POSTURAL LOADING, SACRAL ORIENTATION AND AGE INFLUENCE SEX-DIFFERENCES IN LUMBAR FUNCTIONAL MORPHOLOGY AND HEALTH [1]


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This dissertation explores sexual dimorphism in the human lumbar spine by applying evolutionary theory to understanding variability in lumbar functional morphology and health risks between sexes. Three separate studies were designed to examine how lumbar lordosis (LL) differs between sexes, how sacral orientation differs between sexes, how LL develops in juveniles in relation to sacral orientation, and how age-related changes in lumbar motion and stabilization differ between sexes. Results from this body of work showed that females had greater LL than males, but only in standing posture and not in supine posture. Additionally, vertebral bodies were more lordotically wedged in females than males. For sacral orientation, sacral slope was greater in females than males and pelvic incidence (PI) did not differ by sex. In juveniles, while LL increased with age, PI did not change with age. We found PI is predictive of adult LL. These results may allude to there being higher joint laxity in females that could cause higher standing LL in females than males amid no differences in PI between sexes. Age-related lumbar conditions, like degenerative spondylolisthesis are greater in females and positively relates to LL and spinal instability. Lumbar intervertebral motion in the sagittal plane differed by sex with males having a greater range of flexion and females having a greater range of extension, which may indirectly relate to sex differences in LL. Furthermore, age-related decreases in lumbar intervertebral motion were greater in females than males, and sex differences in intervertebral translation revealed motion indicative of spondylolisthesis at L4-L5 in females but not in males. These results support that there are sex differences in the lumbar spine with females having greater LL and a greater risk of related orthopaedic conditions. Whether there is a functional purpose for greater LL in females remains unclear, but joint laxity appears to be a factor.