

The background features abstract, overlapping geometric shapes in various shades of green and blue, creating a modern, dynamic feel. The shapes are primarily triangular and polygonal, with some appearing as thin lines or semi-transparent layers.

GAIT PATTERNS AND IT'S IMPORTANCE

Introduction :

The art of tracking culprits through gait patterns is an ancient art .Certain tracker families practised it in various parts of india.

The trackers were/are known as “*KHOJIS*” or “*PAGGIES*.”

For the very first time, the forensic gait analysis was used as a means of admissible evidence/scientific evidence in the Old Bailey Central Criminal Court, London, UK, in the case of R v. Saunders by the U.K. based forensic podiatrist, Dr. Haydn Kelly.

Gait analysis is known as 'the systematic study of human locomotion.' Forensic gait analysis or forensic gait comparison is defined as 'the assessment and evaluation of the gait patterns and features of the person/suspect and comparing these features with the scene of crime evidence for criminal/personal identification.'

The forensic gait analysis's general source or evidence comprises the series of footprints found at the crime scene and the closed-circuit television camera (CCTV) footage.

Footprints are one of the pieces of evidence encountered at the crime scene.

Footprints can be recovered in the form of bare prints, shoeprints as well as a series of imprints.

Footprints can be encountered in several types of cases and crime scenes such as:- a] HBT (House Break-in and Theft)

b] robbery

c] sexual assaults

d] hit and run

e] shoplifting, homicides, kidnapping, etc.

The science of footprints and gait analysis is a part of an emerging sub-discipline of forensic science known as forensic podiatry.

GAIT CYCLE;

A single gait cycle is known as “STRIDE”.

A stride can be defined as-

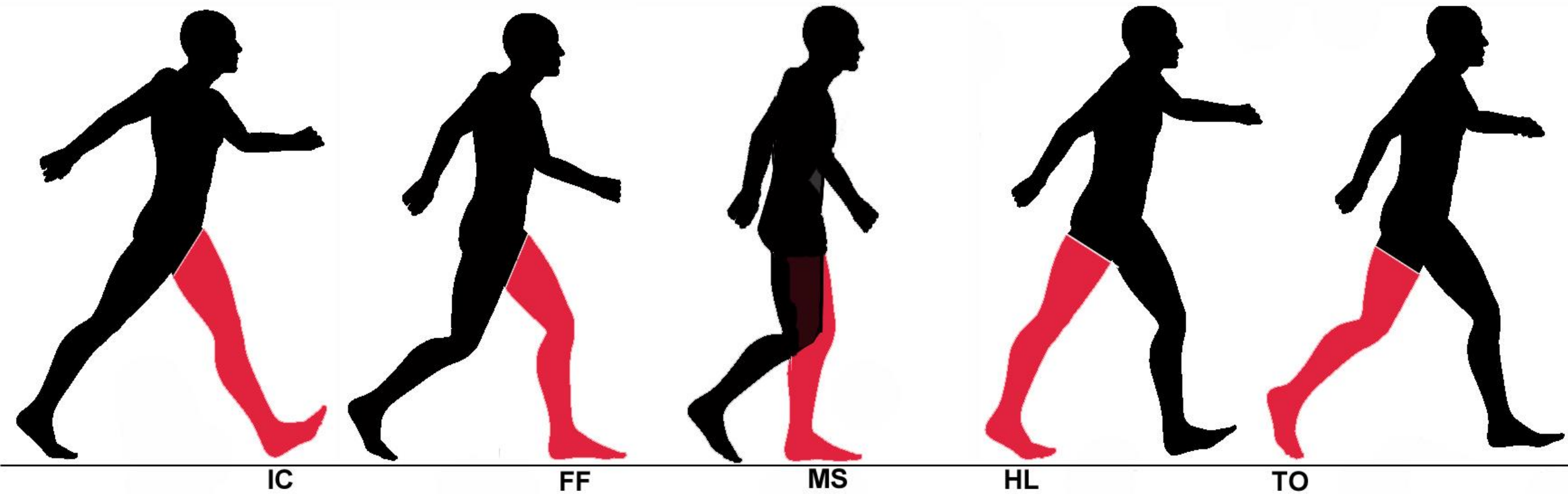
‘Period when the one foot contacts the ground to when the same foot contacts the ground.’

What are the Phases of Gait?

