GAIT ABNORMALITIES

GAIT

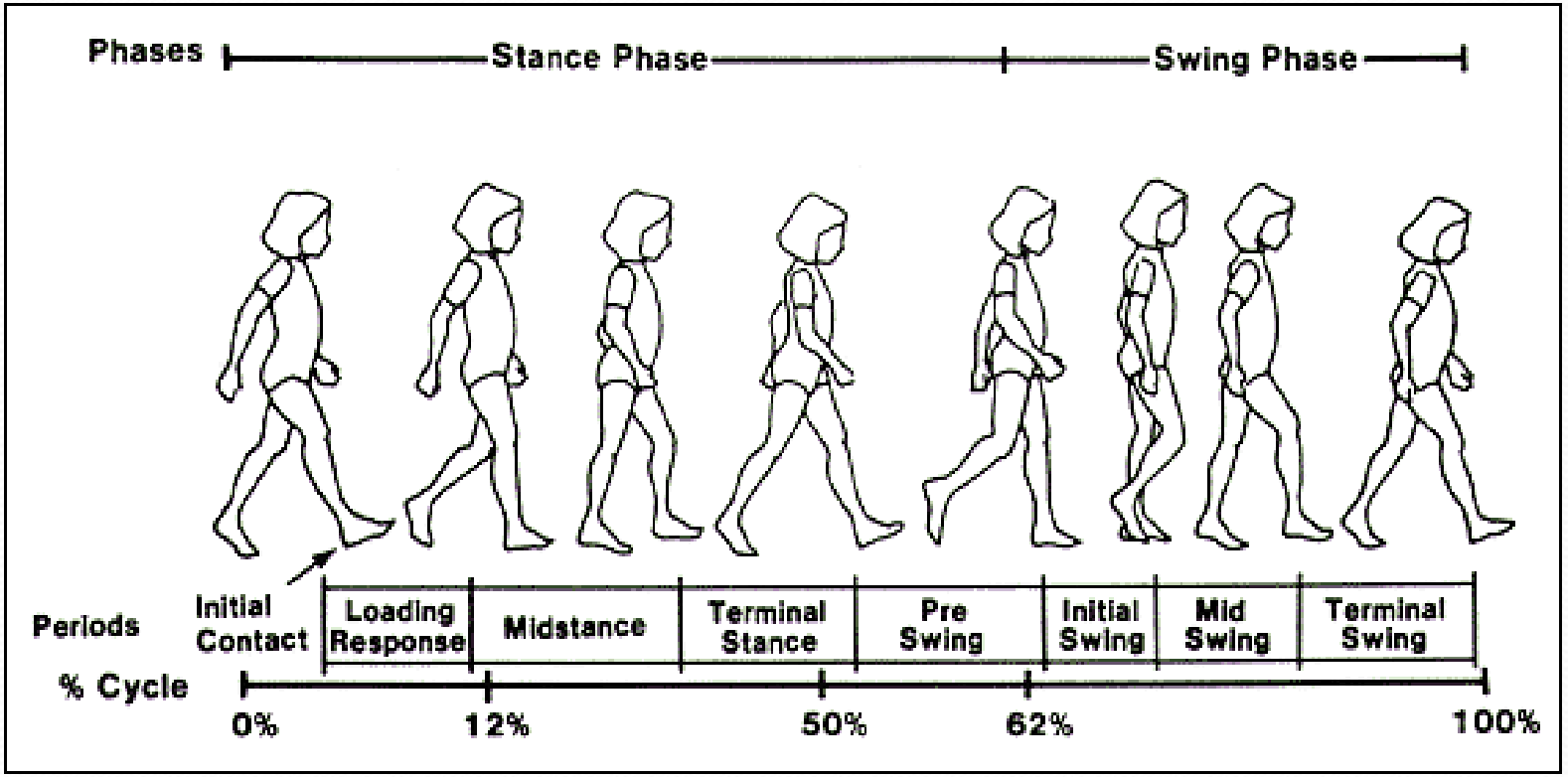
- **Translatory progression of the body as a whole, produced by coordinated, rotatory movements of the body segments**
- **Lower extremities – carry the weight of the head, arms & trunk (HAT)**

