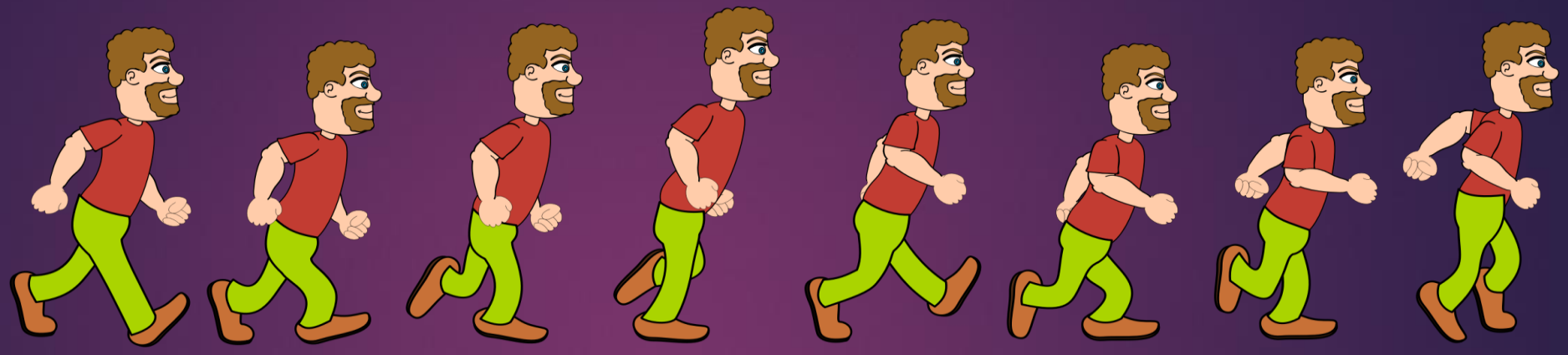


Normal Gait: the 6th Vital Sign

PTA1010

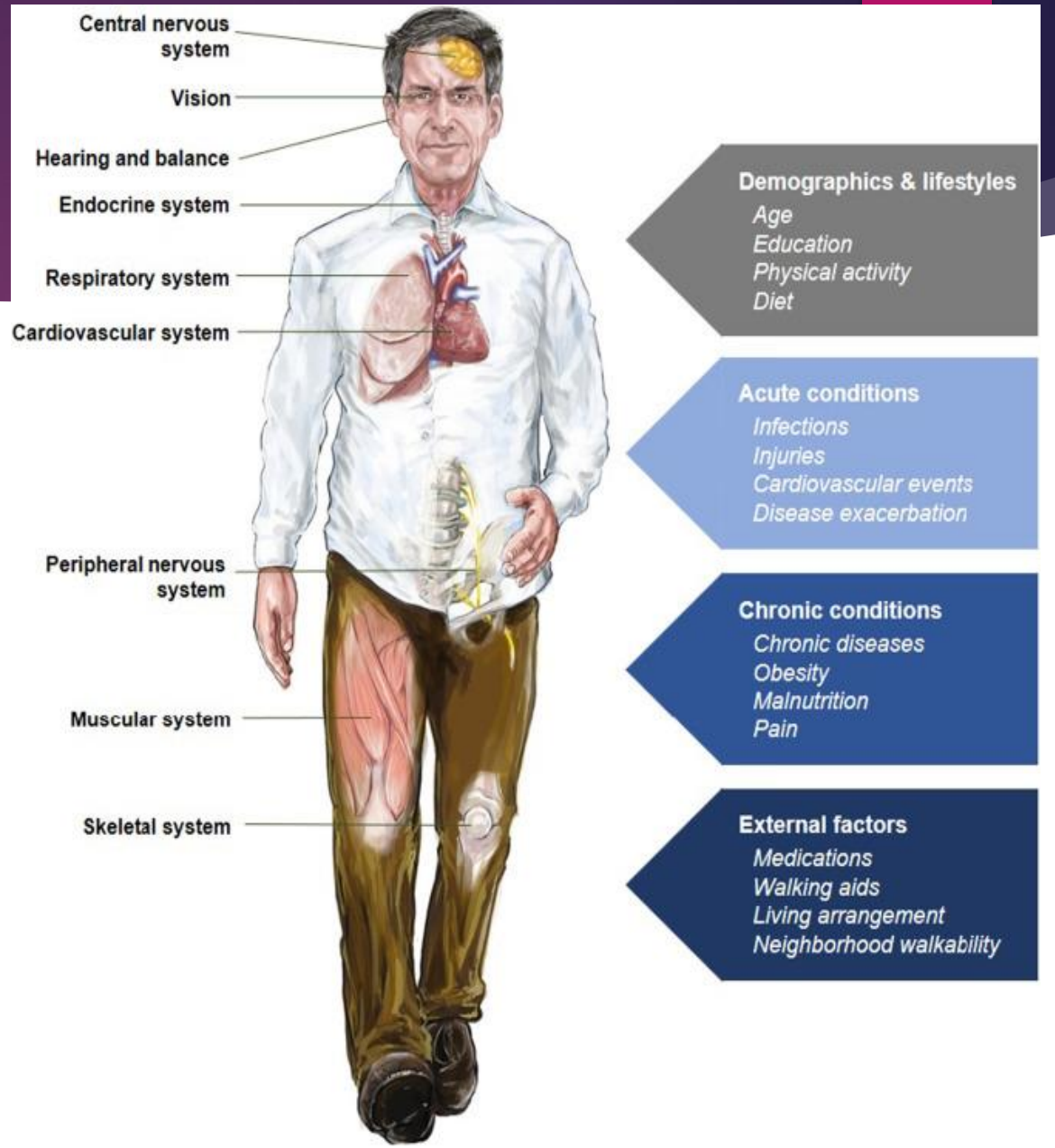
Ambulation or Gait

- Gait is the **most basic components** of independent function

- Gait Velocity is the “new” vital sign

Gait as a Predictor

- Changes in self-selected gait speed **may indicate** a new health problem
- Gait speed assessment **may predict** future health status
- Gait analysis may suggest **preventive interventions**



Gait disturbance	Description of gait	Accompanying symptoms and signs
Antalgic	Limping, short standing phase on affected leg	Pain, limitation of passive range of movement
Paretic	Asymmetry, characteristic motor deficit findings (e.g., steppage gait, Trendelenburg sign)	Paresis, atrophy, reflex asymmetry, radicular/peripheral sensory deficit
Spastic	Non-fluent gait, circumduction of the legs, stiffness, scissors gait, forward rotation of the lateral edge of the foot	Elevated muscle tone, brisk reflexes, pyramidal tract signs (Babinski), urge incontinence
Ataxic	Broad-based, variable, uncoordinated; worsens when the eyes are closed (proprioceptive-deficit ataxia)	Cerebellar: other cerebellar signs (limb dysmetria, oculomotor disturbances, dysarthria); Proprioceptive-deficit ataxia: demonstrable proprioceptive deficit
Sensory deficit	Broad-based, variable, diminished swing phase, worsens when another system is impaired (e.g., with eyes closed)	BVP: oscillopsia, pathological head-impulse test; PNP: diminished reflexes, sensory deficit
Hypokinetic	Small-stepped, slow, shuffling; difficulty initiating movement in parkinsonism; diminished arm swing, worsening with cognitive dual-tasking	Parkinsonism: rigidity, tremor, akinesia; Vascular/NPH: cognitive impairment, incontinence
Dyskinetic	Involuntary movements during ambulation	Dystonia, chorea, myoclonus, tics
Anxious	Slow, broad-based ("walking on ice"); search for something to hold on to; improvement with minimal assistance or with dual-tasking (distraction)	Fear of falling, intolerance of standing without holding on to something
Psychogenic	Multiple patterns: bizarre, variable, exhausting, very slow, sudden buckling without falling	Affect ("la belle indifférence"), possible precipitating life situations, prior psychiatric history

