



Basics of Exercise Therapy

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Chapter 1

Fundamental positions & Starting positions

Introduction

Fundamental postures are a position which one holds their body when standing, sitting or position it in a path fitting to the development that is attractive bowing, lying or for a particular work.

The postures from which the movement is started are known as starting positions, these can either be active or passive in nature. There are 5 fundamental starting positions.

- Standing
- Kneeling
- Sitting
- Lying
- Hanging

Any remaining positions are gotten from these situations by modifying the places of arms, trunk and legs and are known to be Derived Positions. All activities start in one of the beginning positions and changed by moving into another position or adjusted by the need. An equilibrium of powers following up on the body keep up balance and dependability in these positions. Postural reflexes control strength and dissemination of withdrawals.

Standing

In standing the entire body should be adjusted and balanced out in right arrangement on feet with a little base of help by facilitated work of many muscle gatherings. It is the Most troublesome of positions, the position is depicted as underneath.

Heels	Together, in same line, toes slightly apart
Knees	Together & straight
Hips	Extended & slightly laterally rotated

Pelvis	Balanced on femoral heads
Spine	Stretched to maximum length
Head	Thrust upwards, ears leveled & eyes look straight forward
Shoulders	Down & back
Arms	Hang loosely to sides
Palm	Facing inwards towards body

Muscle work

At the point when the Body parts are in acceptable arrangement and totally adjusted the muscle work is least. This increments as development happens or the powers keeping the arrangement disturbs.

Muscle	work
Intrinsic muscles of feet	Stabilizes feet & Prevents toe curling
Plantar flexors	Balances lower leg on foot
Dorsiflexors	Counterbalances plantarflexors& support medial longitudinal arch of foot
Evertors	Counterbalances action of invertors Presses ball of Great toe on ground
Knee extensors	works slightly
<u>Hip extensors</u>	Maintains hip extension Balances pelvis on femoral heads
Hip Lateral rotators(Slight action)	Bracing of legs & foot arches
Spinal extensors	Keeps trunk straight
<u>Lumbar flexors</u>	Prevents over action of lumbar extensors Maintain correct angle of pelvic tilt Supports abdominal viscera

Pre vertebral neck muscles	Controls extensive neck extension Straightens cervical spine
Flexors/extensors of atlanto-occipital joint	Work reciprocally to balance head
Elevators of mandible	Closes the mouth
Scapular retractors	draws the scapulae back wards
Arms	Relaxed

Uses-

Because of small base of support this position is less steady, high COG. This position is reasonable to people who can impeccably adjust and keep up it accurately.

This is appropriate for performing numerous activities, if keep up effectively decreases muscle work and conditions the postural reflex.

Kneeling

In this position the body is supported on the knees which can be together or slightly apart. The feet are plantar flexed if kneeling on ground or in mid position if on plinth, this is often used in praying.

Muscle work

Muscle	work
Flexors & extensors of knee	Inter play to balance femora vertically on the knees
Extensors of Hip and flexors of lumbar spine	Maintain correct angle of pelvic tilt

Remaining work of the muscles is alike that of in standing.

Uses-

In this position the body is upheld on the knees which can be together or somewhat separated. The feet are plantar flexed if bowing on ground or in mid position if on plinth, this is regularly utilized in supplicating.

Sitting

This position is taken in chair or stool and the hips and knees are flexed to right angle and the feet rest on the floor. Most used position in daily life.

Muscle work

This position does not need much of work to be done by the legs to hold on to the position, the flexors of hips work to maintain a right angle and prevent the tendency to slump.

Uses-

This is the most comfortable of positions and is very stable, rotation is limited to spine as the pelvis bears the weight of the upper body and is fixed, suitable for non-weight bearing exercises of the knee and foot can be performed in this position and also suitable for training correct alignment of upper body in habitual sitting.

Lying

Lying is the easiest of the fundamental positions and most of us spend few hours as in sleeping or relaxing and most preferred position for rest.

Muscle work

Muscle work in lying is minimal not much movement occurs in this position is taken on a soft mattress as it gives way to the contours of the body but if taken on a plinth or a hard surface the head can roll to either sides.

Uses-

The spine is relieved of weight of the upper body suitable for many exercises and in the treatment of spinal deformities, unsuitable for patients with respiratory or heart conditions due to increased pressure of abdominal viscera and elderly due the hindrance to return of blood from heart.

Hanging

In hanging body is suspended by grasping onto something with the fingers and palm

Uses-

Hanging requires extensive work of upper back and arms so people with strong muscles to maintain the body weight can use this position. Children enjoy this position in play not suitable for weak individuals.

Chapter 2

Functional Re-education

Introduction

Mat exercises are quite possibly the main pieces of restoration program of SCI patients. Tangle practices are remembered for the treatment program when weight bearing to spine is allowed.