Purposes of gait

- **Support of the HAT**
- **Maintenance of upright posture & balance of the body**
- **Achieve safe ground clearance & a gentle heel or toe landing**
- **Generation of mechanical energy to maintain the present forward velocity or to increase the forward velocity**
- **Absorption of mechanical energy for shock absorption & stability or to decrease the forward velocity of the body**

Kinematics of the gait

- Phases of the gait cycle:



Events in Stance Phase

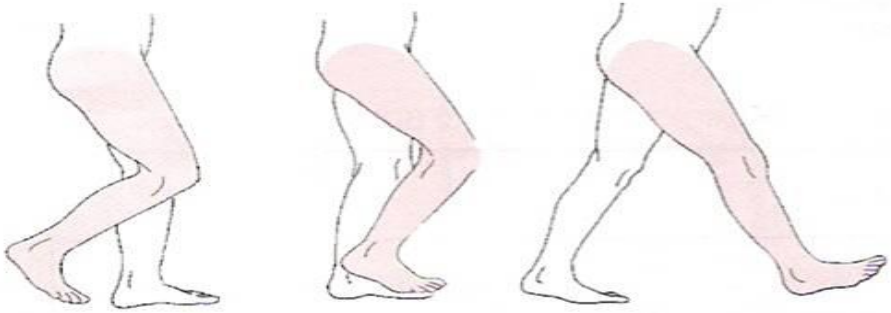
- **Traditional:**

1. Heel Strike
2. Foot Flat - 7%
3. Midstance- 30%
4. Heel off – 40%
5. Toe off – 60%

- **Rancho Los Amigos**

1. Initial Contact
2. Loading response
3. Midstance
4. Terminal Stance
5. Preswing

Events in Swing Phase



Traditional	Early swing 60-75%	Midswing 75-85%	Late swing 85-100%
Ranchos Los Amigos	Initial swing 60-73%	Midswing 73-87%	Terminal swing 87-100%

- **Traditional**

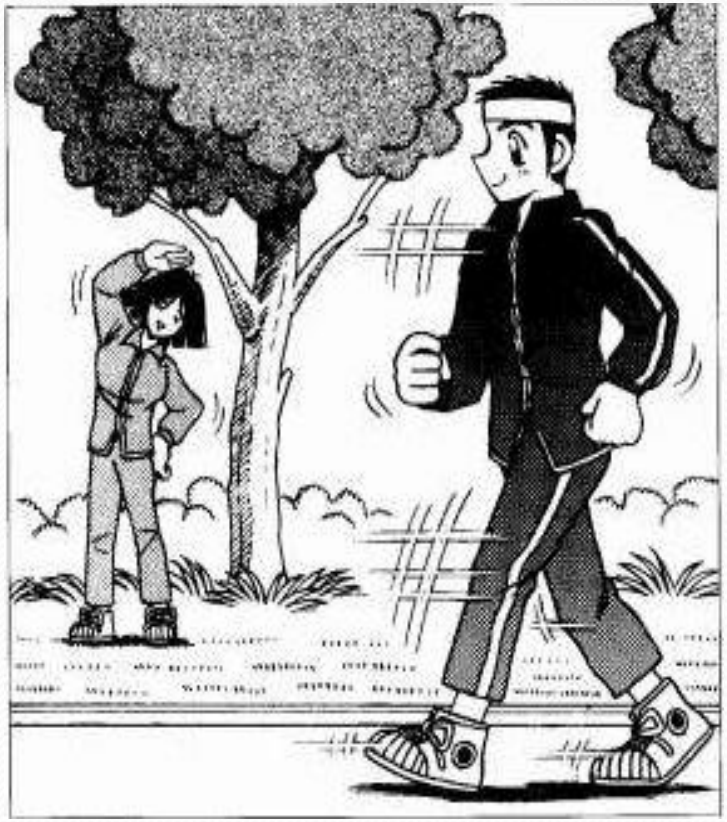
1. Acceleration
2. Midswing
3. Deceleration

