LEARNING OBJECTIVES

• Understand the importance of user + wheelchair + environment fit when assessing for equipment
• Understand the principles of seating
• Understand types of postures commonly seen
• Understand the effect of inappropriate equipment on posture
• Understand the ergonomics of self propulsion
When prescribing a wheelchair you need to consider the **needs** of the user and the **environment** and match them to the features of the **wheelchair**.
• What does the individual hope to achieve?
• What is realistic?
• By providing a wheelchair will other goals be compromised or enhanced?
• What is the condition and is it going to change?
• Who else will be affected?
• Is there someone else to assist (e.g. for transit propulsion)?
• Does the wheelchair need to be transported?
• How long will the user spend in the wheelchair?
• How often will the wheelchair be used?
• Who will be using the wheelchair (user and carers)?
• Where will the wheelchair be used?
• Who will be lifting the wheelchair?
THE ENVIRONMENT

• Steps?
• Doorway widths?
• Storage?
• Floor type?
• Stairs?
• Space to move indoors?
• Anywhere else the wheelchair will be used?
THE ASSESSMENT PROCESS

1. INTERVIEW
2. PHYSICAL EXAMINATION
3. MEASUREMENTS
4. EQUIPMENT TRIALS
5. EQUIPMENT PRESCRIPTION
6. REVIEW
• Good posture begins with the pelvis

• You need to be aware of the position of the Anterior Superior Iliac Spine (ASIS) and the Posterior Superior Iliac Spine (PSIS) during your physical assessment in order to determine any postural abnormalities
NORMAL POSTURE

In an optimal seated position, the ASIS and the PSIS are level, and the pelvis is in minimal anterior pelvic tilt. Weight is taken evenly through both Ischial Tuberosities with the head and spine balanced and aligned above the hips.
TYPES OF POSTURES COMMONLY SEEN

Pelvic Postures
- Posterior Pelvic Tilt
- Windswept Deformity
- Pelvic Rotation
- Pelvic Obliquity

Spinal Postures
- Kyphosis
- Lordosis
- Scoliosis
TYPES OF POSTURES

POSTERIOR PELVIC TILT

- Ischial tuberosities push forward rather than downwards increasing shear forces and friction
- Increased loading on the sacrum and coccyx & increased hip angle
- Commonly referred to as ‘sacral sitting’
**TYPES OF POSTURES**

**KYPHOSIS**
- Abnormally excessive convex curvature of the spine
- Rounding of the spine
- Can be fixed or flexible
- Usually associated with posterior pelvic tilt

**LORDOSIS**
- Less common
- Seen in many Duschenne’s Muscular Dystrophy cases where the vertebrae are stacked to achieve upright sitting posture.
- Often shown as a barrel-shaped chest in sitting
TYPES OF POSTURES

PELVIC OBLIQUITY
• Describes the pelvis when one iliac crest is higher than the other
• Pelvis leans laterally to one side
• Majority of weight being supported by one ischial tuberosity & greater trochanter.

SCOLIOSIS
• Gravity works against the body and muscle strength is insufficient to work against it
• Often seen with 2 s-shaped curve,
• Needs to be supported in 2 or 3 different places, often off-set
• Seen with pelvic obliquity
TYPES OF POSTURES

WINDSWEPT DEFORMITY

- Abduction and external rotation of one hip with the adduction and internal rotation of the other.
- May occur in association with hip dislocation, scoliosis, pelvic rotation.

PELVIC ROTATION

- One ASIS is in front of the other
- Often seen with pelvic obliquity and can lead to windswept deformity
- Often allows the head to be in its most functional position at the expense of the rest of the body
PRINCIPLES OF SEATING

WHAT ARE WE AIMING TO ACHIEVE?

HOW DO WE DO IT?
PRINCIPLES OF SEATING

POSTURAL MANAGEMENT AIMS TO:

• Encourage normal movement patterns, by re-establishing the memory of normal movement, and allowing freedom of movement

• Attain or sustain a good posture to enable the individual to take part in everyday activities

• Facilitate good posture for effective communication, breathing and eating

• Reduce discomfort or pain and fatigue

• Reduce the possibility of further changes to joints and spine, and help manage spasms
PRINCIPLES OF SEATING

FIXED POSTURES

• If the posture is fixed, you need to accommodate this posture using the functions available to you in the chair.

