

Most of us do not give much thought to how we walk – it is generally an automatic process for most healthy people. However, a knee injury, stroke, or arthritis will cause one to think more about walking and the mechanisms by which it is performed. **DigiGait™** simplifies kinematic observations and analyses by imaging the animals from below a transparent treadmill. The **DigiGait™** Imaging System generates numerous indices of gait dynamics and posture. But how are these metrics determined, and what do they mean? The questions below are meant to help you think about gait and how characteristics of human walking may be reflected by the walking of laboratory animals. Answering the questions below, moreover, will increase your knowledge of how DigiGait works and which/how metrics might be affected under various conditions. Note: most of the answers can be found in blogs posted on the Mouse Specifics, Inc. website.

1. Which changes more dramatically when running, your swing time, or your stance time?
2. Is the swing duration of the forelimbs more, less, or about equal than the swing duration of the hind limbs in a normally walking mouse?
3. Describe the qualitative differences in the gait signals of the forelimbs compared to the gait signals of the hind limbs. Comment on how these differences relate to the functional roles of forelimbs and hind limbs in rodent locomotion.
4. Which limbs are primarily responsible for accelerating the animal in the forward direction?
5. Will stance duration be shorter or longer in a slow moving animal, compared to a faster moving animal?
6. Sketch a plot of how the stance/swing ratio might look as a function of walking/running speed.
7. What is meant by stride frequency?
8. What is the mathematical relationship between stride length, stride frequency, and walking or running speed?
9. What is meant by “girdle” when talking about a person’s limbs? Which girdle is wider in you?
10. Imagine you have been standing for a long time, watching a baseball game or at a religious service. Are you more likely to decrease or increase your stance width, for comfort and support?
11. When you walk at an average speed, say to a meeting down the hall, would you say your steps are fairly regular, or are they variable?
12. When you walk leisurely, say in the park with a spouse, friend, or child, would you say your steps are fairly regular, or are they variable?
13. What is meant by the metric “stance width variability”?
14. Would you expect the paw placement variability to be increased or decreased in a mouse that has consumed a lot of alcohol?
15. What is the difference between step angle variability, and step angle CV%?
16. When a person falls down, what does he/she do instinctively with his/her arms?
17. When a person runs fast, what role do the thigh and calf muscles play in moving the subject forward?

18. Do you, personally, walk with your toes pointed towards each other, out away from each other, or neither?
19. Draw a sketch to indicate how the step angle is determined.
20. Imagine you and a friend are late for a train and you need to go faster – by what mechanisms are you able to walk faster or run?
21. Now imagine that your friend has to carry a bowling ball with her, yet you both get to the train together...how might her gait have been affected?
22. Study the palms of your hands....would you say the surface area of your hands is larger or smaller than the surface area of the bottom of your feet?
23. Spread your fingers apart, then close your fingers together.? Repeat with your feet and toes. What differences do you note?
24. Imagine you are at the circus, entertained by one who walks across hot coals. Would you say his foot area variability is high or low?
25. What happens to shared stance time as a subject increases its walking speed?
26. What is meant by “Double Support CV%”?
27. How might the Stance Factor be affected in mice with amyotrophic lateral sclerosis?
28. How is gait symmetry affected in a rat recovering from spinal cord injury?
29. What might an increase in the Max dA/dt indicate?
30. In a limping animal, how might the Min dA/dt be affected?
31. When you walk, about how many strides per second do you perform?
32. How many strides does a laboratory mouse take each second, approximately?
33. If your camera captures images at a rate of 150 frames per second, estimate how many images comprise a movie of a mouse walking 24 strides at a speed of 40 cm/s?
34. Which do you think will be more greatly affected in a rat with osteoarthritis in the left knee – Axis Distance or Midline Distance?
35. We are all familiar with footprints in the snow or in the sand at the beach. How does DigiGait determine the equivalent, reflected by the metric “Paw Overlap Distance”?
36. What dimensions are used to calculate the SFI?
37. Which anatomical feature from answer 36 has the largest impact on the magnitude of the SFI?
38. Why is capturing images of brown mice more difficult than capturing images of white mice?
39. How might the gait be affected in animals walking down hill vs. horizontally?
40. If a catwalk type apparatus enables you to obtain data from a mouse walking across the platform inconsistently for a handful of strides, vs. DigiGait which empowers you to have the mouse run up an inclined treadmill at a known speed for numerous strides, which test do you believe would provide you more useful information? Why?