Tangle exercises are given to:

- Facilitate balance
- Promote steadiness
- Mobilize and fortify the storage compartment and appendage.
- Train for useful exercises
- To accomplish the ideal impact of the treatment program, tangle exercises should be sequenced from simpler to troublesome and movement through succession should be thought of. The kind of the tangle exercises, given to the patient is dictated by the advisor based on degree of injury and clinical status of patient. The cutoff to which an action can be performed and time taken to learn it relies upon the capacity of the patient. Yet, advisor should strive to improve the circumstance and speed of the patient.

Different mat activities taught to patient are:

a) Rolling

For moving to be viable, understanding is needed to figure out how to move the head, neck, upper appendage, lower appendage and trunk in an equilibrium way. Moving is expected to improve bed versatility and to change position freely. At first, moving is instructed to quiet in tangle however thereafter tolerant gets certainty to perform it over bed.

Activity to job inclined from prostrate position:

- 1) Patient lies in prostrate position.
- 2) Patient flexes his head, neck and right shoulder.
- 3) Right arm is moved towards left side to make force.

- 4) The force of arm is moved to trunk and lower appendage.
- 5) The lower half of body will be moved to inclined position. Flexion of hip and knee will encourage the roll.
- 6) Patient takes his correct shoulder at the rear by putting weight on left lower arm and along these lines, weight is dispersed on both upper appendage.
- 7) Patient falsehoods inclined

b) Prone on elbow

This position on tangle exercises given to cervical sore patient encourages head and neck control and reinforces serratus foremost and other scapular muscles. This position is imperative to prepare the patient to pick up soundness is quadruped and sitting position. Inclined on elbow position should be utilized cautiously in lumbar wounds as this increments lumbar lordosis.

Activity of patient:

- 1) Patient untruths inclined and puts his elbows near trunk.
- 2) Elbows are pushed down while lifting head and upper trunk.
- 3) Now, persistent carries the elbow to the degree of shoulder and body weight is moved through elbows.

c) Prone on hands

- d) This position is given to paraplegic patient because it requires strong pectoralis major and deltoid muscles. However, this activity is not appropriate to all paraplegics as excessive lordosis is produced. Prone on hand position is required to gain postural alignment during standing, ambulation and standing from floor with use of orthosis and crutches.
- e) Position of hands in this position is same as standard push up position except that arms are laterally rotated.

f) Supine on elbow

This position is a significant reinforcing exercise for shoulder extensors and scapular adductors. The reason for this position is to plan quiet for long sitting position. This

position is expected by the solace and handicap of patient.

This position is accomplished either from side lying position or by pushing the elbow over tangle and lifting into this position. The later strategy requires a solid abs.

g) Pull ups

This kind of mat activities is given in quadriplegics to strengthen their biceps and shoulder flexors, which may be required for wheel chair propulsion.

Action:

- 1) Patient lies supine.
- 2) Therapist stands over the patient in high kneeling position.
- 3) Lower limb of therapist is near the hips of patient.
- 4) Patient holds the forearm of therapist and pulls himself to sitting position and then lowers down.

f) Sitting

- Sitting position are important for various activities in daily life such as ADL, transfer, dressing, wheel chair mobility etc. Sitting is achieved easily by paraplegics, but it is a difficult job for quadriplegics.
- Stability in sitting position for quadriplegics is achieved by weight bearing through hands with flexed fingers, extended wrist, extended elbow and hyper extended and externally rotated shoulder.
- Sitting position varies according to level of lesion.

To sit from supine position in lower level lesion:

- 1) Patient lies in supine position.
- 2) Patient turn the upper trunk to left side moving the right arm toward left side of body along with head and neck flexion.
- 3) Both elbows are brought nearer to trunk alternately.
- 4) Patient leans over left elbow and extends the right arm behind the body.
- 5) Left elbow is extended by leaning over right arm.
- 6) Both hands are brought forward alternately to achieve sitting position

Chapter 3

Manual therapy

"Manual therapy is the use of hands in a curative and healing manner or a hands-on technique with therapeutic intent..."²

There is a wide range of disciplines which use manual therapeutic methods to treat and manage pathology and dysfunction as a primary treatment method or in conjunction with other treatments. Physiotherapists are sometimes considered specialists in manual therapy but other professions such as Osteopaths, Chiropractors and Nurses employ manual therapy in treatment. Manual therapy works through a multitude of different mechanisms to be effective and understanding the physiological, neurological and psychophysiological mechanisms is critical to utilising manual therapy clinically in a competent and safe manner².

From a Physiotherapy perspective manual therapy is an essential and commonly used treatment method for the management of tissue, joint and movement dysfunction. There are several different main stream approaches to manual therapy; arguably the most common form simplistic form manual therapy used by physiotherapists are mobilisations from the Maitland school of thought.