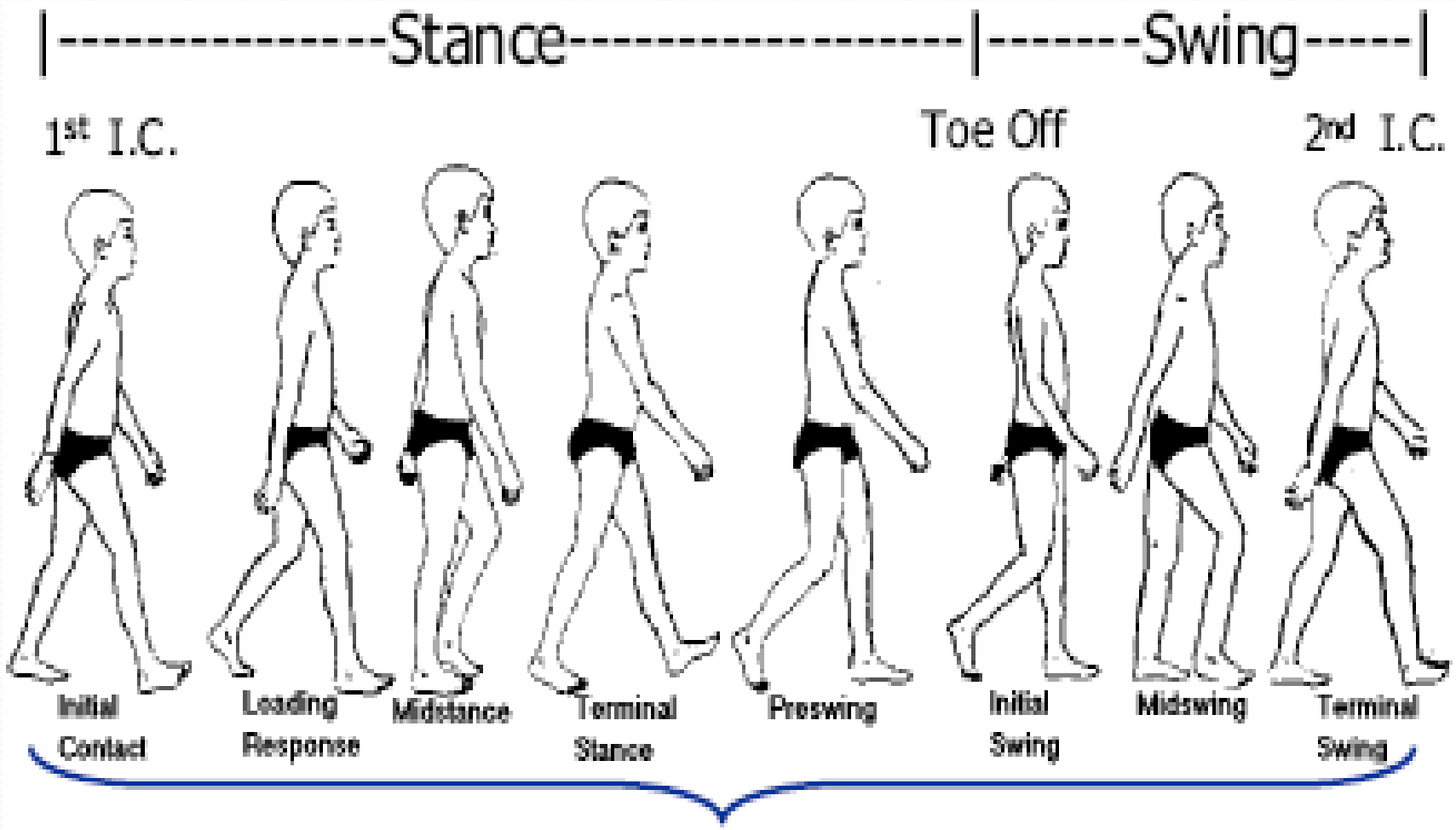
- **Rancho Los Amigos**

1. Initial Swing
2. Midswing
3. Terminal swing

Double Support

- **In normal walking speed – each period of double support occupies about 11% of the gait cycle - 22 % for full cycle**
- **The body supported – by only one limb for nearly 80 % of the gait cycle**





