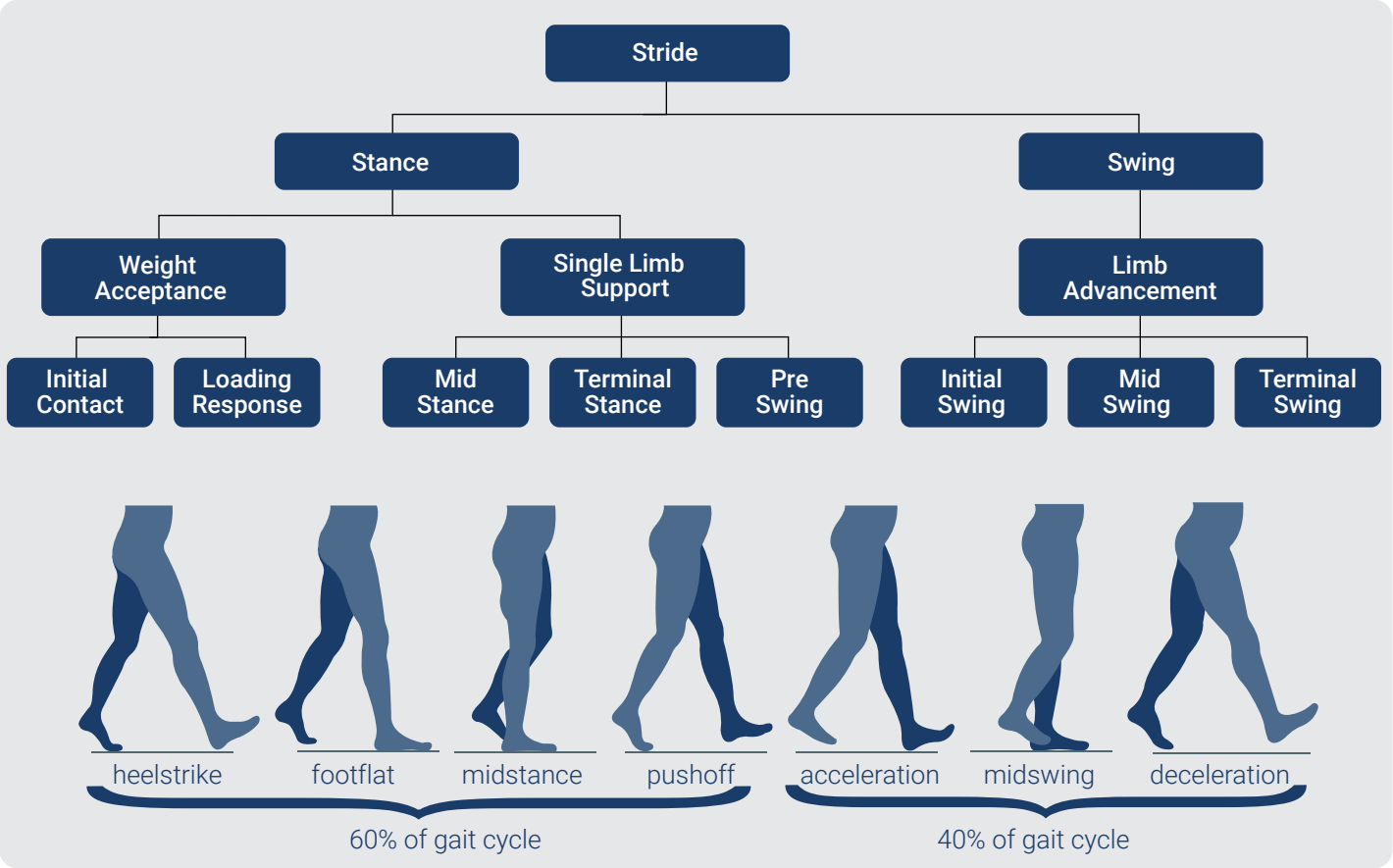
Gait Analysis

Walking is an efficient cyclic, bilaterally symmetrical universal pattern which can be adapted according to various surfaces at a range of speed. The way a person walks is their gait and the study of a person's way of walking is gait analysis.

While a normal gait is uneventful, an abnormal gait has tremendous psychological, functional and economic repercussions. People with cardiovascular, musculoskeletal, neurological and even psychological disorders display changes in Gait.

One Gait cycle in normal walking begins with heel strike of the reference extremity and ends when it occurs again. Observational gait analysis was and as yet is the primary method of analysis. This can be further supported by measurements using goniometers; scrutinizing gait recorded using digital video and at times conducting measurements using doing video anlaytics & Plantar Pressure Transfer tracking using a plantar measurement systems.