Each Stride has two phases;-

- The **stance phase of gait** begins when the foot first touches the ground and ends when the same foot leaves the ground. The stance phase makes up approximately 60% of the gait cycle.
- The **swing phase of gait** begins when the foot first leaves the ground and ends when the same foot touches the ground again. The swing phase makes up the other 40% of the gait cycle.

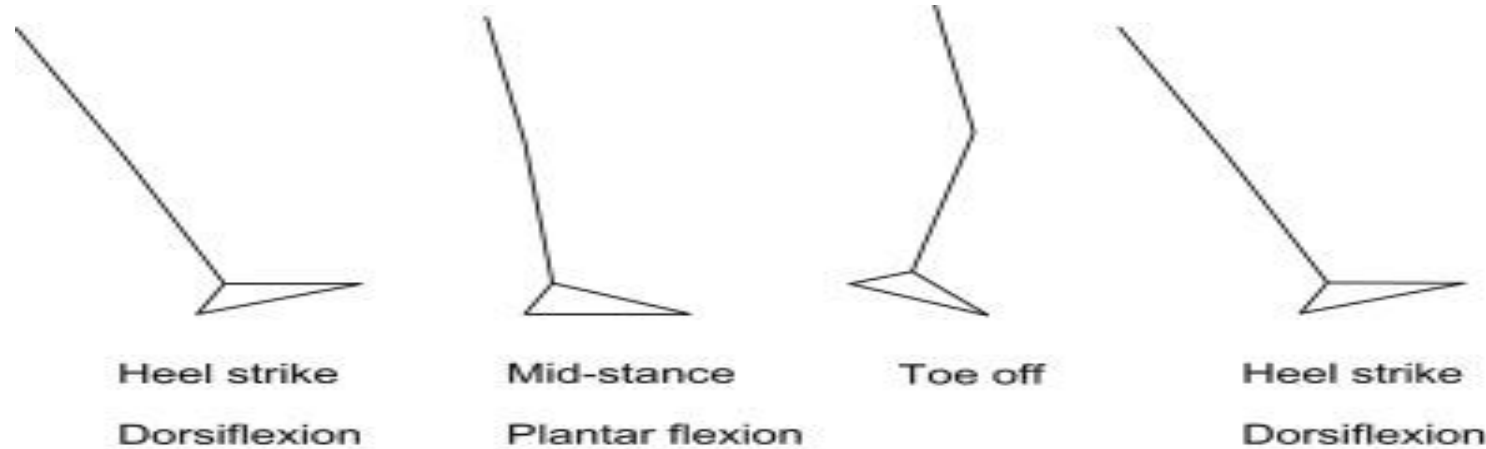
THE GAIT CYCLE



The gait pattern examination includes ACE-VR, which stands for analysis–comparison–evaluation–verification–report. Every step needs to be taken into consideration.

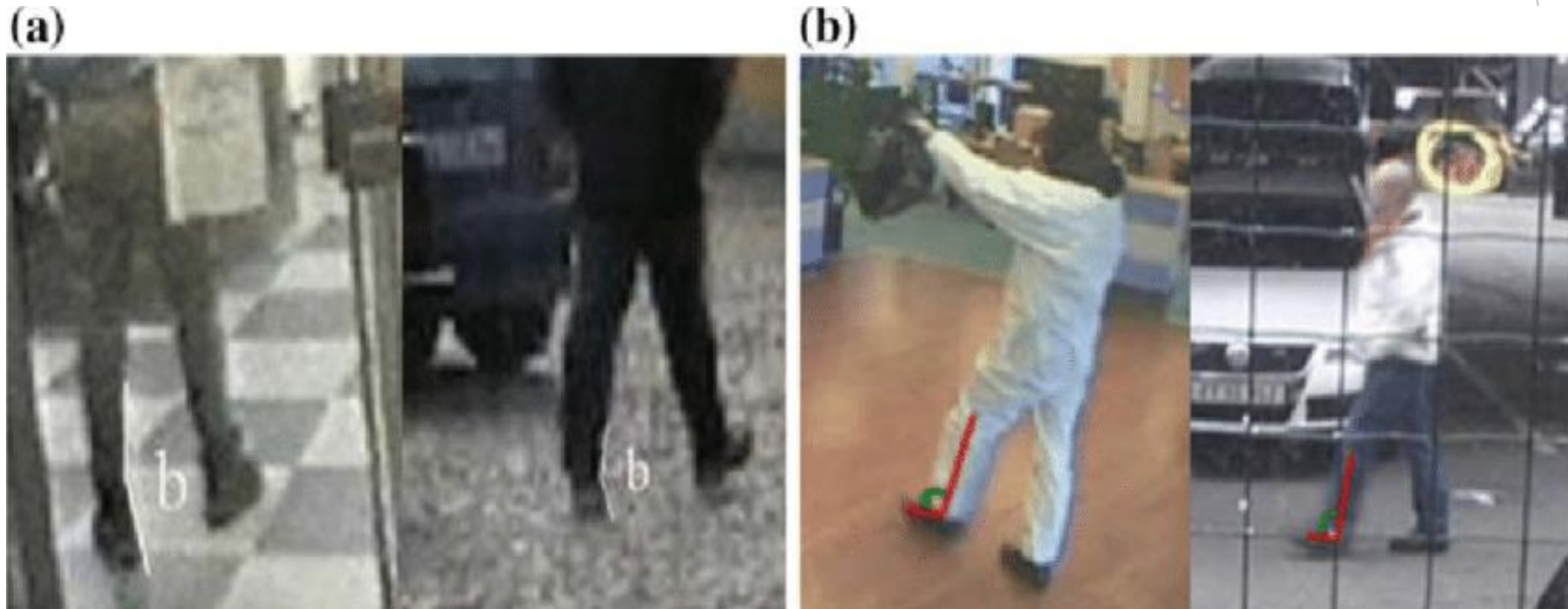
The forensic gait analysis would depend on the type of gait pattern. The gait pattern may be classified into the following two types:

