A Lack of Correlation between Static and Dynamic Measures of Postural Stability

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Context: Static balance has been used to assess postural stability (PS) and potential predisposition to injury; yet, female athletes, who are at greater risk for noncontact anterior cruciate ligament injury (ACL), demonstrate better single-leg static balance than male athletes. A dynamic functional assessment of balance seems indicated although the relationship between dynamic and static measures of PS has yet to be quantified. **Objective:** To determine if a relationship exists between static and dynamic single-leg measures of PS in physically active females. It is hypothesized that no relationship exists. **Design:** Descriptive, correlational study. **Setting:** University sports medicine laboratory. **Participants:** A total of eight physically active females (age: 21.5±0.8yrs, mass: 62.3±7.9kg, height: 165.6±5.4cm) volunteered. Subjects reported no history of lower extremity surgery and no lower extremity injury within six months prior to testing. **Interventions:** Postural stability was assessed using two static single-leg balance tasks (eyes open and eyes closed), and two dynamic balance tasks (anterior-posterior (AP) and medial-lateral (ML) jump). Static balance included right leg stance with hands on hips. Dynamic balance included a double-leg jump, single-right leg land, and attempt to stabilize quickly on one leg. Once stabilized subjects placed their hands on their hips and maintained single-leg balance for an additional 10s. Jumps were performed over a 12" (AP jump) or 6" (ML jump) hurdle placed halfway between the force plate and a jump distance normalized to % subject height, 40% for AP and 33% for ML. Vertical, AP and ML ground reaction forces (GRFs) were collected using a force plate. For static balance, standard deviation (stdev) for each GRF was averaged across three 10 s trials. For five dynamic balance trials, mean postural stability indices were calculated using GRFs identified within the first three seconds post initial contact. Index calculations are as follows: AP stability index (APSI) = $[\sqrt{(\sum(0\text{-}GRFx_i)^2)}]$/body weight, ML stability index (MLSI) = $[\sqrt{(\sum (0\text{-}GRFy_i)^2)}]$/body weight, vertical stability index (VSI) = $[\sqrt{(\sum (\text{body weight}\text{-}GRFz_i)^2)}]$/body weight. A series of 12 bivariate correlations were computed between the vertical, AP, and ML measures across dynamic and static balance assessments. An alpha level of 0.05 was set a priori to determine significant correlations. **Main Outcome Measures:** Dependent variables for the dynamic balance tasks included APSI, MLSI, and VSI and for the static balance tasks included AP stdev, ML stdev, and vertical stdev. **Results:** None of the 12 computed Pearson correlation coefficients achieved statistical significance (p-value range=.06 to 0.937, correlation coefficient range= - 0.44 to 0.69). **Conclusions:** The results of this study indicate that no relationship exists between the static and dynamic measures of PS tested suggesting that a dynamic assessment of PS may be a more functional assessment for risk of ACL injury.