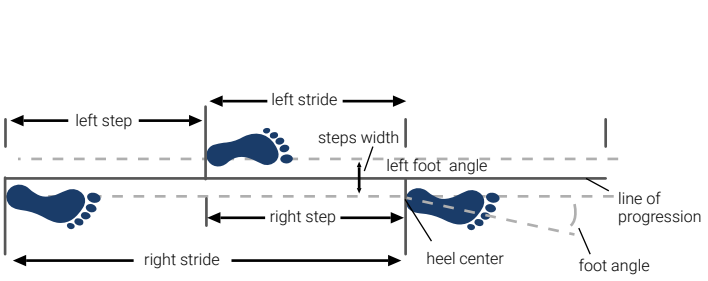


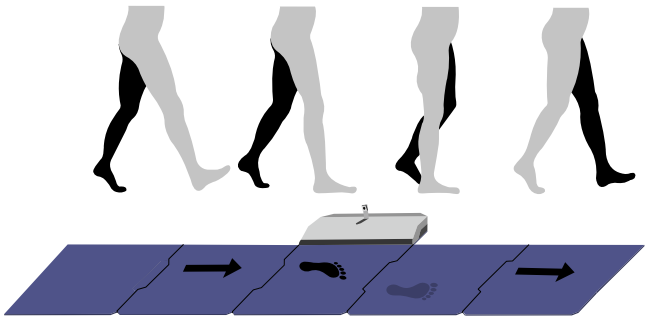
Human Gait Can Be Studied As

- Temporal phases (stance/swing) and events (foot-strike, toe-off), stride rate, Time-distance measurements
- Kinematics - the science of motion. In human movement, it is the study of the positions, angles, velocities, and accelerations of body segments and joints during motion, stride length, velocity, ranges of motion, acceleration
- Kinetic techniques - Study of forces that cause motion ground reaction forces, plantar pressure patterns, plantar Pressure transfer, joint forces, and movements

Gait Analysis on Ohm 3000

Ohm 3000, a plantar pressure measurement system, can do a Gait analysis!! Although there are some limitations due to presence of only one pressure mat, it can do a complete pressure transfer tracking during the stance phase of the Gait cycle. The subject is asked to walk across the pressure sensing area of the plantar pressure mat.





Plantar Pressure Distribution

During the stance phase of the gait, one can visualize using a dynamic visualization of the pressures exerted on the sensing pressure mat indicating any high and low pressure areas and abnormal distributions that indicate the extent of gait adjustment done by the subject due to his/her condition. Additional synchronized videos help make subjects understand the problem while correlating findings with the video.

COP (Center of Pressure)

The Center of Pressure is the point where the ground reaction force vector applies. During walking, the center of pressure is near the heel at the time of heel strike and moves anteriorly throughout the step, being located near the toes at toe-off. For this reason, the analysis of the movement of the center of pressure during the dynamic Gait cycle informs us of the combined impact of ground forces and its travel and deviation indicates the dysfunction and also helps track the progress of treatment.

Plantar Pressure Tracker

The plantar pressure tracker tracks time, pressure, location (region of foot) and computes almost 30 parameters that indicate nature of gait. Example: Stance time, mid-foot contact time, forefoot loading slope, heel peak pressure, COP deviation etc. It provides a graph of pressure against time, where the peak pressure from heel strike to toe off is visualized over time for a single and both limbs. This graph is relatable to the different phases of the gait cycle. Problems in the stance phase can be accurately visualized with this. Moreover, it can also be compared with the contralateral foot.

Plantar Pressure Gait Analysis

Deviations in metrics of gait can be an indicator for providing interventions.

- In diabetics, orthotics, custom-made insoles and shoes can be prescribed after visualization of higher pressure areas
- In patients post ACL reconstruction dynamic, functional and proprioceptive training can be prescribed following plan tarpressure analysis
- In case of abnormal gait (hemiplegic or circumductory gait) patterns, specific functional training to improve gait
- A patient with osteoarthritis of right knee, on dynamic analysis will present with higher pressure, increased stance time and foot contact time on the unaffected or normal foot in comparison to the affected foot.
- In Parkinson's disease patients, the LSVT can be delivered and analysis of freezing phenomenon can be done
- Functional gait training in rehabilitation of a hemiplegic patient can be planned after evaluating their gait parameters with the help of pedobarography

