DOA BELAJAR

رَضِيْتُ بِاللّٰهِ رَبًّا وَبِالْإِسْلَامِ دِيْنًا وَبِمُحَمَّدٍ نَبِيًّا وَرَسُوْلًا

رَبِّيْ زِدْنِيْ عِلْمًا وَارْزُقْنِيْ فَهْمًا

“Kami ridho Allah SWT sebagai Tuhanku, Islam sebagai agamaku, dan Nabi Muhammad sebagai Nabi dan Rasul, Ya Allah, tambahkanlah kepadaku ilmu dan berikanlah aku kefahaman”

SKIL LAB Motion Analysis Basic Human MOvement

TIM DOSEN

Disampaikan pada Kuliah MK FISIKA GERAK

Mei, 2021

Capaian Pembelajaran

Mahasiswa mampu mempraktikkan tentang **Motion Analysis Basic Human MOvement**

Movement Analysis: An Introduction

In order to fully appreciate and understand motion analysis of patients with movement dysfunction, it is first necessary to understand the normal movement pattern in various activities of daily living, such as:

- Rolling over
- Sitting up
- Standing up
- Walking

Movement Analysis: An Introduction

1. Observational Motion Analysis
2. Instrumented Motion Analysis
3. Clinical Motion Analysis

Movement Analysis: An Introduction

I. Observational Motion Analysis

- Direct observation of subject's movement by therapist
- Observation is carried out in a systematic manner, either from head down to the foot, or from foot up to the head.
- Do not interfere with the subject's movement.
- Identify the "essential components" and compare it with the patient's movement
- Identify the difference between the movement performed by a normal subject and the patient

Movement Analysis: An Introduction

I. Observational Motion Analysis

Identify the "essential components" and compare it with the patient's movement

"Essential components" are the parts of the movement which are absolutely necessary for the execution and completion of the movement.

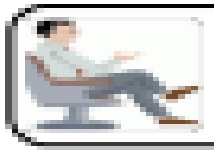
Without these essential components, the execution of the movement is not possible.

Movement Analysis: An Introduction

3. Clinical Motion Analysis

Movement Analysis 2: Sitting up from bed

What are the "essential components"?



Movement Analysis 2: Sitting up from bed

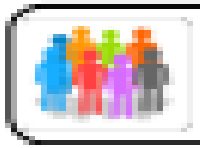
What are the "essential components"?

Essential components for sitting from left side lying:

1. RIGHT lateral flexion of head
2. RIGHT side flexion of the trunk
3. Flexion of hips
4. Dropping of both lower legs over the edge of the bed (to provide a swinging momentum)
5. Push off with left arm.

Movement Analysis 3: Standing up from chair

What are the "essential components"?



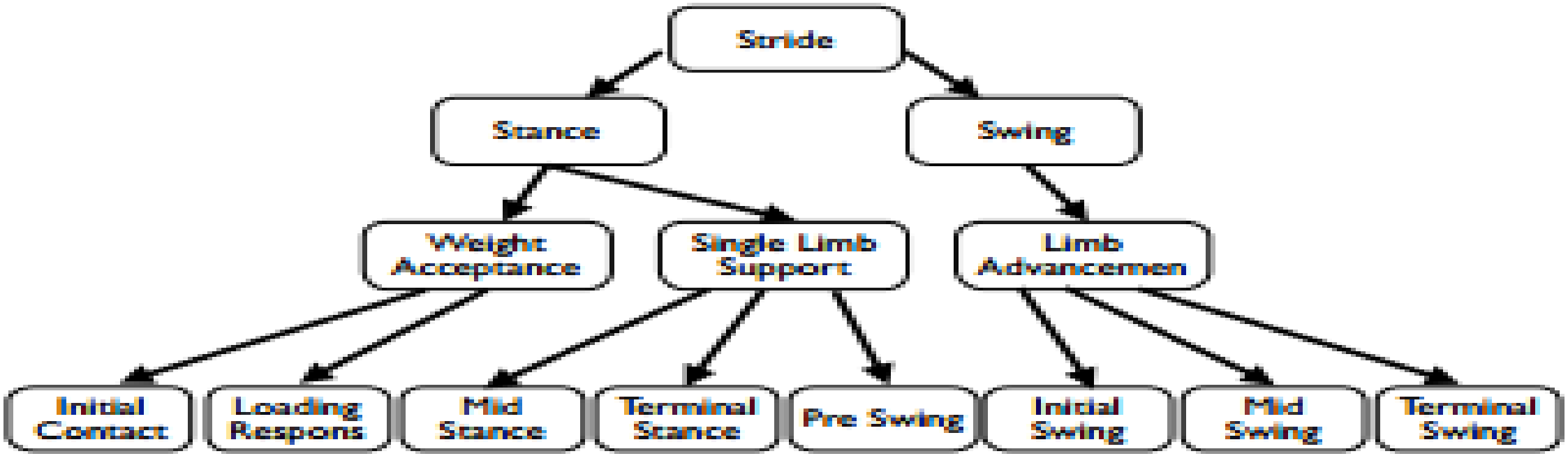
Movement Analysis 3: Standing up from chair

What are the "essential components"?