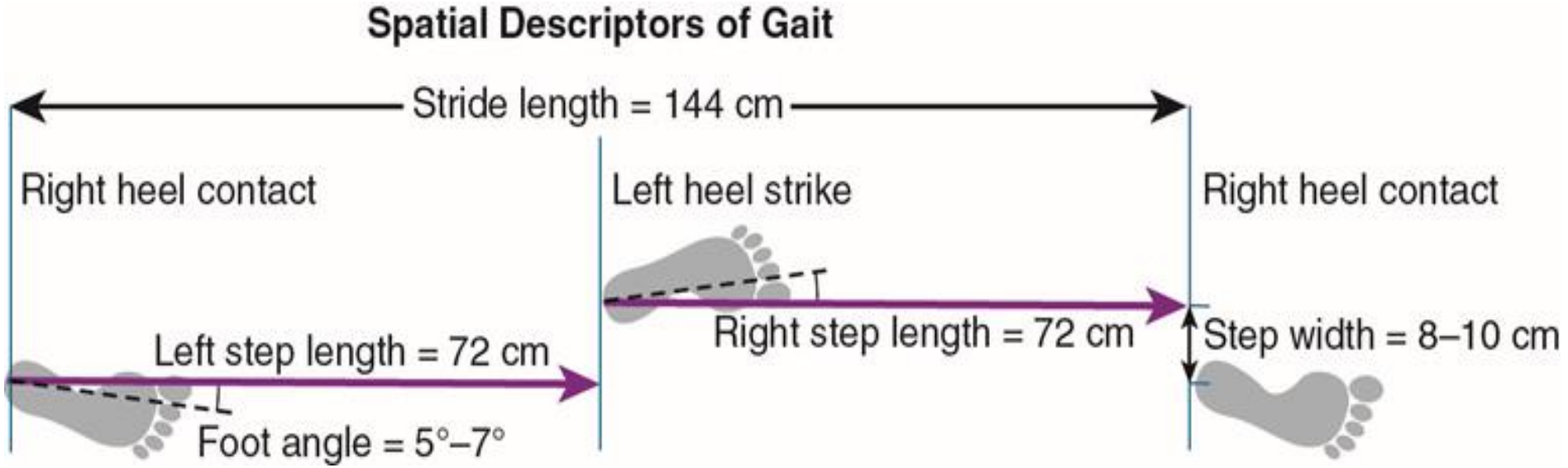
BVP, bilateral vestibulopathy; NPH, normal-pressure hydrocephalus; PNP, polyneuropathy

Normal Gait: the manner in which a person walks

Components of gait:

1. Step length:
2. Stride length:
3. Velocity: distance/seconds
4. Cadence: steps/min
5. Rhythm:

Gait Cycle:


Spatial Descriptors of Gait
Stride length = 144 cm
Right heel contact
Left heel strike
Right heel contact
Left step length = 72 cm
Right step length = 72 cm
Step width = 8–10 cm
Foot angle = 5°–7°

Two Phases of Gait:

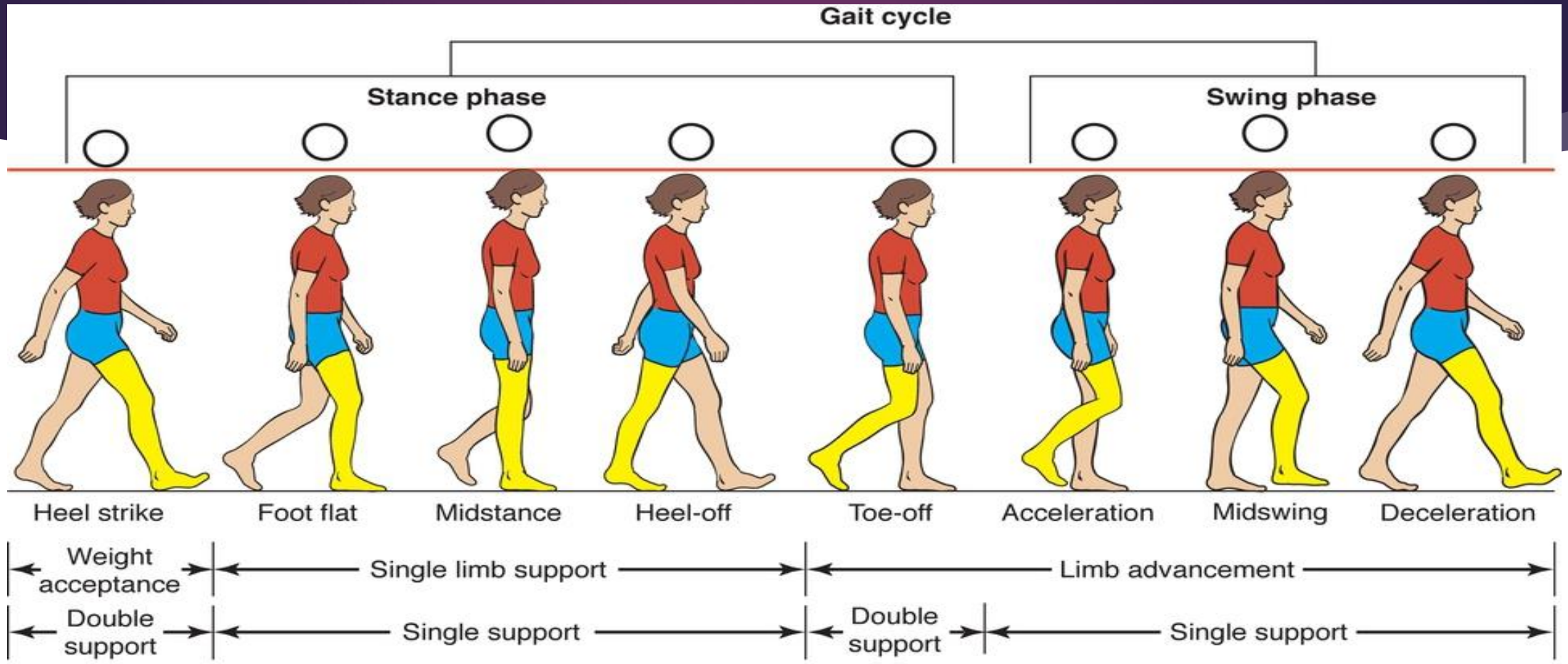
1. **Stance Phase**= 60% of normal gait

Foot is in contact with the ground

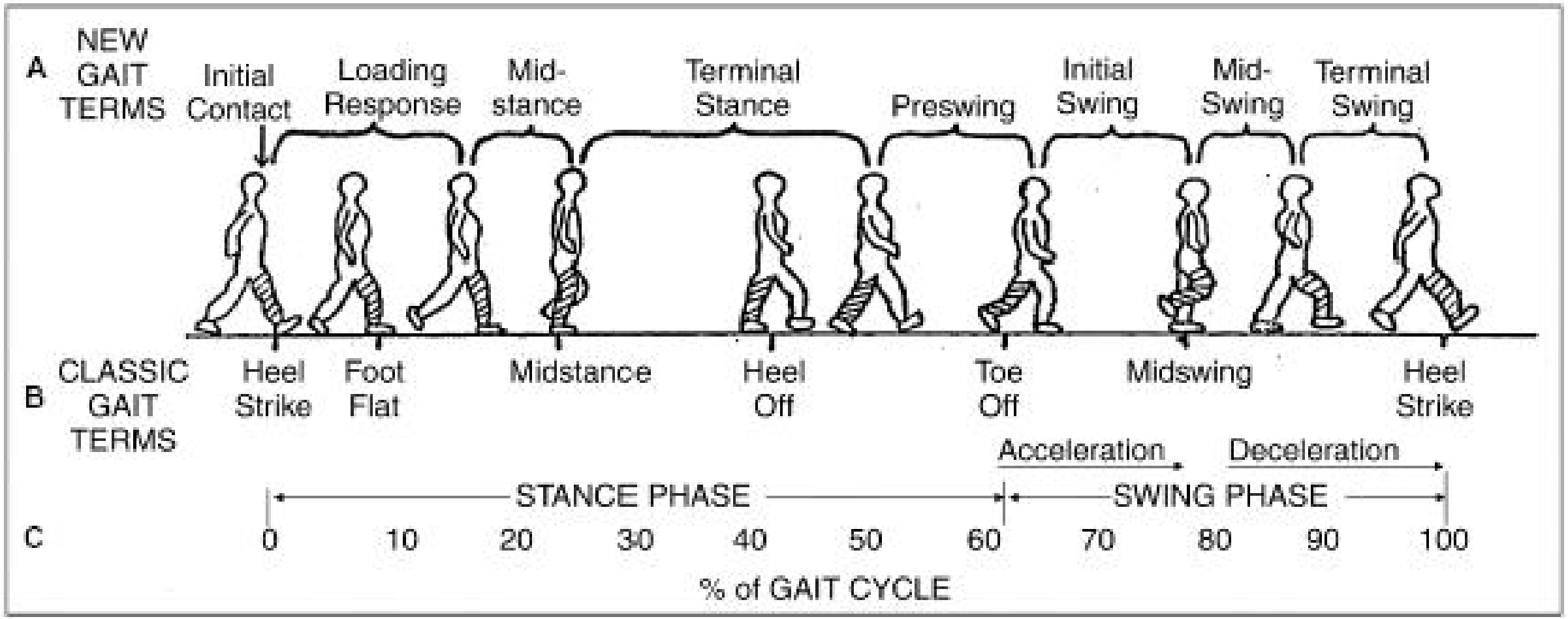
2. **Swing Phase**= 40%

Foot is not in contact with the ground

Normal Phases: traditional terminology



Rancho Los Amigos terminology-



GAIT CYCLE REVIEW

Highest and Lowest Points in Cycle

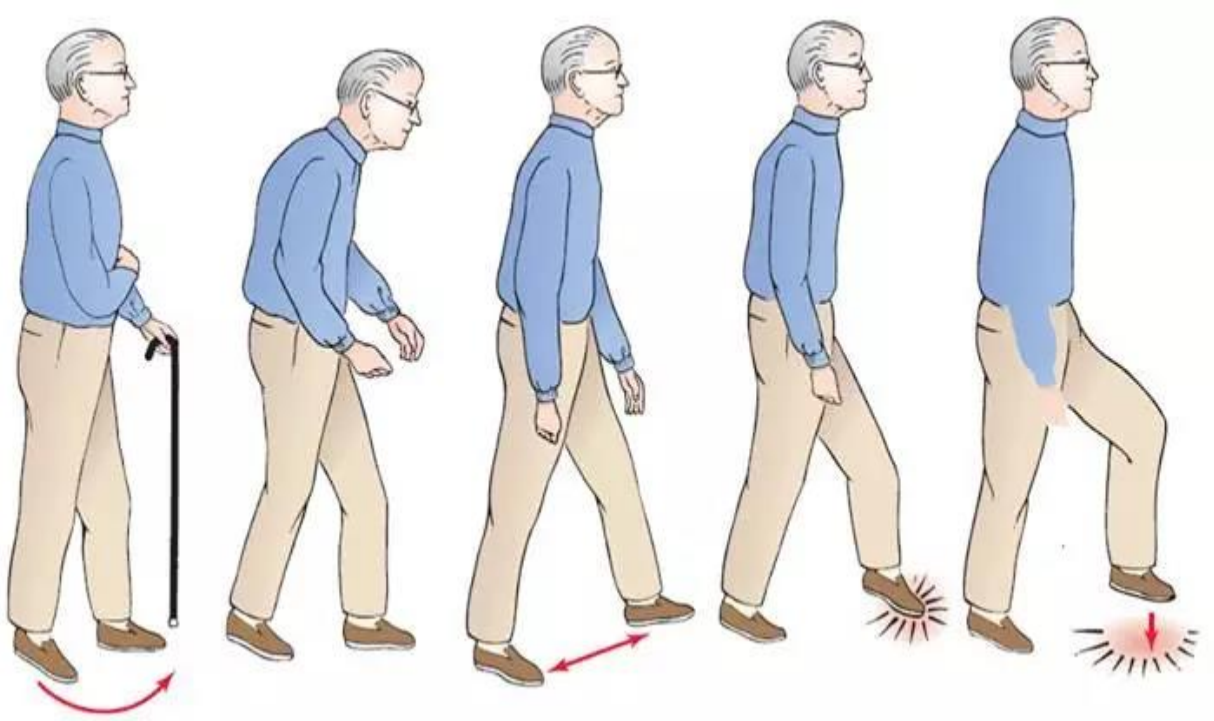
Lowest Point in Cycle=
double support

Highest Point in Cycle=
single leg support

What parts of gait change with age?

- **BOS-** base of support
- **SLS-** single leg stance
- **Velocity**

- WHY???

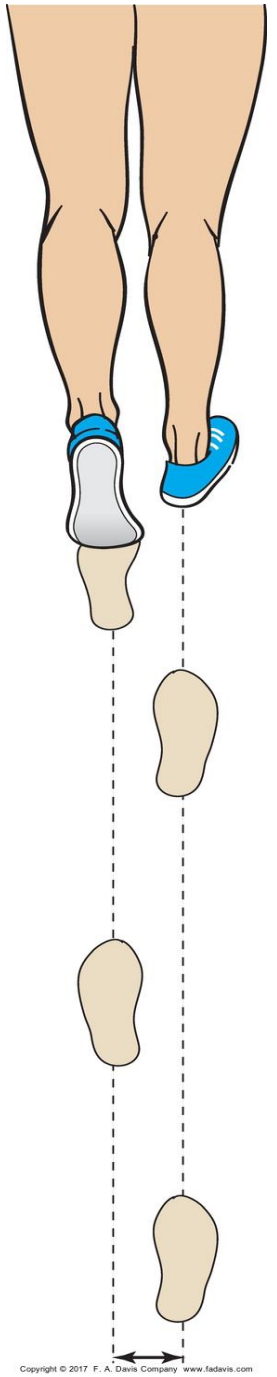


