Disturbed proprioceptive weighting during postural control in pregnant women compared to non-pregnant controls.

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BACKGROUND AND AIM: Falling during pregnancy can seriously harm mother and child, and should thus be avoided. However, 1/4 women report falling during pregnancy. Pregnant women show a decreased postural balance (i.e., greater sway variability and velocity), particularly during the second part of pregnancy. Unfortunately, the underlying mechanisms are poorly understood. Postural balance depends greatly on proprioceptive inputs from e.g., ankle and lumbar muscles. Depending on the postural condition, the brain will adjust the weight assigned to these inputs. For example during standing on unstable support surfaces, healthy individuals up-weight lumbar proprioception and down-weight ankle proprioception. So far, it remains unclear whether the weighting of ankle and lumbar proprioception during postural control differs in pregnant compared to non-pregnant women.

METHODS: We recruited 12 pregnant, multiparous women in the third trimester, and 20 non-pregnant women. Exclusion criteria were a history of surgery/major trauma to spine, pelvis or lower limbs; specific balance or neurological disorders; and acute ankle problems. All women stood on a force plate (AMTI), with the heels 20 cm apart and vision occluded. After 20 s, muscle vibration (60 Hz, 15 s) was applied to the ankle or lumbar muscles. A stable and unstable support surface was used. Center-of-pressure (COP) displacements during vibration, and the Relative Proprioceptive Weighting (RPW) ratio, a measure of ankle vs. lumbar proprioceptive dominance, were calculated. Group differences in age, and pre-pregnancy BMI were determined with Mann-Whitney U tests, differences in COP displacement during vibration, and RPW ratio with mixed-design ANOVAs with "Surface" as the within-subjects factor, and "Pregnant" as the between-subjects factor.

RESULTS: Pregnant women were significantly older (31 (30-34) vs. 28 (27-30) years, p= 0.004), and reported lumbopelvic pain more often (7/12 vs. 1/20, p= 0.002) than the non-pregnant controls. Prepregnancy BMI did not differ between groups (23.3 (21.4-27.2) vs. 22.4 (21.1-23.8), p= 0.219). For COP displacement during lumbar muscle vibration, a significant interaction effect of "Pregnant x Surface" was found (F= 8.157, p= 0.009). Post-hoc tests showed a significantly larger COP displacement during lumbar muscle vibration on the unstable compared to the stable support surface in the non-pregnant women (p< 0.001), but not in the pregnant group (p= 0.065).

CONCLUSIONS: While non-pregnant women adequately up-weighted lumbar proprioception when switching from the stable to the unstable support surface, pregnant women did not show this increase in reliance on lumbar proprioception when needed. Future research must determine whether this decreased ability for proprioceptive re-weighting in pregnant women is already present in early pregnancy or even before conception, and whether it correlates to the presence of lumbopelvic pain and an increased risk of falling.

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