Essential components for standing up from chair:

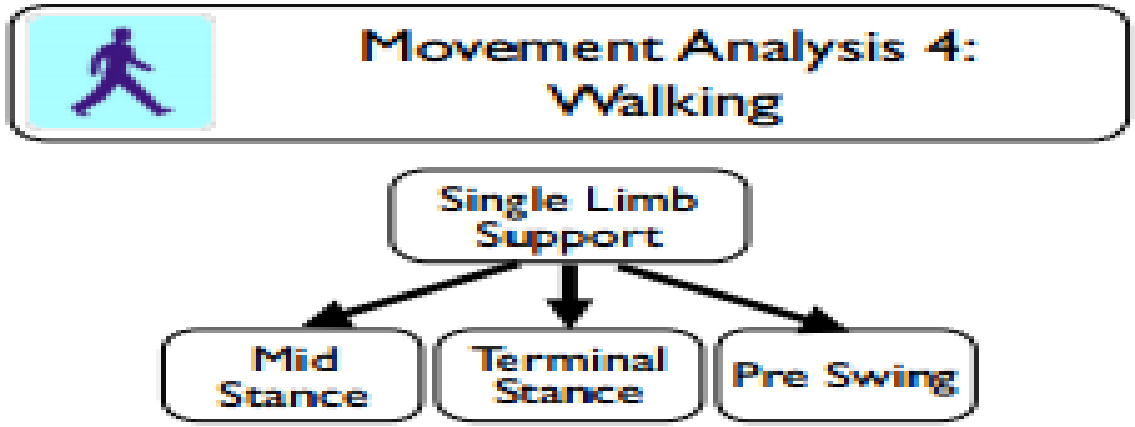
1. Placement of foot backwards (not shown in video)
2. Flexion of trunk to bring CoG forwards over base of support
3. Lifting of buttocks from chair and simultaneous forward movement of knees (dorsiflexion of ankles)
4. Simultaneous extension of knees, hips and trunk

Movement Analysis 4: Walking



Weight acceptance is the most demanding task in the gait cycle. It involves the following:

1. the transfer of body weight onto a limb that has just finished swinging forward and has an unstable alignment.
2. shock absorption, and
3. the maintenance of a forward progression

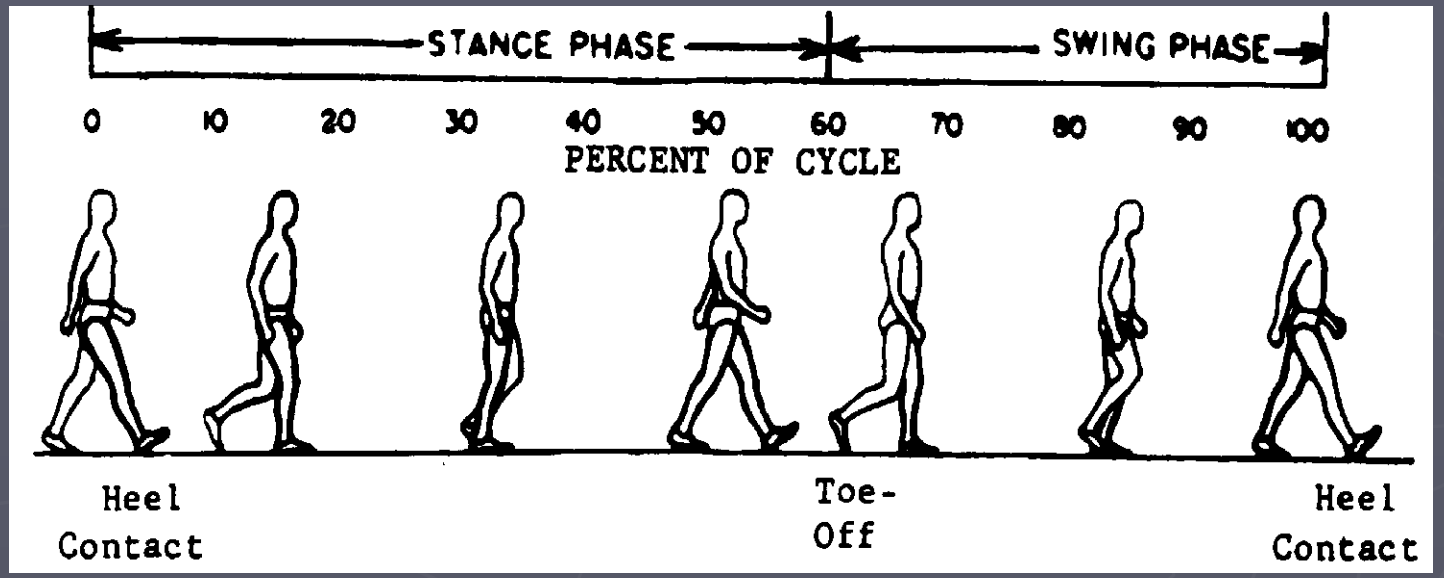


The next task of the gait cycle is single limb support.

