

Sex Differences in Postural Control During and Following an Attentional Focus Balance Training Intervention in Older Adults with Elevated Fall Risk

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Context: Compared to their male counterparts, females age 65 and older are at a greater risk of sustaining severe fall related injuries. Balance training is beneficial for reducing fall rates in older adults; however, limited evidence exists regarding sex-related differences in response to balance training using instructional cues. Such data is important for designing sex-specific balancing training intervention to reduce fall related disability in older adult females. **Objective:** To examine sex differences during and following a 12-week balance training intervention with attentional focus instruction. We hypothesized that regardless of attentional focus group, females would demonstrate superior static postural control at baseline with no differences between sexes in the rate of learning or retention during or following the intervention, respectively. **Design and Setting:** This study utilized a cohort design and took place in independent living communities and fitness facilities in Greensboro, NC. **Participants:** Participants N=53 (37 females, 16 males, 80.70 ± 6.19 yrs.) who reported falling during the previous 12 months were enrolled in the 12-week balance training intervention and assigned to either an internal focus (IF) or external focus (EF) group. **Interventions:** Participants completed 20 minutes of balance training on a wobble board, twice per week for 12 weeks. The EF group was instructed to “focus on keeping the board parallel to the floor”, while instructions for the IF group were “focus on keeping your feet parallel to the floor”. **Outcome Measures:** Outcomes were assessed during the intervention at weeks 0, 6, and 12, and during retention at weeks 13, 16, and 20. Static postural control was assessed via force plate center of pressure (CoP) during bi-pedal stance with hands on hips and eyes closed for 3, 20-second trials. Average pathlength (PL), CoP resultant velocity, and sample entropy of CoP resultant velocity were calculated at each time point. Dynamic postural control was assessed on a wobble board equipped with an inertial measurement unit (IMU) and is reported as mean velocity and acceleration in the anterior posterior (AP) and medial lateral (ML) directions. Piecewise linear growth models assessed sex and treatment effects on individual growth trajectories of outcome measures during the intervention and retention periods. **Results:** Sex significantly predicted baseline PL ($\beta = -17.07$, $p = .004$) and CoP resultant velocity ($\beta = -.001$, $p = .026$) with females (PL: 35.83 ± 3.91 cm, CoP velocity: 0.0026 ± 0.0003 m/s) demonstrating shorter pathlengths and lower velocities compared to males (PL: 55.54 ± 14.90 cm, CoP velocity: 0.0042 ± 0.0009 m/s). A time by sex interaction was observed during the intervention for mean velocity ($\beta = .002$, $p = .006$) and acceleration ($\beta = .192$, $p = .002$) in the ML direction, with females demonstrating higher values. A time by sex interaction was also observed during retention for mean acceleration AP ($\beta = .083$, $p = .019$), with females showing higher acceleration. **Conclusions:** Females demonstrated superior static postural control at baseline and less favorable dynamic postural control during and following balance training regardless of instructional cues. The differing training response by sex suggests that compared to males, females may have difficulty reacting to external postural perturbations; thus proposing the need for unstable surface training to reduce fall related disability in older adult females.