"Rancho Los Amigos" (RLA) CONVENTION

GAIT TERMINOLGY

- **Temporal Variable**

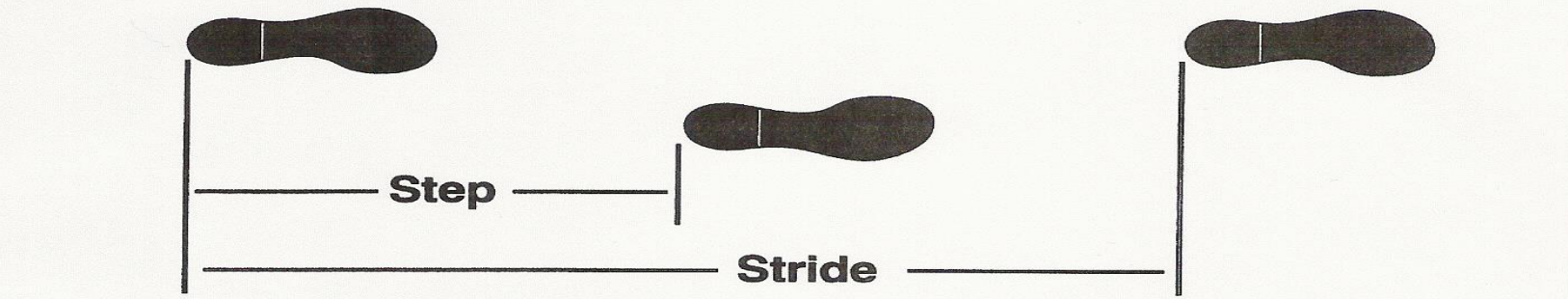
1. **Stance time**
2. **Single limb & double time**
3. **Swing time**
4. **Stride & Step time**
5. **Cadence**
6. **Speed**

- **Distance Variable**

1. **Stride length**
2. **Step length**
3. **Width**
4. **Degree of toe-out**

Distance Variables

- Stride length: **is the linear distance between two successive events that are accomplished by the same lower extremity**
- **It is measured from the point of one heel strike of one lower extremity to the point of the next heel strike of the same extremity**
- ↓ **- elderly pts &** ↑ **- speed of gait increases**



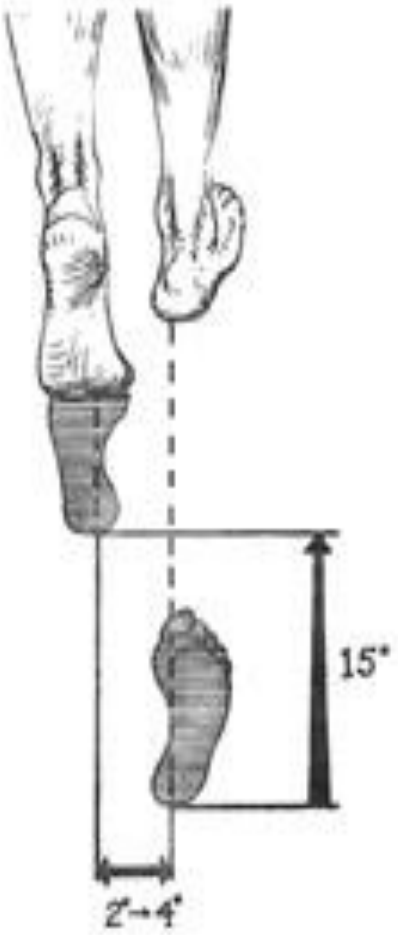
Distance Variables

- Stride duration: **amount of time it takes to complete one stride**
- **Stride duration & gait cycle are synonymous**
- **For normal adult the stride duration lasts for 1 sec**

