Evaluation of Gait Development Trajectory in Mice

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Background/Objective: Movement and walking are huge facets in how we go about our lives and experience the world. Gait is compromised in numerous conditions, from injury and chronic pain to neurological conditions and arthritis. Movement biomechanics have therefore been studied extensively in humans for decades. Although animal models are often used to examine the progression of various health conditions, translational gait research in animal models are less complete, and there is limited information on gait changes as mice grow.

Methods: We recorded video segments of wild-type C57Bl/6J mice during skeletal growth (5 weeks to 16 weeks) walking (n = 4 Female, n = 2 Male) at 20 cm/s on the DigiGait system, a transparent treadmill equipped with a high-speed camera. Videos captured a ventral view of the mouse and were processed using DigiGait Analysis software, which uses local thresholding and position-finding algorithms to examine paw placement on the treadmill belt. Manual adjustments were made to eliminate artifacts and confirm heel-strike and toe-off times. After these corrections, the software returns stride parameters that were compared between sexes.

Results: Over 30 gait metrics, including stride length, frequency, stance/swing times, and stance width, were calculated for all four limbs per animal for several time points. Stride length increased from 4.5 ± .5 cm at week 5 to 5.0 ± .8 cm at week 16, and frequency decreased from 4.6 ± .6 to 4.2 ± .6 steps per second. No notable changes in stance width, symmetry, or stance/swing ratio were identified.

Conclusion and Potential Impact: Future directions for this research include conducting a principal component analysis to investigate the variability within the gait data. Identifying trends in gait parameters will help create a more complete picture of gait maturation. Establishing this baseline data allows for its comparison against treatment groups and the potentially meaningful investigation of translatable therapeutics and interventions.