The Maitland Concept

"The Maitland Concept of Manipulative Physiotherapy [as it became to be known], emphasises a specific way of thinking, continuous evaluation and assessment and the art of manipulative physiotherapy ("know when, how and which techniques to perform, and adapt these to the individual Patient") and a total commitment to the patient."³

The application of the Maitland concept can be on the peripheral or spinal joints, both require technical explanation and differ in technical terms and effects, however the main theoretical approach is similar to both.

The concept is named after its pioneer Geoffrey Maitland who was seen as a pioneer of musculoskeletal physiotherapy, along with several of his colleagues.

Key Terms

- **Accessory Movement** - Accessory or joint play movements are joint movements which cannot be performed by the individual. These movements include roll, spin and slide which accompany physiological movements of a joint. The accessory movements are examined passively to assess range and symptom response in the open

pack position of a joint. Understanding this idea of accessory movements and their dysfunction is essential to applying the Maitland concept clinically.

- **Physiological Movement** - The movements which can be achieved and performed actively by a person and can be analysed for quality and symptom response.
- **Injuring Movement** - Making the pain/symptoms 'come on' by moving the joint in a particular direction during the clinical assessment.
- **Overpressure** - Each joint has a passive range of movement which exceeds its available active range. To achieve this range a stretch is applied to the end of normal passive movement. This range nearly always has a degree of discomfort and assessment of dislocation or subluxation should be acquired during the subjective assessment.

Initial Assessment

The Maitland concept is a fantastic tool for approaching an initial assessment as it can be used to form a logical and deduced hypothesis about the nature of the origins of the movement disorder or pain. It is worth considering using mobilisations in your assessment process and reading the **Initial Assessment** section in Maitlands book **Peripheral Manipulation**.

As with any treatment decision a competent and effective assessment is crucial to any patient interaction. The Subjective Assessment is necessary for determining whether or not mobilisations are suitable for this patient or if they are contraindicated by looking for red flags such as cancer, recent fracture, open wound or active bleeding, infective arthritis, joint fusion and more.

The Objective Assessment is an area which the versatile nature of mobilisations becomes clear. Additionally to being a treatment method they are available to the therapist to assess a patients joints and tissues by analysing their extensibility, pain reproduction, bony blocks or abnormal end feels.

Principles of Techniques

Decisions Which Need to be Made:

1. **The Direction** - of the mobilisation needs to be clinically reasoned by the therapist and needs to be appropriate for the diagnosis made. Not all directions will be effective for any dysfunction.
2. **The Desired Effect** - what effect of the mobilisation is the therapist wanting? Relieve pain or stretch stiffness?
3. **The Starting Position** - of the patient and the therapist to make the treatment effective and comfortable. This also involves thinking about how the forces from the therapists hands will be placed to have a localised effect.

4. **The Method of Application** - The position, range, amplitude, rhythm and duration of the technique.
5. **The Expected Response** - Should the patient be pain-free, have an increased range or have reduced soreness?
6. **How Might the Technique be Progressed** - Duration, frequency or rhythm?

How to Choose the Direction

To make sure you settle on appropriate mobilisations it is important to get the type of glide, the direction and speed correct.

Different Types of Mobilisation: How Many Glides?

Each joint has a different movement arc in a different direction to other joints and therefore care needs to be taken when choosing which direction to manipulate; this is where the Concave Convex Rule comes into use, but for now consider the number of possible glides a clinician may use:

1. A-P (Anteroposterior)
2. P-A (Posteroanterior)
3. Longitudinal Caudad
4. Longitudinal Cephalad
5. Joint Distraction
6. Medial Glide
7. Lateral Glide

Due to anatomical position and other physical limitations not all peripheral or spinal joints can be subjected to all of the types of glide. Here are examples of mobilisations of joints of the body:

- Elbow Mobilizations
- Wrist/Hand Mobilizations
- Hip Mobilizations
- Knee Mobilizations
- Ankle and Foot Mobilisations
- Spinal Manipulation
- Shoulder Mobilizations and Manipulation
- Cervicothoracic Manipulation

Concave Convex Rule: Up, down, Left or Right?

Choosing the direction of the mobilisation is integral to ensuring you are having the desired clinical outcome. This is where a knowledge of Arthrokinematics is important. In summary:

There are two important things to remember:

- When a convex surface (i.e Humeral Head) moves on a stable concave surface (i.e Glenoid Fossa) the sliding of the convex articulating surface occurs in the opposite direction to the motion of the bony lever (i.e the Humerus).

The opposite can be said for

- When a concave surface (i.e Tibia; talocrural joint) is moving on a stable convex surface (i.e Talus) sliding occurs in the same direction of the bony level.