Distance Variables

- Step length: **is the linear distance between two successive points of contact of opposite extremities**
- **Measured from the heel of one extremity to the heel strike of the opposite extremity**
- Step duration: **amount of time spent during single step**

If there pain in an extremity, step duration ↓ ed on the affected side & ↑ ed on the normal side

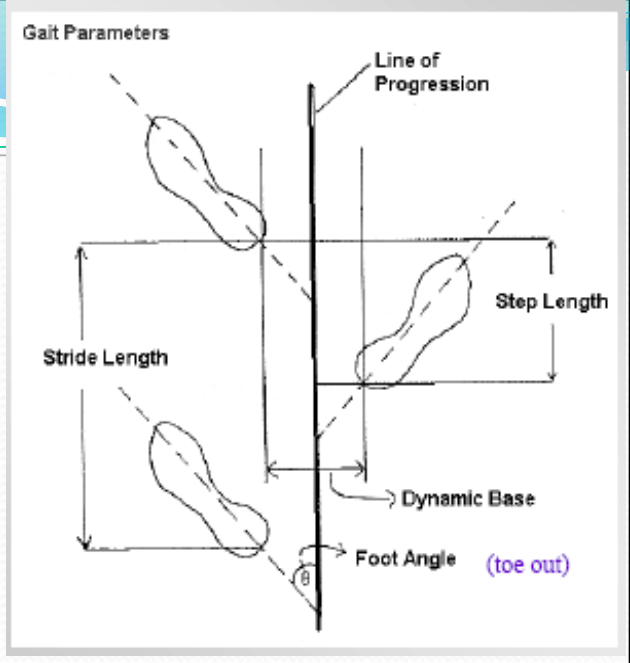


Distance Variables

- Cadence – **no of steps / unit of time, it is usually measured steps / min**
- **Adult men – 110 steps / min**
- **Adult women – 116 steps / min**

Gait terminology

- Step width – **measuring the linear distance between the mid point of the heel of one foot & the same point on the other foot**
- **Step width ↑ in elderly persons & children as they demand more stability**
- **In young children, It is higher than in adults, as wide base of support is necessary for stability**
- **Normal width – 3.5 inches & varies between 1 – 5 inches**



Double Support time

- **Increased in elderly persons & in those with balance disorders**

- **Decreases as the speed of walking increases**

Assessment of gait

- History
  - Posture of head, neck, thorax, lumbar spine
  - Musculoskeletal pathology
    - Muscle weakness
    - Pain

Observation

- Anterior View
- Posterior View
- Lateral View
- Foot wear
  - Bare feet
  - Normal foot wear