This involves:

1. one limb supporting the entire body weight
2. ability to provide trunk stability while progression of the body forward is continued

Gait Cycle - Components:

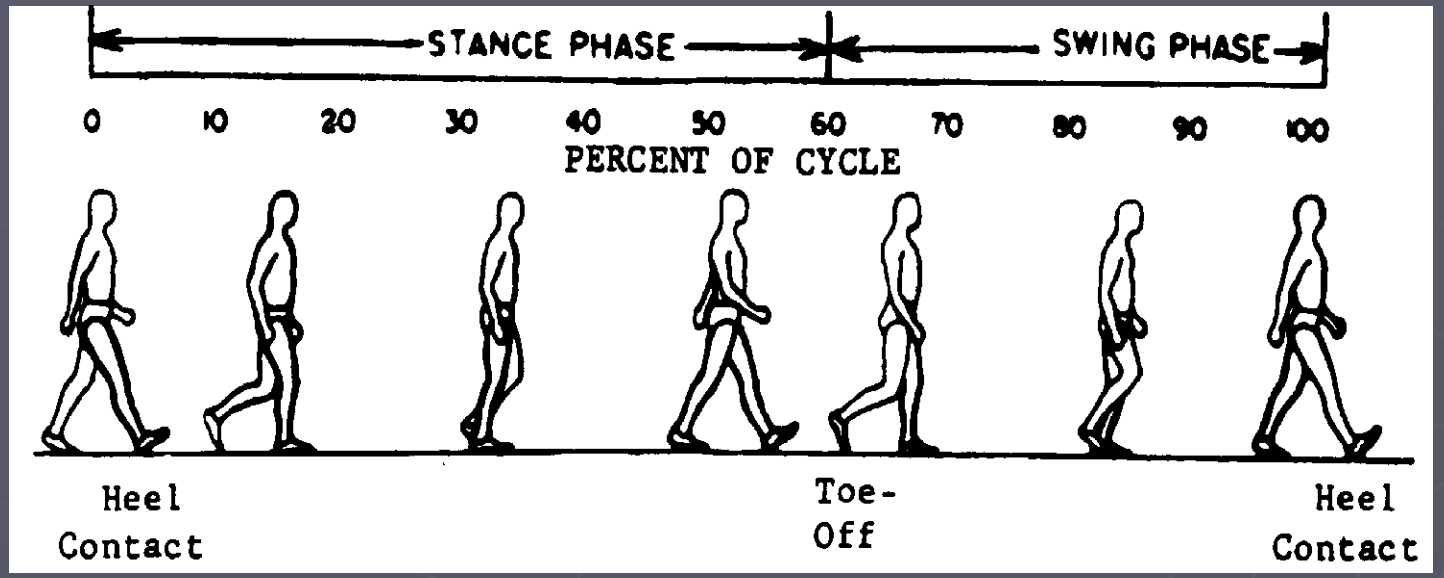


- Phases:

(1) Stance Phase: reference limb in contact with the floor

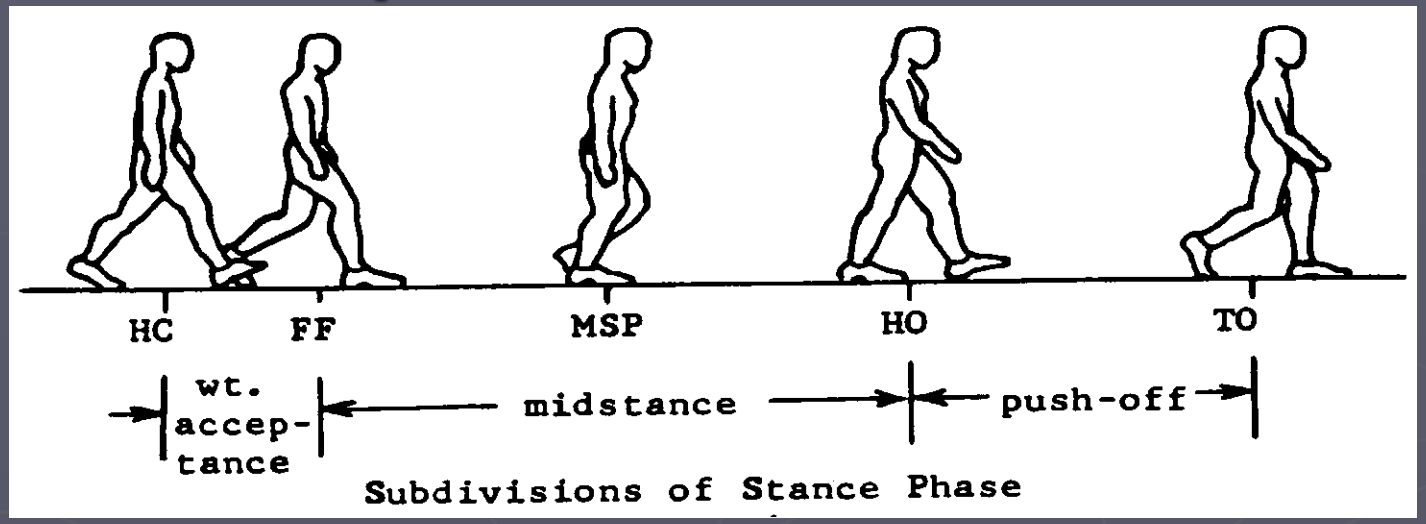
(2) Swing Phase: reference limb not in contact with the floor