Examples:

To improve shoulder flexion you would perform an A-P mobilisation due to the way the convex humerus articulates with the concave glenoid fossa.

An easier way to visualise this is to try and show this rule with your hands. (Picture fro

How to Choose the Grade: How Far into Range and Quickly or Slowly?

Grades of Mobilisations

Grade I – small amplitude movement at the beginning of the available range of movement

Grade II – large amplitude movement at within the available range of movement

Grade III – large amplitude movement that moves into stiffness or muscle spasm

Grade IV – small amplitude movement stretching into stiffness or muscle spasm

A 5th grade is possible but further training will be required to perform safely

In many places, you are obliged to obtain a written consent from your patient before applying grade 5 manipulation .

The grading scale has been separated into two due to their clinical indications

- Lower grades (I + II) are used to reduce pain and irritability (use VAS + SIN scores).
- Higher grades(III + IV) are used to stretch the joint capsule and passive tissues which support and stabilise the joint so increase range of movement.

The rate of mobilisation should be thought of as an oscillation in a rhythmical fashion at.

- 2Hz - 120 movements per minute
- For 30 seconds - 1 minute

Chapter 4

Range of Motion

Introduction

This is the range through which a joint can be moved, usually its range of flexion and extension, as determined by the type of joint, its articular surfaces, and that allowed by regional muscles, tendons, ligaments, joints and physiologic control of movement across the joint.^[1] Range of motion is the extent of movement of a joint, measured in degrees of a circle. It is the Joint movement (active, passive, or a combination of both) carried out to assess, preserve, or increase the arc of joint motion.

Measuring range of motion

Devices to measure range of motion in the joints of the body include the Goniometer and Inclinometer which use a stationary arm, protractor, fulcrum, and movement arm to measure angle from axis of the joint.^[2] Tape measures can also be used to measure range of motion in some specific parts of the body (lumbar range of motion).

Diagram

Limited range of motion

Limited range of motion refers to a joint that has a reduction in its ability to move. Motion may be limited because of a problem within the joint, swelling of tissue around the joint, stiffness of the muscles, or pain.

Range of motion exercises

Range of motion exercise refers to activity aimed at improving movement of a specific joint. This motion is influenced by several structures: configuration of bone surfaces within the joint, joint capsule, ligaments, tendons, and muscles acting on the joint.

There are three types of range of motion exercises

1. Passive
2. Active
3. Active assistive

Passive range of motion

Passive range of motion is the movement applied to a joint solely by another person or persons or a passive motion machine. When passive range of motion is applied, the joint of an individual receiving exercise is completely relaxed while the outside force moves the body part, such as a leg or arm, throughout the available range. Injury, surgery, or immobilization of a joint may affect the normal joint range of motion.

Passive range of motion techniques

For upper limb

Shoulder joint –

Flexion

Extension

Abduction

Adduction

Internal rotation

External rotation

Elbow joint –

Flexion

Extension

Superior & inferior radioulnar joint –

Pronation

Supination

Wrist joint –

Flexion

Extension

Abduction (Radial deviation)

Adduction (Ulnar deviation)

Active range of motion

Active range of motion is movement of a joint provided entirely by the individual performing the exercise. In this case, there is no outside force aiding in the movement.

Active range of motion techniques

For upper limb

Shoulder joint –

Flexion

Extension

Abduction

Adduction

Internal rotation

External rotation

Elbow joint –

Flexion

Extension

Superior & inferior radioulnar joint –

Pronation

Supination

Wrist joint –

Flexion

Extension

Abduction (Radial deviation)

Adduction (Ulnar deviation)

For lower limb

Hip joint-

Flexion

Extension

Abduction

Adduction

Internal rotation

External rotation

Knee joint –

Flexion

Extension

Ankle joint –

Dorsiflexion

Plantarflexion

Cervical spinal segment

Flexion

Extension

Lateral Flexion

Lumber spinal segment

Flexion

Extension

Lateral Flexion (Side Bending)

Active assisted range of motion

Active assist range of motion is described as a joint receiving partial assistance from an outside force. This range of motion may result from the majority of motion applied by an exerciser or by the person or persons assisting the individual. It also may be a half-and-half effort on the joint from each source.

Active range of motion techniques

For upper limb

Shoulder joint –

Flexion

Extension

Abduction

Adduction

Internal rotation

External rotation

Elbow joint –

Flexion

Extension

Superior & inferior radioulnar joint –

Pronation

Supination

Wrist joint –

Flexion

Extension

Abduction (Radial deviation)

Adduction (Ulnar deviation)

Fingers-

Thumb-

For lower limb

Hip joint-

Flexion

Extension

Abduction

Adduction

Internal rotation

External rotation

Knee joint –

Flexion

Extension

Ankle joint –

Dorsiflexion

Plantarflexion

Toes -

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