Examintion

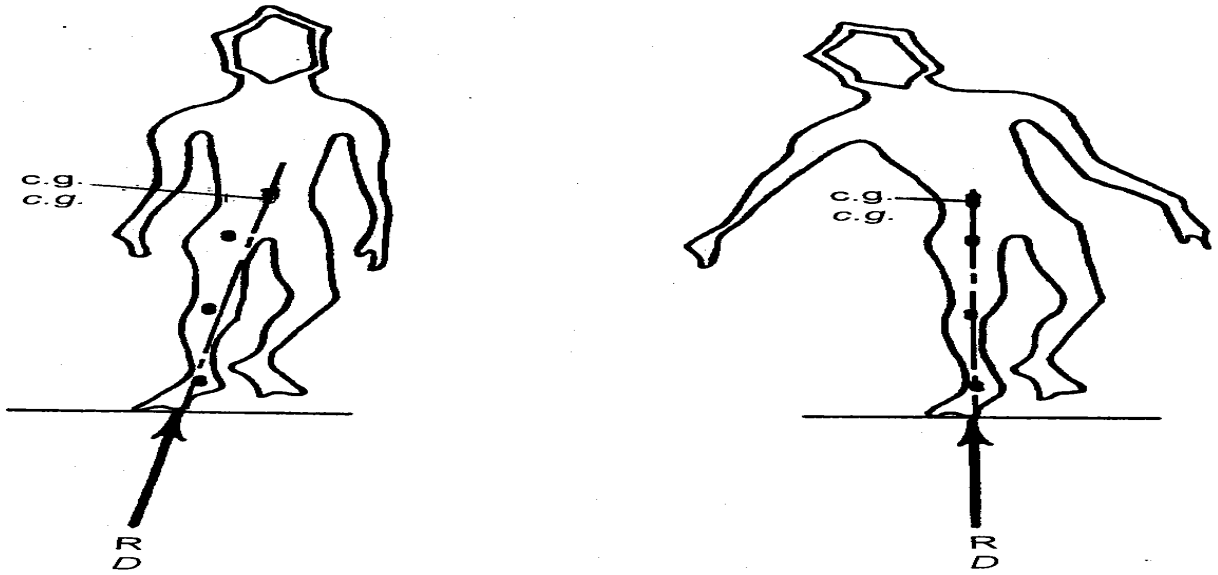
Gait Parameters

Abnormal Gait

- Antalgic (Painful Gait)
  - Self – protective gait
  - Injury to plvis, hip, knee, ankle, foot
  - Stance phase of affected leg is reduced to reduce weight
  - Swing phase of unaffected is decreased
  - Trunk bending

- Tredelenburg gait
  - Hip dislocation
  - Coxa vara
  - Hip pain
  - Short limb
  - Knee flexion contracture
  - Weak abductors

Lateral Bending Gait



TRENDELENBURG LURCH DUE TO LIMPING CENTRE OF GRAVITY SHIFT
Boiterie de Trendelenburg entraînée par un déplacement du centre de gravité

Lurching Gait

Also known as

- Posterior trunk bending
  - Inability to extend hip
  - Gluteus max weakness
- Jack knife gait