1] Gait analysis on the surface: The analysis of gait pattern on the surface (consisting of a minimum of 3 to 4 consecutive footprints/footwear prints) is performed by considering various parameters including the dimensions, general shape of the prints, patterns in case if ridges are visible, margins of the prints, toe marks, etc. This analysis may also help approximate stature, sex, age, and the bodyweight of a suspect.



2] Gait analysis from CCTV footage/video recording:

Currently, video recording and footages from CCTV are used to study the gait of a person. Before the invention and usage of CCTV, the investigating agencies used to rely upon the eye witness who might have 'seen' someone on the spot with a particular 'style of walking.' However, scientific evidence suggests that the discriminative strength of such statements cannot be relied upon as the sole evidence, although forensic gait analysis plays an important supportive role in the absence of other biometric identifiers in the video.



Spatial Gait Parameters:

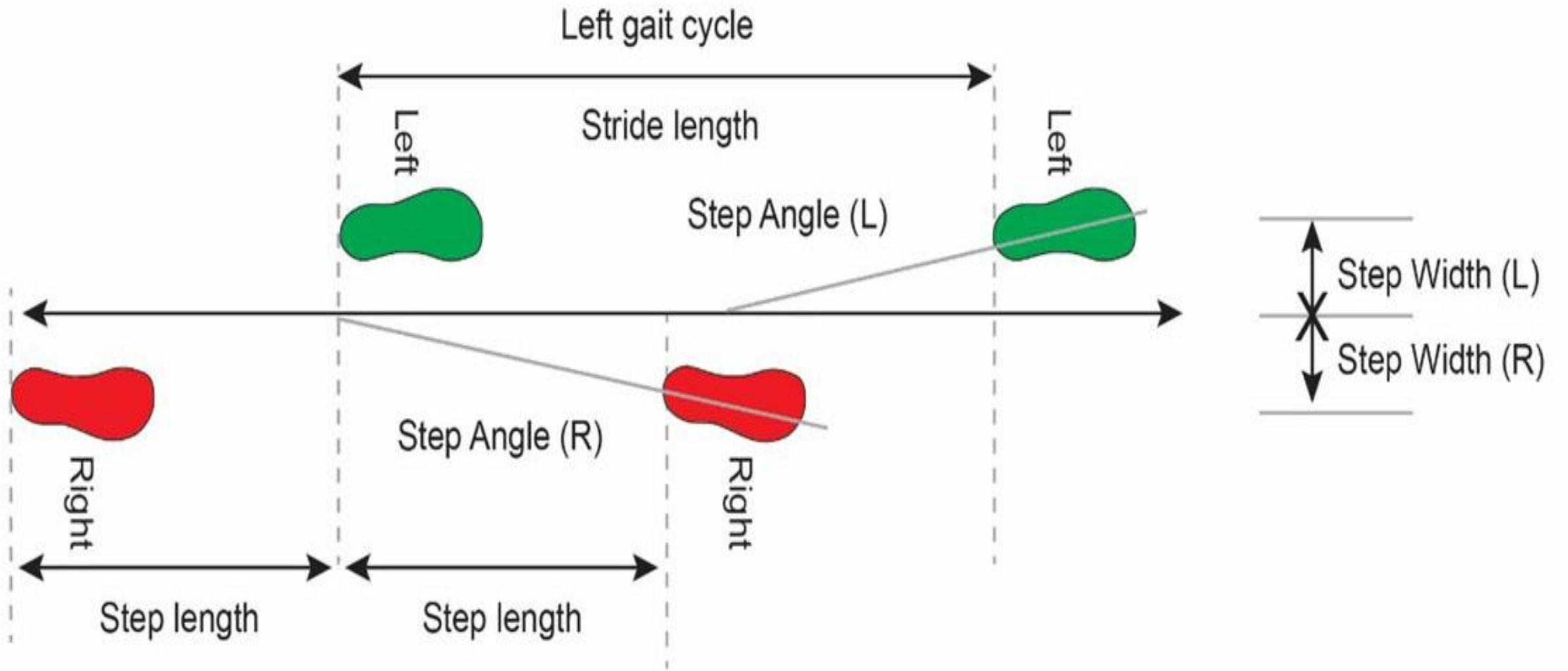
Some typical spatial gait parameters are: step length, stride length, step width and foot angle.