Gait Cycle - Components:



- Support:
  - (1) Single Support: only one foot in contact with the floor
  - (2) Double Support: both feet in contact with floor

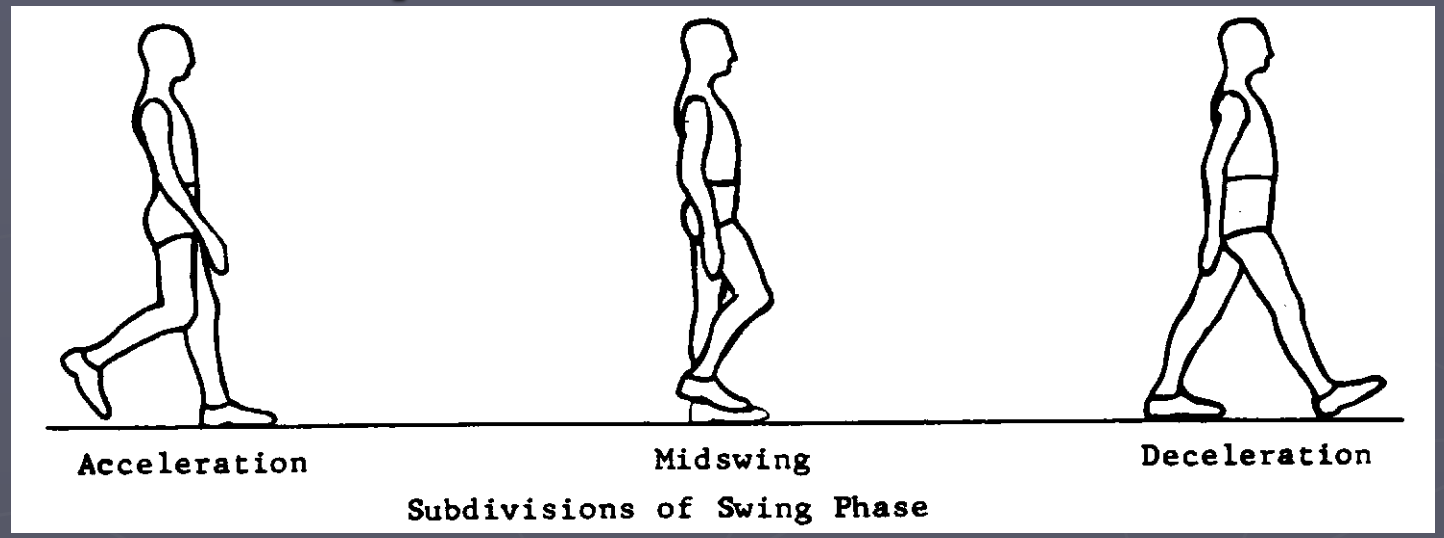
Gait Cycle - Subdivisions:



A. <u>Stance phase:</u>

1. **Heel contact**: 'Initial contact'
2. **Foot-flat**: 'Loading response', initial contact of forefoot w. ground
3. **Midstance**: greater trochanter in alignment w. vertical bisector of foot
4. **Heel-off**: 'Terminal stance'
5. **Toe-off**: 'Pre-swing'