Jack Knife Gait

HAND TO KNEE GAIT

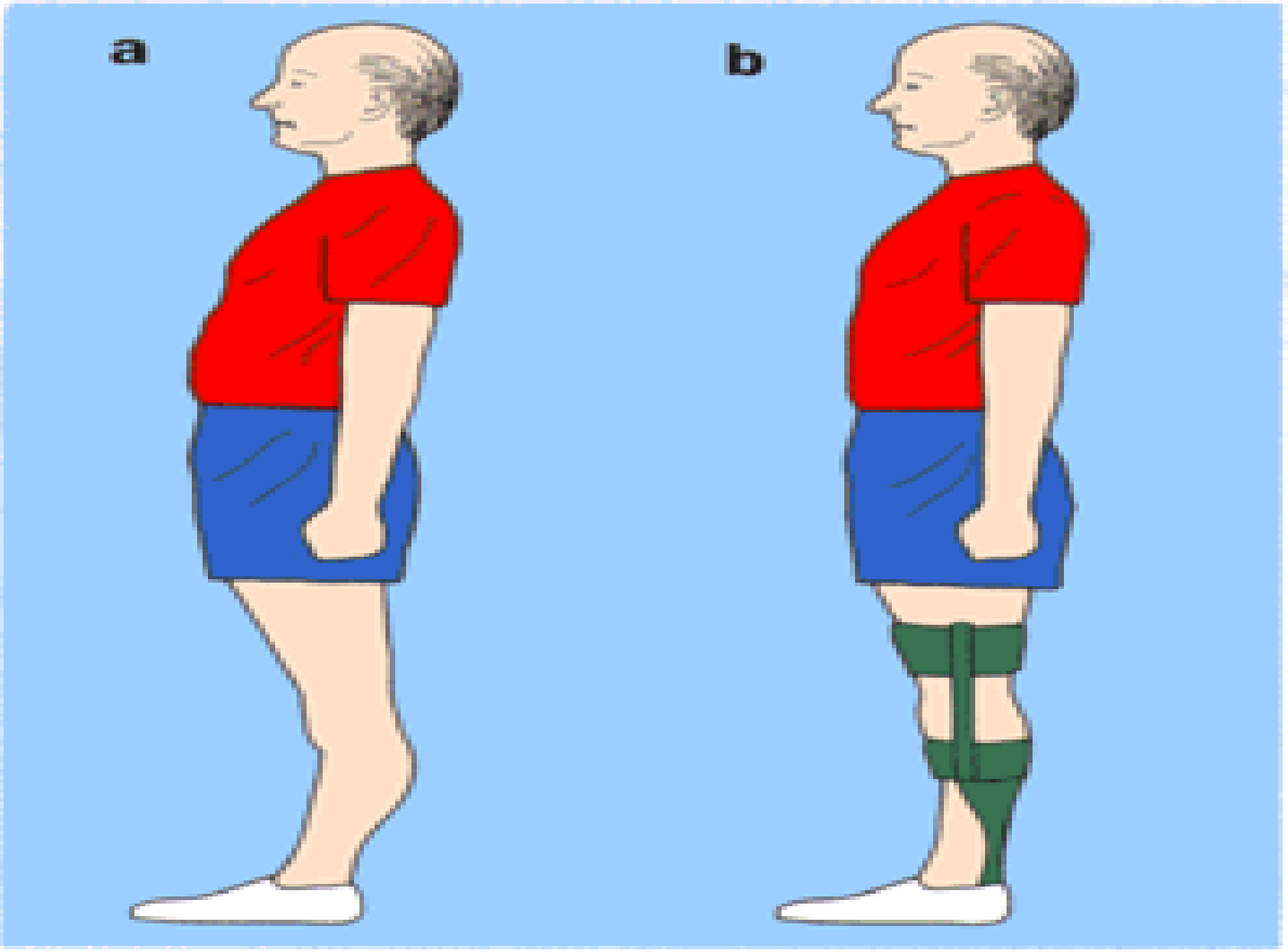
- Seen in Post Polio Patients
- Paralysis of quadriceps
- Weakness of gastro- soleus
- Weakness of gluteus max
- To avoid buckling knee, pt bends anteriorly

GENU RECURVATUM GAIT

- Paralysis of Quadriceps

- Compensation by gastro soleus & gluteus max

Orthosis



Circumductory Gait

- Hemiplegic Patients
  - Extensors Spasticity
  - Abnormal reflex
  - Abnormal synergy pattern

  - Swing phase
    - Knee flexion – 30 -60 degree
    - Hip flexion – 20-30 degree

Hip Hiking Gait

- Hip Flexors Weakness
- Knee Ankylosed
- Hamstrings weakness

Foot Drop Gait
High Steppage Gait

- Weakness or Paralysis of Dorsiflexion.
- No heel to toe pattern
- Excessive Hip and Knee Flexion

Flexed knee Gait

- Contracture of Hamstrings
- Knee remains in flexion
- Excessive DF of foot

Ataxia Gait

- Cellebellar ataxia
- Walks with wide base
- Poor balance
- Exaggerates all movement

Calcaneal Gait

- Weakness of Plantar flexon of foot
- Metatarsalgia
- Rupture of Tendoachillis

  - No Toe touch

Parkinson Gait

- Stereotype
- Decrease Generalised extension of LL
- Walks with
  - Flexed trunk
  - Short steps

Scissors Gait

- Spastic Diplegic CP
- Child walks on forefeet

Equinus Gait

- Pt walks on forefoot
- Contracture or spastic TA
- No heel contact
  - CP

REFERENCES

- Harrison's Principles of Internal Medicine (19th Ed)
- Davidson's Principles and Practice of medicine (23rd Ed)