- **Step length** is the length measured parallel to the Line of Progression of the body, from the posterior contact (heel) of the previous footfall to the posterior contact (heel) of the current opposing footfall.

- * **Stride length** is the distance measured parallel to the Line of Progression, between the Posterior Heel points of two consecutive footprints of the foot in question

- **Step width** is the distance measured between line of progression of the left foot and the line of progression of the right foot.

- **Foot angle** is the angle between the line of progression and the foot axis. Foot Angle is zero when the foot axis is parallel to the line of progression.



Factors Affecting Gait Pattern and Analysis:

Gait is a biological characteristic of a person, and the gait pattern is simply the manner or style in which a person usually walks. It is highly influenced by many factors (internal as well as external). Some of the factors that tend to affect the gait and hence the forensic gait analysis are as follows:

Footwear: It causes gait pattern variability. Some footwears can cause increased hip movement, which results in long stride length, while some may reduce the stride length.

Fatigue: Fatigue causes depletion of energy, which affects the gait cycle, thus influencing the gait pattern. The speed of walking also decreases when the person is low on energy.

Use of knee brace: The use of a knee brace also affects the gait of a person.

Sex: Studies have revealed that the sex of a person can be assessed from the gait pattern, which supports that sex affects the gait pattern.

Speed: The gait pattern shows changes between the normal walking pattern and the person's running pattern.

Disease/disorders/medical conditions: This is one of the common factors affecting a person's gait. A typical and at time-specific gait pattern in the person suffering from such condition is evident, e.g., Parkinsonian/Parkinson's gait in Parkinson's disease.

Age: Age is one of the factors which influence the gait pattern. Walking depends on muscle strength, which gradually changes as the person grown up. The variations in muscle strength affect gait.

First trimester during pregnancy: It is believed that during pregnancy, the gait pattern shows changes. A study has shown that foot angle exhibits changes during the first trimester of the pregnancy.

Significance:

1] Forensic Significance

- a) It is the visual comparison of the videos to identify the individual based on gait patterns. This knowledge has been used in the crime scene investigation, particularly to identify the criminal or perpetrator from the characteristics of the gait pattern.
- b) The forensic gait analysis may additionally help in the estimation of stature and sex of the person, estimation of body weight, estimation of the number of people involved by measuring and evaluating step length/stride length if a series of footprints or gait patterns are available for analysis.
- c) The gait analysis may also help comment upon the type of footwear used, the use of any walking aid or support (like a walking stick), underlying disease/disorder/medical condition affecting the gait, etc.

2] Clinical Significance

Clinical gait analysis helps assess and treat individuals with pathological and/or underlying neurological conditions that may affect their ability to walk.

With the help of gait analysis, podiatrists, neurologists, and orthopedic surgeons usually diagnose the issues related to the cause of pain, such as muscles, nerves, and skeletal problems, consequently initiate the treatment for correction of the gait-related abnormalities and develop rehabilitation protocols.



Heel Strike



Propulsion (or toe off)



Midstance

Thank
you!!!
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