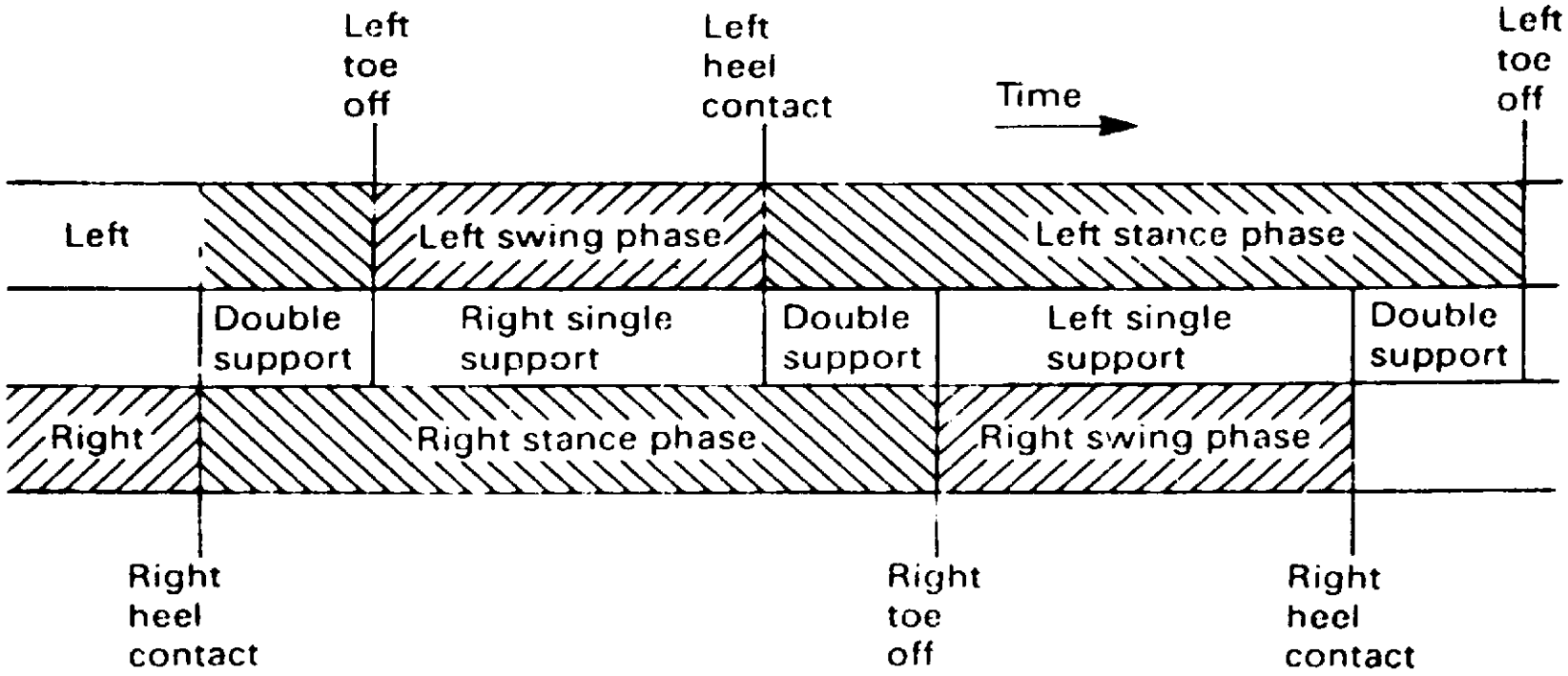
Gait Cycle - Subdivisions:

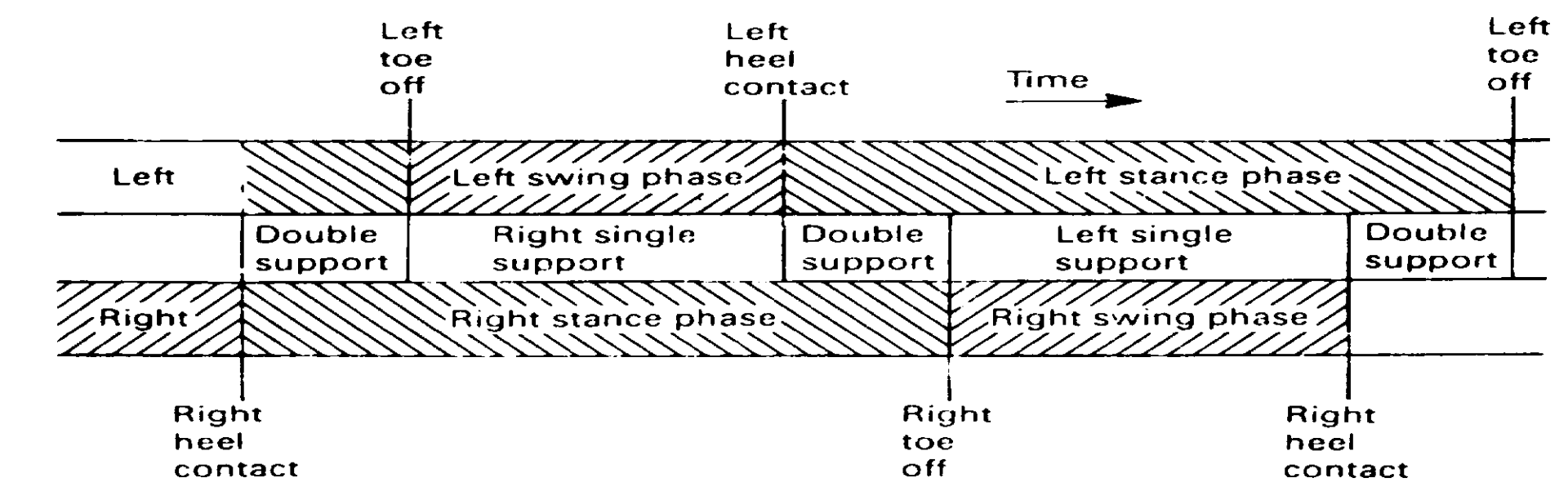


B. <u>Swing phase:</u>

1. **Acceleration**: 'Initial swing'
2. **Midswing**: swinging limb overtakes the limb in stance
3. **Deceleration**: 'Terminal swing'

