interaction ($F_{1,18}=12.25$, $p=0.03$) to be different.

CONCLUSION: These findings suggest that mechanical differences at the pelvis, as defined by pelvic inclination, may influence the body's strategy in managing COF. This may warrant consideration in injury prevention.