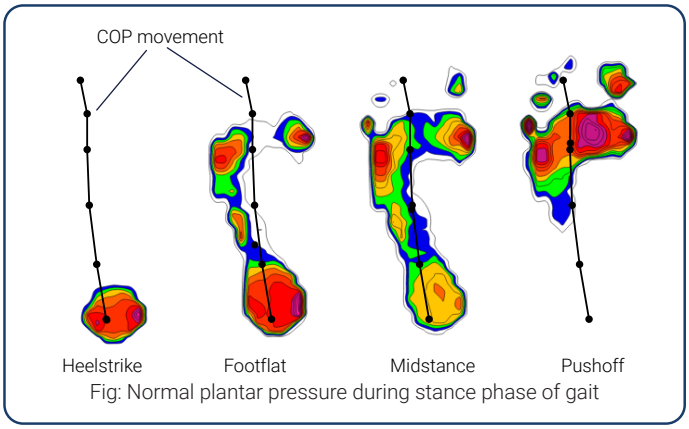


Fig: Normal plantar pressure during stance phase of gait

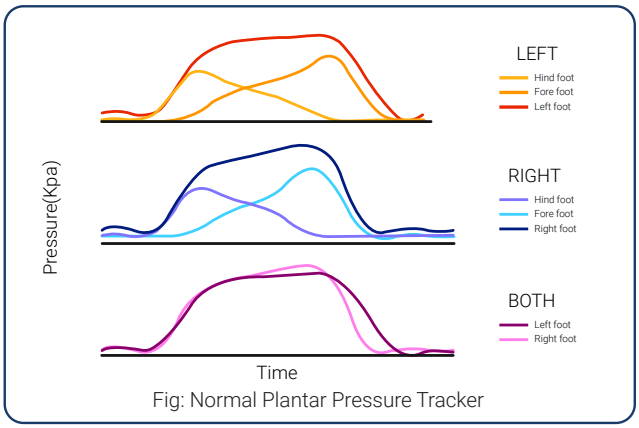


Fig: Normal Plantar Pressure Tracker

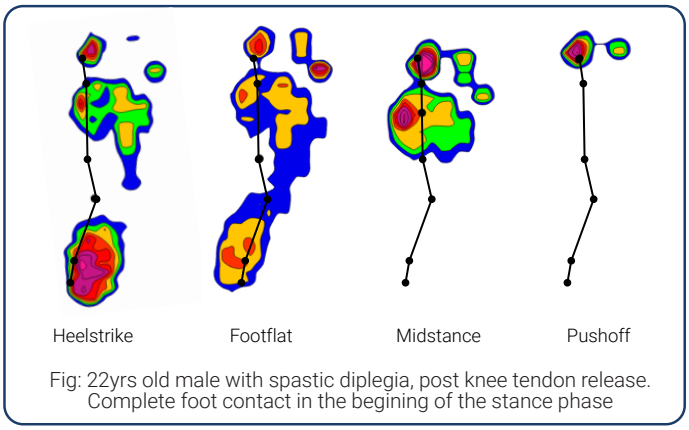


Fig: 22yrs old male with spastic diplegia, post knee tendon release. Complete foot contact in the begining of the stance phase

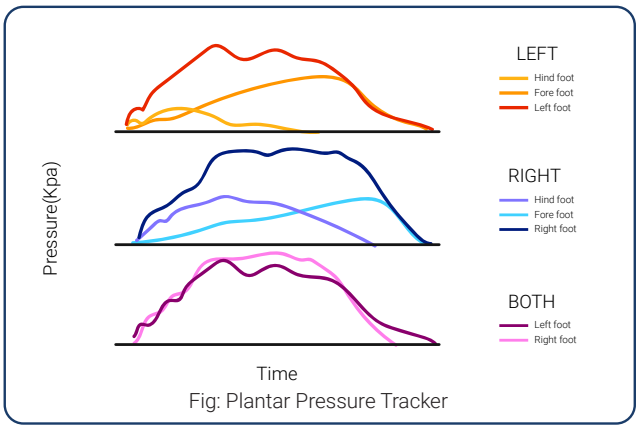


Fig: Plantar Pressure Tracker

1. Susan B. O'Sullivan, Thomas J. Schmitz & George D. Fulk- Physical Rehabilitation, 6th Edition, 2014: page 251- 300

2. Nick A. Guidemond- Plantar Pressure Measurement- Plantar Pressure, Diabetes And Amputation Studies On Etiological, Diagnostic And Therapeutical Aspects- 2007 Chapter 2: Page 27- 68

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