Gait Cycle

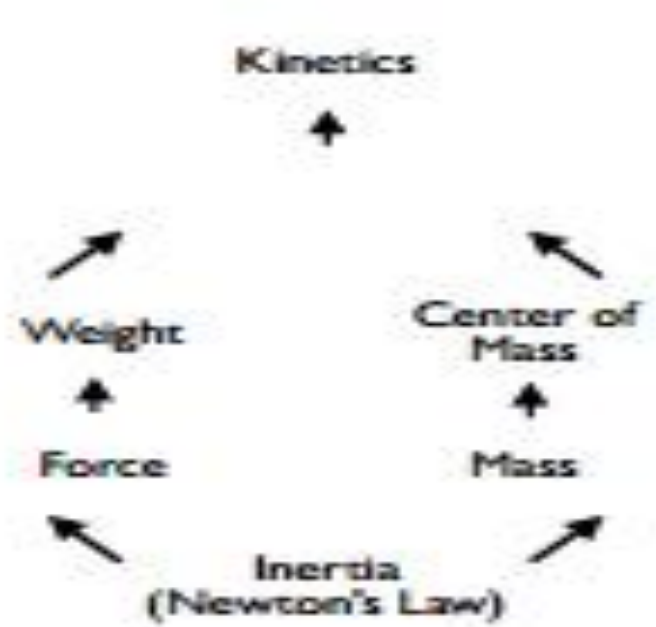

Left toe off
Left heel contact
Time
Left toe off
Left
Left swing phase
Left stance phase
Double support
Right single support
Double support
Left single support
Double support
Right
Right stance phase
Right swing phase
Right heel contact
Right toe off
Right heel contact



- Time Frame:
  - A. Stance vs. Swing:
    - Stance phase = 60% of gait cycle
    - Swing phase = 40%
  - B. Single vs. Double support:
    - Single support= 40% of gait cycle
    - Double support= 20%

