

Gait Testing

The Importance of a Balanced Gait

Gait refers to the pattern of movement of your limbs during locomotion, or simply put, your manner of walking, stepping, or running. Like our fingerprints, each person has a unique gait specific to their own height, weight, and range of motion. But while each human gait may look different, they all function under one universal principle – **a gait is most efficient when it is perfectly balanced.**

The relationship between balance and efficiency is simple: the less energy the body has to spend correcting and compensating for asymmetry, the more energy it will have to use toward propulsion. If you become unbalanced (for example, limping due to a foot injury) it will require more effort to walk at 3mph than it would to reach the same speed if you were functioning at 100%. Since efficiency of movement is the goal for all humans, a balanced gait is therefore largely important.

But how do we know if our gait is balanced? Sometimes we can tell just by looking - if an asymmetry is large enough it will have an outward physical effect on gait. Severe gait irregularities like limps are clear signs that someone's body is compensating for an underlying imbalance. But when the imbalance is less severe, it becomes much harder to detect with subjective data alone.

This is where OptoGait comes in - by walking through an OptoGait system at a constant speed we are able to gather real-time data on all the parameters of gait and make instant comparisons of the left and right sides. The more balanced the person, the smaller the difference in side-to-side data will be for each parameter. Non-zero differentials indicate quantifiable imbalances that may not have been detected by the human eye.

We now have a full objective understanding of whether any underlying asymmetries exist, exactly which parameters are bearing the asymmetries, and during which phase of the gait cycle these asymmetries are most prominent. If our bodies are not perfectly balanced, we have an exact roadmap of what needs to be improved in our quest for maximum efficiency.



Your Biomechanical Footprint

The data collected from this test gives you a clear understanding of your body's underlying mechanics. We call this your Gait Print - your biomechanical footprint. Tracking your Gait Print over time can help in a number of different ways:

Injury Prevention:

Large changes in differential readings let us know that something is not functioning properly and that adjustments must be made before the asymmetry leads to injury.

Health Check:

Research has come to show that small changes in gait may be an early detector of Alzheimer's Disease. By

tracking these numbers in the elderly, we may be able to improve and lengthen their quality of life.

Checking Footwear:

All footwear should be helping your gait, not hurting it. If your Gait Print worsens with shoes on, they should not be worn - especially when training.

Lengths	Step length [in]	Left	2' 04.9"± 1.1" (CV 3.9%)
		Right	2' 03.2"± 1.1" (CV 4.0%)
		Diff.	5.7%
	Stride length [in]		1yd 01' 08.1"± 1.1" (CV 1.9%)

Gait parameters	Stance phase [%]	Left	68.5±1.4 (CV 2.1%)
		Right	65.8±3.4 (CV 5.2%)
		Diff.	3.9%
	Swing phase [%]	Left	31.5±1.4 (CV 4.5%)
		Right	34.2±3.4 (CV 9.9%)
		Diff.	-8.6%
	Single support [%]	Left	34.2±4.5 (CV 13.1%)
		Right	31.5±2.6 (CV 8.2%)
		Diff.	8.0%
	Total double support [%]		34.4±4.2 (CV 12.3%)
	Load response [%]	Left	17.5±1.8 (CV 10.4%)
		Right	16.9±4.0 (CV 23.7%)
		Diff.	3.6%
	Pre-swing [%]	Left	16.8±4.4 (CV 26.3%)
Right		17.5±2.2 (CV 12.6%)	
Diff.		-4.2%	

Interpreting the Gait Report

The main items to focus on in the Gait Report are lengths (measured in inches) and gait parameters (measured as a percentage of the gait cycle)

We look at differentials (the percent difference between the left and right side) and the coefficient of variability (which tells us how evenly the body produces this data).

Step Length - this is the most important parameter for this test. We want the differentials here to be as close to zero as possible

Stride Length: stride length is simply one left step and one right step combined

Gait Parameters: Measured as a Percentage of the Gait Cycle

Stance Phase begins with a heel strike and ends with toe-off - this is the single support phases of the gait cycle

Swing Phase begins with foot flat and ends with a heel-strike - this is the double support phase of the gait cycle.

This data shows us exactly what is going on on a biomechanical level as we walk. The numbers may indicate imbalances in certain parts of the gait cycle that need to be addressed with either therapy or training - it is up to the data collector to understand the mechanics and suggest the proper changes as each individual will be unique.

The Second Screen: Neuromuscular Re-education in Real Time

If data from the gait report indicates a need for improvement in a certain parameter, you can move to the 2nd screen for neuromuscular re-education. While walking at a certain speed, select the parameter you wish to improve and watch the differential change in real time with each step. The goal here is to make minor gait adjustments as you walk to make the differential go to zero. Over time, your brain and neuromuscular pathways will slowly make adjustments and reeducate themselves on how to walk most efficiently, and this low-differential walk will become your norm.

A Great Gait is at Your Feet

Color, durability, biomechanical efficiency...? While most people choose their footwear based on style or comfort, we believe that all shoes should serve one purpose: to increase balance and coordination with every step. If you are spending all day on your feet in a pair of shoes that is not efficient, you will slowly increase underlying asymmetries that can lead to larger problems down the road. Just as you wouldn't drive a Ferrari fitted with the wrong tires, neither should you conduct your day to day activities with the wrong shoes on your feet.

But how can you know if a shoe is right for you? Subjective measures can only get us so far. While the orthotics prescribed to "fix" your flat feet may feel comfortable, are they really helping? Footwear that promise good results are often based on normative data, not the individual. The only way to know if a shoe is truly helping to improve your gait is to look at the objective data comparison from OptoGait.

Evaluating the efficiency of your shoes with a Gait Walk is quick and easy. First, perform the test barefoot to establish your baseline, then repeat the test with shoes on. Side-by-side comparison of the data will allow you to see the direction in which the numbers are changing, and the exact degree to which the shoes are either helping or hurting. If wearing the shoes decreases your asymmetries, they're helping. If they're not helping, toss them, no matter how cute they may be!

Don't just walk,
therapeutically walk.

Test your shoes today!