• The aim is to slow down deterioration of this abnormal posture by supporting it within the chair.

FLEXIBLE POSTURES

• If the posture is flexible or partially correctable, you can attempt to correct this posture using the chair/equipment.

• The aim is to support the person into a better seating position, improve their functional ability and to prevent or slow down the deterioration of their posture.
WHEELCHAIR ACCESSORIES FOR POSTURAL MANAGEMENT

- Tension adjustable backrests
- Headrests
- Lateral supports
- Pelvic positioning belts
- Harnesses
- Rigid backrests
- Wheelchair cushions
- Tilt in space
- Customised armrests
- Modular seating
- Elevated legrests
- Wheelchair trays
- Brake extension
- Extended footplate supports
- Ankle huggers
EFFECTS OF INAPPROPRIATE SEATING

• Poor / reduced head control
• Mal-alignment of internal organs
• Poor digestion
• Reduced lung capacity (possible chest infections)
• Cardiac output may be compromised
• Root of spinal nerves may affect muscle innervation
• Hip migration or dislocation
• Pressure ulcer development
• Muscle shortening
• Fixed deformities
SELF PROPULSION
Ergonomics of Propulsion

Research has been carried out on the best propulsion techniques for manual wheelchair users.

Originally two styles were identified:
- Circular
- Pumping
  - Sanderson DJ & Sommer HJ (1985)

Now, **FOUR DISTINCT STYLES** have been identified:
- Arc
- Single Loop Over
- Double Loop Over
- Semicircular
  - Boninger et al. (2002)
**PROPELLION PATTERNS**

**Arcing (ARC)**
- This occurs when the hands follow an arc along the path of the rim during the recovery phase.

**Single-Loop Over**
- Single-looping-over propulsion (SLOP) is identified by the hands rising above the push rim during the recovery phase.
PROPULSION PATTERNS

Double-Loop Over

- Double-looping-over propulsion (DLOP) begins with the hands rising above the push rim, then crossing over and dropping under the push rim during the recovery phase.

Semi-circular

- Semi-circular propulsion is recognised by the hands falling below the push rim during the recovery phase.
BEST PRACTICE – SEMI-CIRCULAR

- Use long and smooth strokes that limit high forces and rate of loading on the push rim.

- Allow the hand to naturally drift down when letting go of the push rim; the user should make an effort to keep the hand below the push rim when not in contact with the push rim.
BEST PRACTICE – SEMI-CIRCULAR

- Hand follows an elliptical pattern with no abrupt changes in direction and extra hand movements
- Lower stroke frequency
- Less angular joint velocity and acceleration
- Greater time spent in the push phase relative to the recovery phase
- Increased efficiency
- Used by wheelchair racers
OPTIMAL REAR WHEEL POSITION FOR SELF PROPULSION

• Tip of the middle finger at the wheel hub
• Centre of gravity positioned over the hub of the wheel
• 120° of elbow flexion at the top of the push cycle
• Optimal push stroke:
  • 10 o’clock → 2 o’clock
• 70-80% weight over the wheels
• Camber
OPTIMAL PROPULSION

• 10 o’clock – 2 o’clock
  • User hand to start at 10 o’clock position and finish at 2 o’clock position on the hand rim during the push phase.

• Elbow flexion
  • User’s elbow to be at 100° - 120° angle, half way through the push phase with hand at the top of the hand rim.

• Full extension
  • User’s arm in full extension at the end of the push phase in the 2 o’clock position.
USEFUL LINKS

• Seating Matters - http://seatingmatters.com

• Lifetec Factsheets
  • https://lifetec.org.au/education/fact-sheets
    • Manual Wheelchair Features
    • Wheelchairs For Outdoors
    • Manual Wheelchair Selection

• Medical Aids Subsidy Scheme
  • https://www.health.qld.gov.au/mass/prescribe/mobility/resources

The Therapy Collective was founded by Occupational Therapist Amy Vincent. Amy has extensive experience in wheelchair and specialist seating assessment and prescription.

Amy Vincent // 0407 158 875
info@thetherapycollective.com.au
www.thetherapycollective.com.au