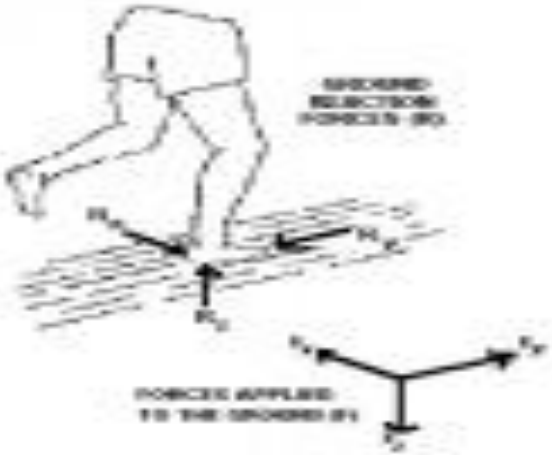
Movement Analysis 4: Walking

Ground Reaction Force



Force Plate

Inverse Dynamics



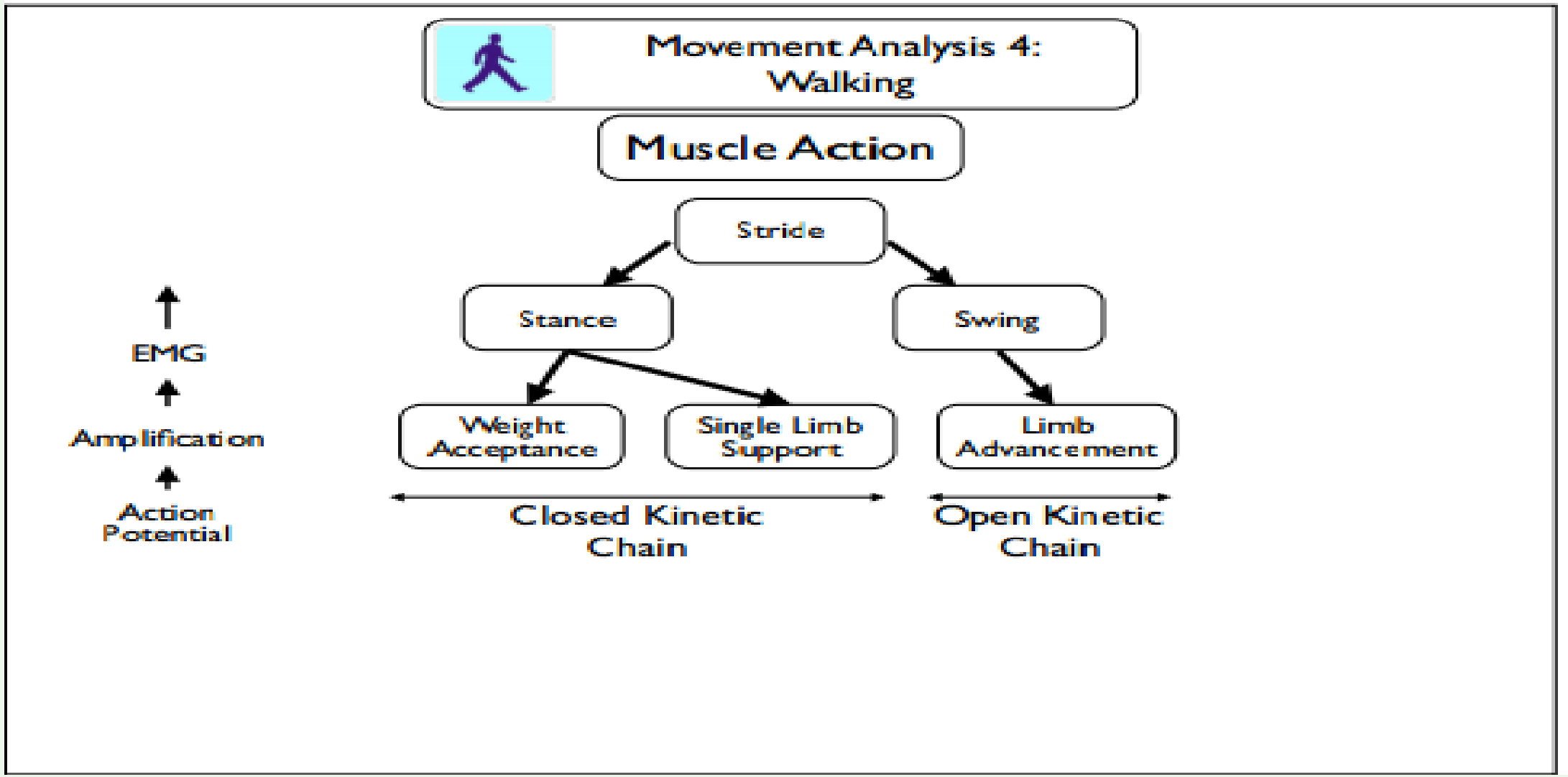
Movement Analysis 4: Walking

Muscle Action

↑ EMG
↑ Amplification
↑ Action Potential

The two basic muscle functions to be performed during gait are:

- Stance - body is maintained upright by anti-gravity muscles
- Swing - leg swings forward, in front of the rest of the body

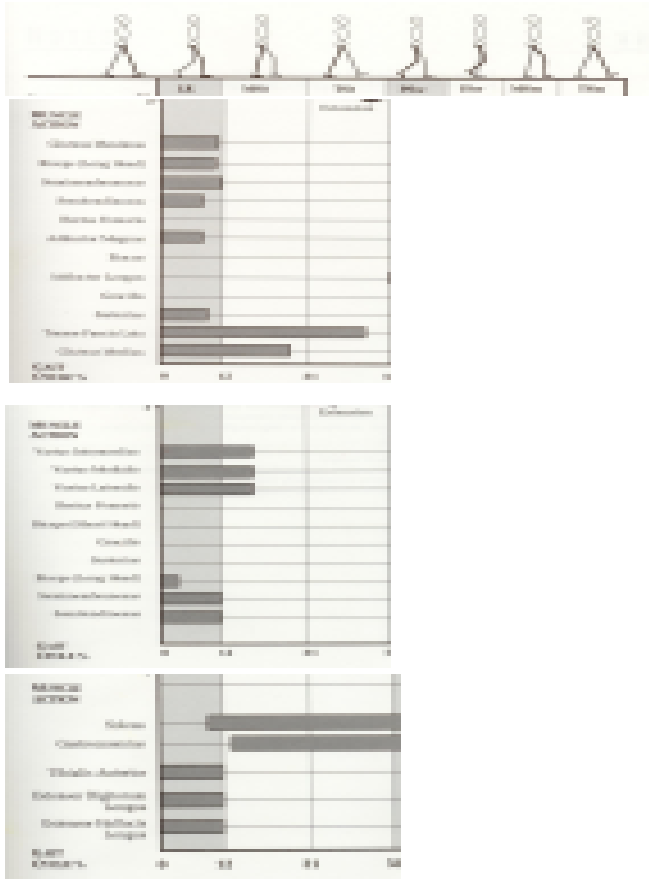

Movement Analysis 4:
Walking
Muscle Action
Stride
Stance
Swing
Weight Acceptance
Single Limb Support
Limb Advancement
Closed Kinetic Chain
Open Kinetic Chain
EMG
Amplification
Action Potential

Movement Analysis 4: Walking

Muscle Action

- Stride
  - Stance
    - Weight Acceptance
    - Single Limb Support

Closed Kinetic Chain



Stance: Anti-gravity muscles are

- Hip extensors (gluteus maximus, hamstrings)
- Knee extensors (quadriceps femoris)
- Ankle plantarfelxors (gastrocnemius, soleus)