Normal BOS: 2-4inches

Narrow ≤ **2-4”**≤ Wide

↑BOS = ↑Stability

measure from midpoint to midpoint on heels



Velocity of Gait:

1. Muscle Strength

2. Postural Stability: COG, BOS

Timed Walk Tests

- **Timed Up and Go (TUG):** dynamic balance and mobility
- **6 Minute Walk Test**: measures endurance
- **10 meter timed test**: determines average walking speed

Gait parameters for healthy individuals

Parameters (self-selected speed)	**Range**
Gait velocity (m/s)	1.30–1.46
Stride length (m)	1.68–1.72
Step length (m)	0.68–0.85
Stance phase (s)	0.62–0.70
Swing phase (s)	0.36–0.40
Cadence – fast walking (steps/min)	113–118
Single support (% of stride)	60.6–62
Double Support (% of stride)	21.2–23.8

Gait Speed Normal Values:

Table 1. Normal gait speeds for healthy community-dwelling men and women.[11]

Age (years)	Gender	Average Gait Speed (m/s)
20-29	Men	1.36
	Women	1.34
30-39	Men	1.43
	Women	1.34
40-49	Men	1.43
	Women	1.39
50-59	Men	1.43
	Women	1.31
60-69	Men	1.34
	Women	1.24
70-79	Men	1.26
	Women	1.13
80-89	Men	0.97
	Women	0.94

Desired Walking Velocity

- **1.2 m/sec- 1.3 m/sec** is usual adult walking speed
- **1.1 m/sec or 2.4 MPH** is required to cross street before light changes

Gait Muscle Action Analysis