Movement Analysis 4: Walking

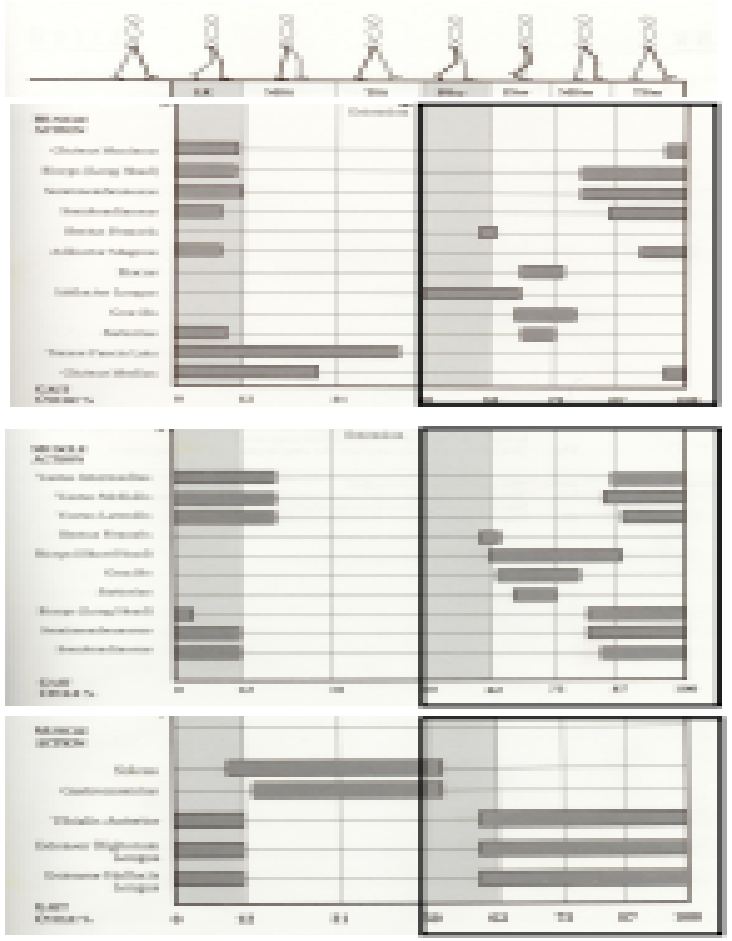
Muscle Action

Stride

Swing

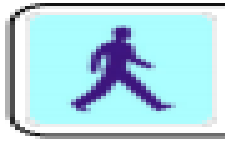
Limb Advancement

Open Kinetic Chain



Swing: Limb advancement

- The leg is made to swing forward at the end of stance by two mechanisms: push-off and pull-off
- The ankle plantar flexors push the leg forwards, while the hip flexors (iliopsoas) pull it forward.



Movement Analysis 4: Walking

Pathological Gait

I Rachos Los Amigos OGA

STEP 2 Cause Identification

Possible causes such as:

- Motor control problems
- ROM limitations
- Sensory (proprioceptive) deficits
- Pain
- Leg length discrepancy
- Balance deficits

Movement Analysis 4: Walking

Pathological Gait

3 10 points to observe in Hemiplegia

- STEP 1 Problem Identification
- STEP 2 Cause Identification
- STEP 3 Treatment

STEP 1	Problem Identification	STEP 1	Observed Deviation
Point 1	Step / Stride length	Decreased step length	
Point 2	Ankle angle at contact	Decreased dorsiflexion in swing	
Point 3	Ankle angle at toe-off	Decreased ankle plantarflexion at toe off	
Point 4	Knee angle at contact	Decreased knee extension prior to heel strike	
Point 5	Amount of stance phase knee flexion	Decreased knee flexion (or knee hyperextension) in stance	Increased knee flexion in stance
Point 6	Amount of swing phase knee flexion	Decreased peak knee flexion in early swing	
Point 7	Hip extension in terminal stance	Decreased peak hip extension in late stance	
Point 8	Trunk angle (forward flexed ?)	Decreased peak hip flexion in swing phase	
Point 9	Trendelenberg Sign	Decreased peak lateral pelvic displacement in stance	Increased lateral pelvic displacement in stance
Point 10	Angle of patella, feet, arm posture	Nil	

JAWAB PERTANYAAN DI BAWAH INI

- Apakah fungsi kita memahami Basic Human movement?
- Bagaimanakah analis pergerakan dari duduk di bed ke berdiri?
- Lakukan analisis pergerakan jalan dimulai dari awal fase dan akhir fase, terjadi komponen gerak apa saja di mulai dari HIP, Knee, angkle, dan komponen kerja otot penggerak eksentrik dan konsentrik?

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PENUTUP BELAJAR

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

اَللَّهُمَّ أَرِنَا الْحَقَّ حَقًّا وَارْزُقْنَا اتِّبَاعَه ُ وَأَرِنَا الْبَاطِلَ بَاطِلاً وَارْزُقْنَا اجْتِنَابَهُ

Ya Allah Tunjukkanlah kepada kami kebenaran sehinggga kami dapat mengikutinya,

Dan tunjukkanlah kepada kami keburukan sehingga kami dapat menjauhinya.


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